

No. 614,319.

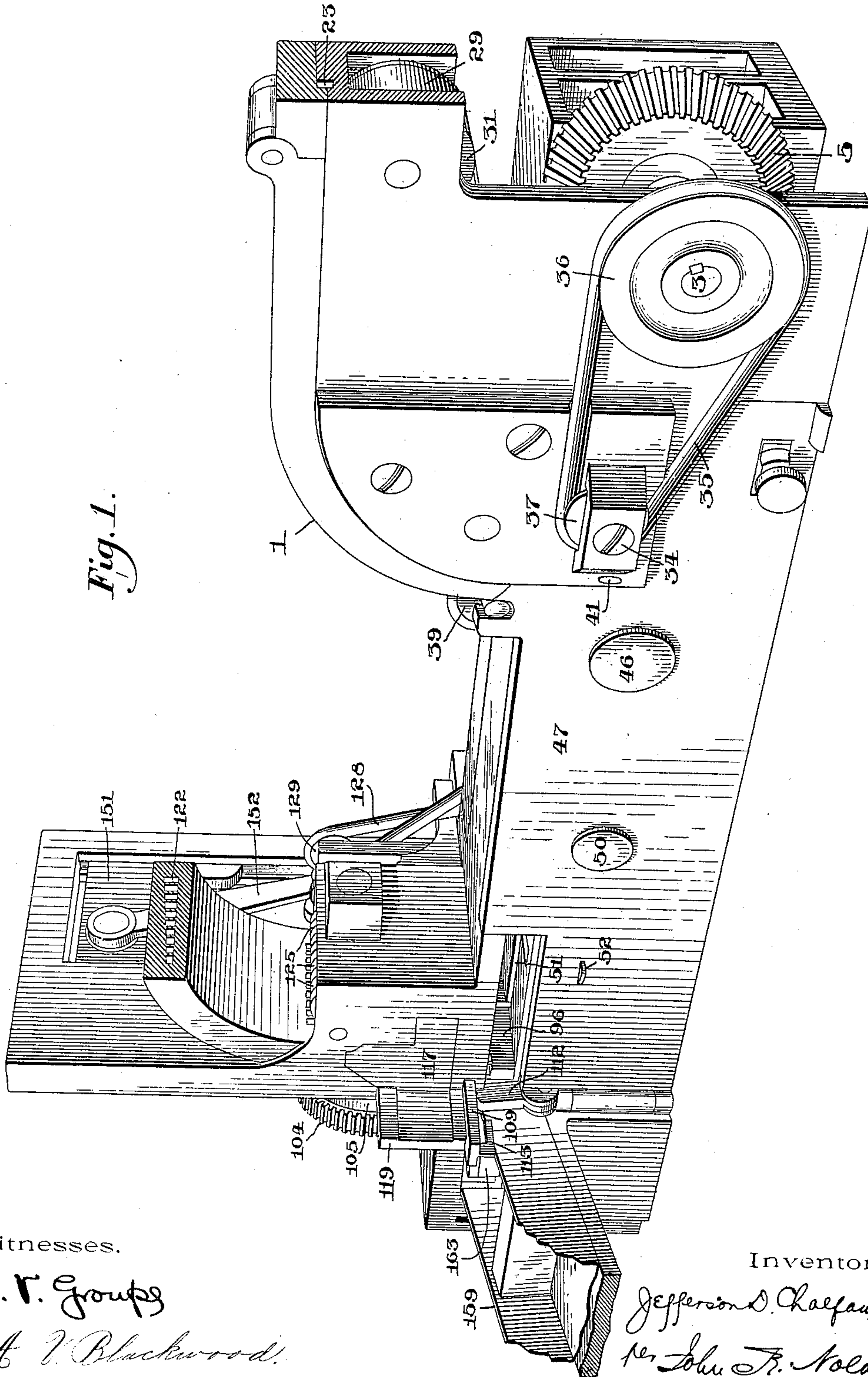
Patented Nov. 15, 1898.

J. D. CHALFANT.  
MACHINE FOR JUSTIFYING TYPE.

(Application filed Jan. 3, 1896.)

(No Model.)

15 Sheets—Sheet 1.



Witnesses.

A. V. Group

H. V. Blackwood.

Inventor.

Jefferson D. Chalfant  
per John F. Nolan

Attorney.





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Patented Nov. 15, 1898.

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15 Sheets—Sheet 3.

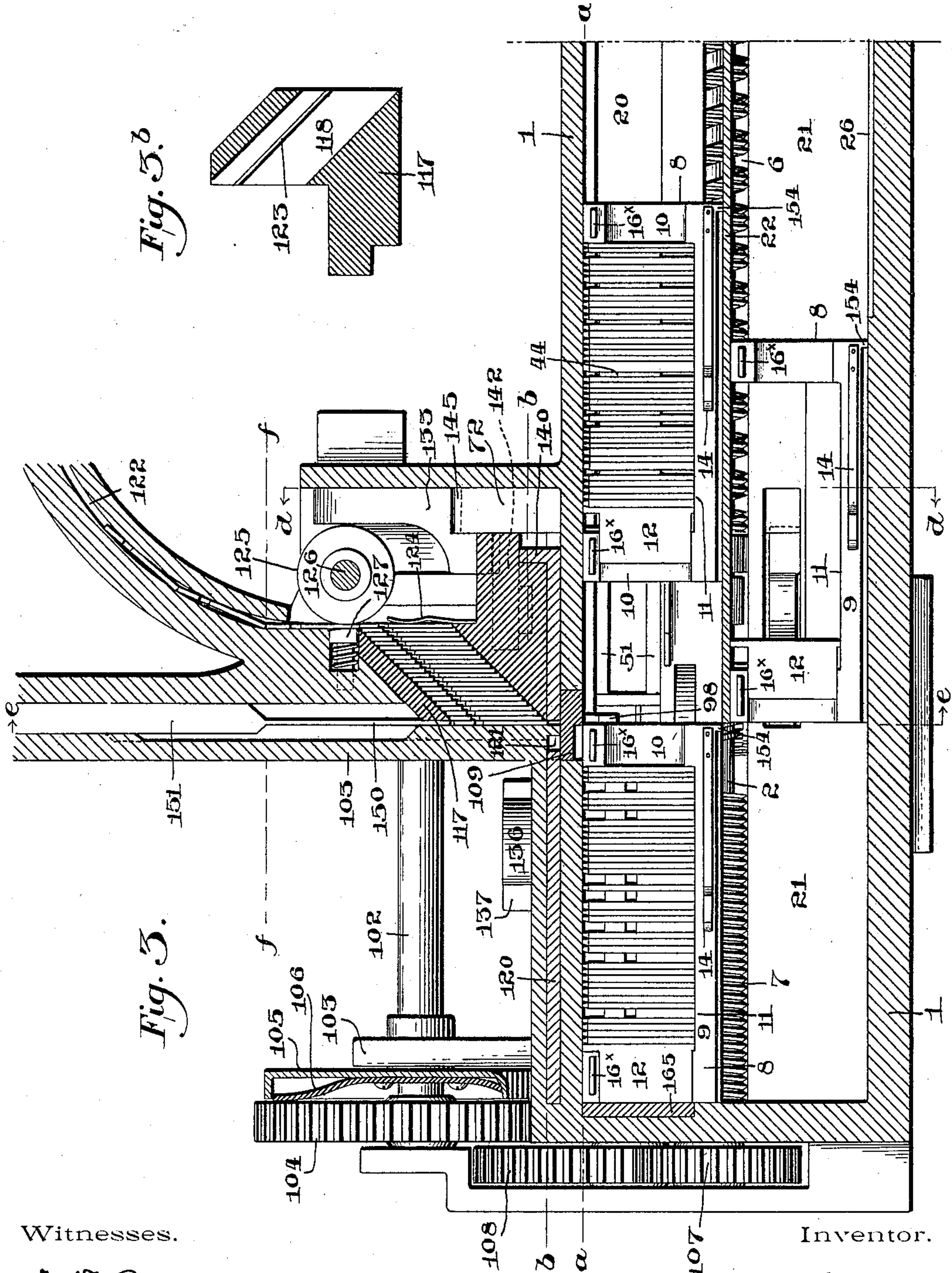


Fig. 3.

Fig. 3.<sup>b</sup>

Witnesses.

A. V. Groupes  
A. V. Blackwood.

Inventor.

Jefferson D. Chalfant  
per John T. Nolan  
Attorney.



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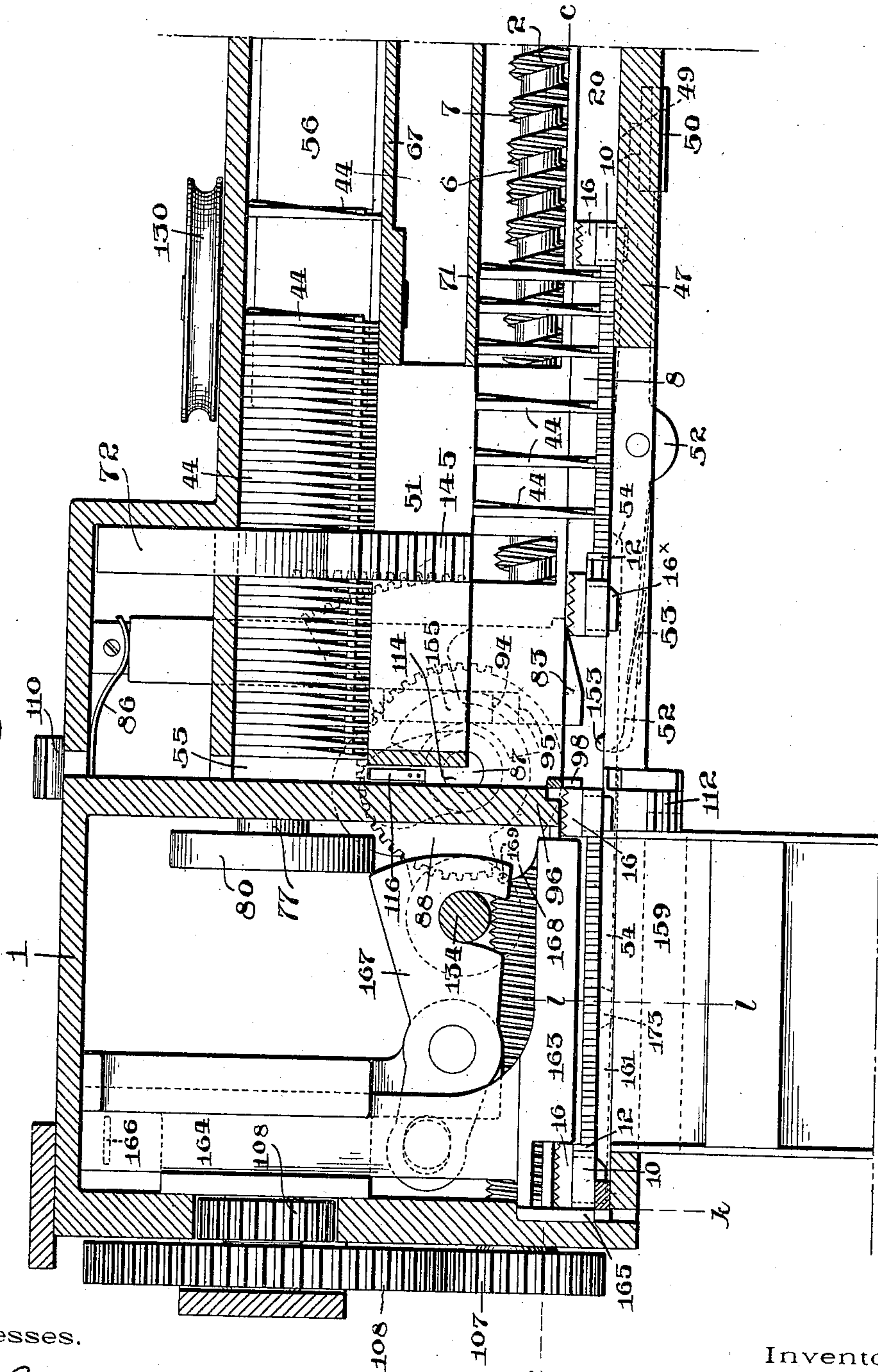
J. D. CHALFANT.  
MACHINE FOR JUSTIFYING TYPE.

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(No Model.)

15 Sheets—Sheet 5.

Fig. 5.



Witnesses.

A. V. Group  
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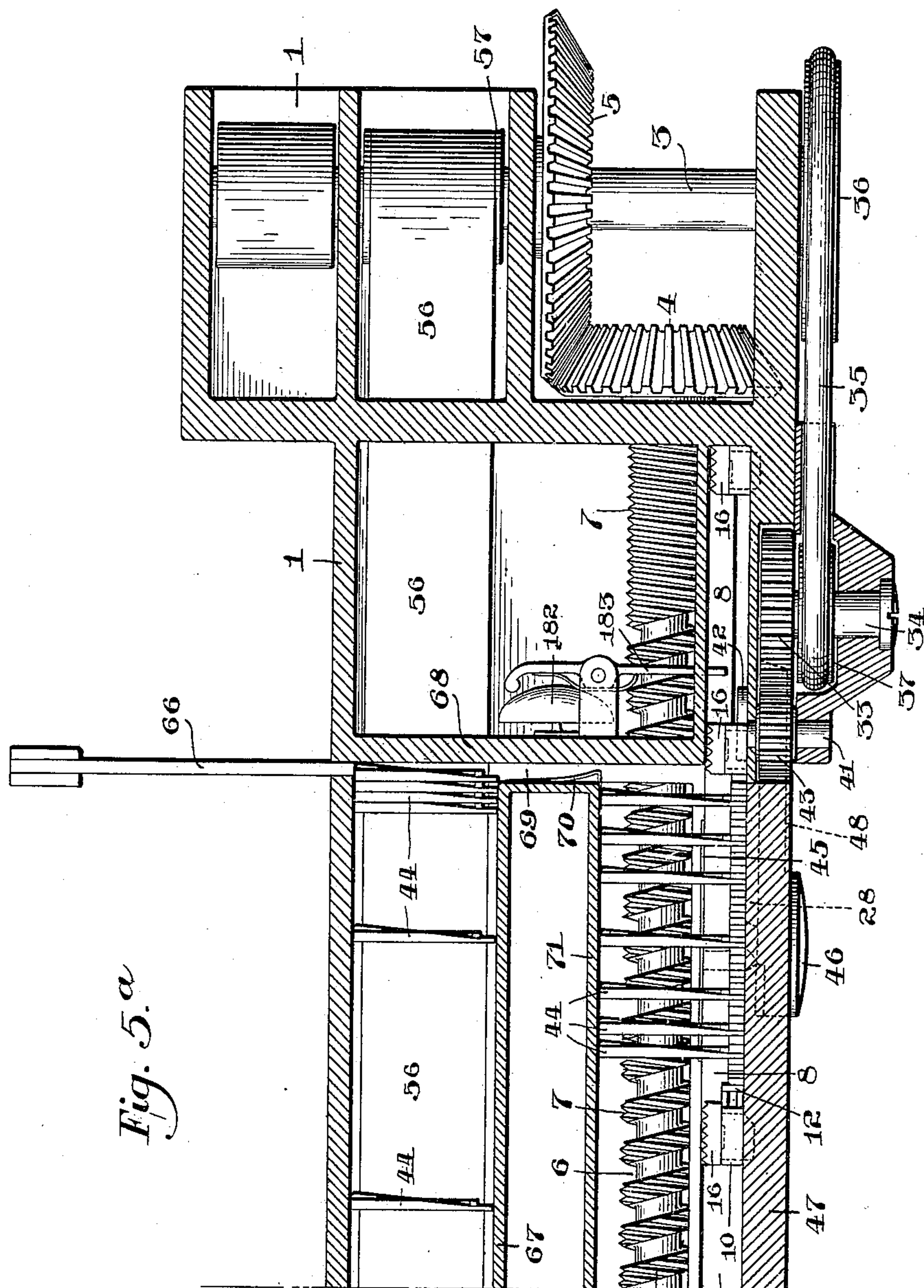


Fig. 5a

Witnesses.

A. V. Goup  
A. T. Blackwood.

Inventor.

Jefferson D. Chalfant,  
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Attorney.

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Patented Nov. 15, 1898.

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(Application filed Jan. 3, 1898.)

(No Model.)

15 Sheets—Sheet 7.

Fig. 6.

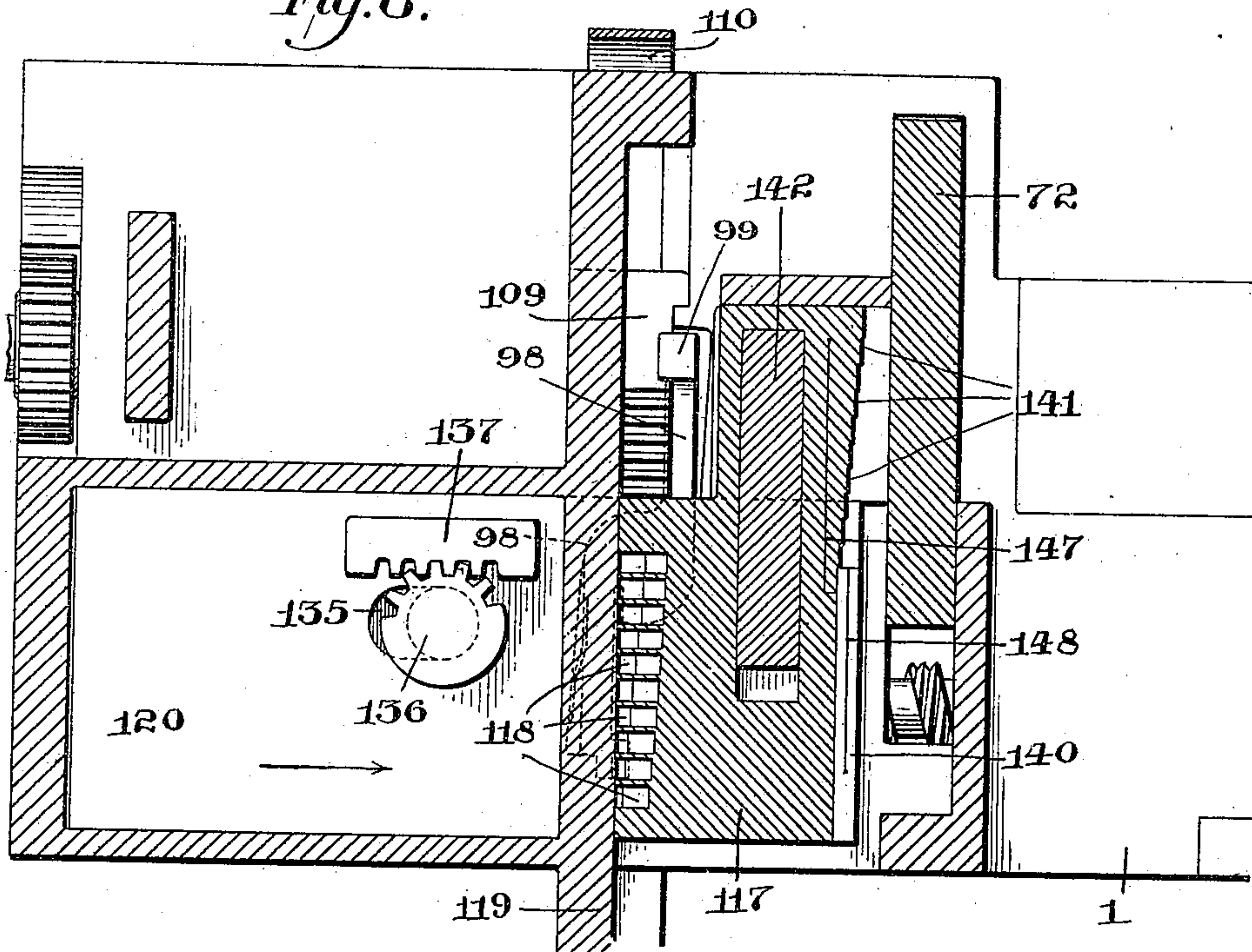
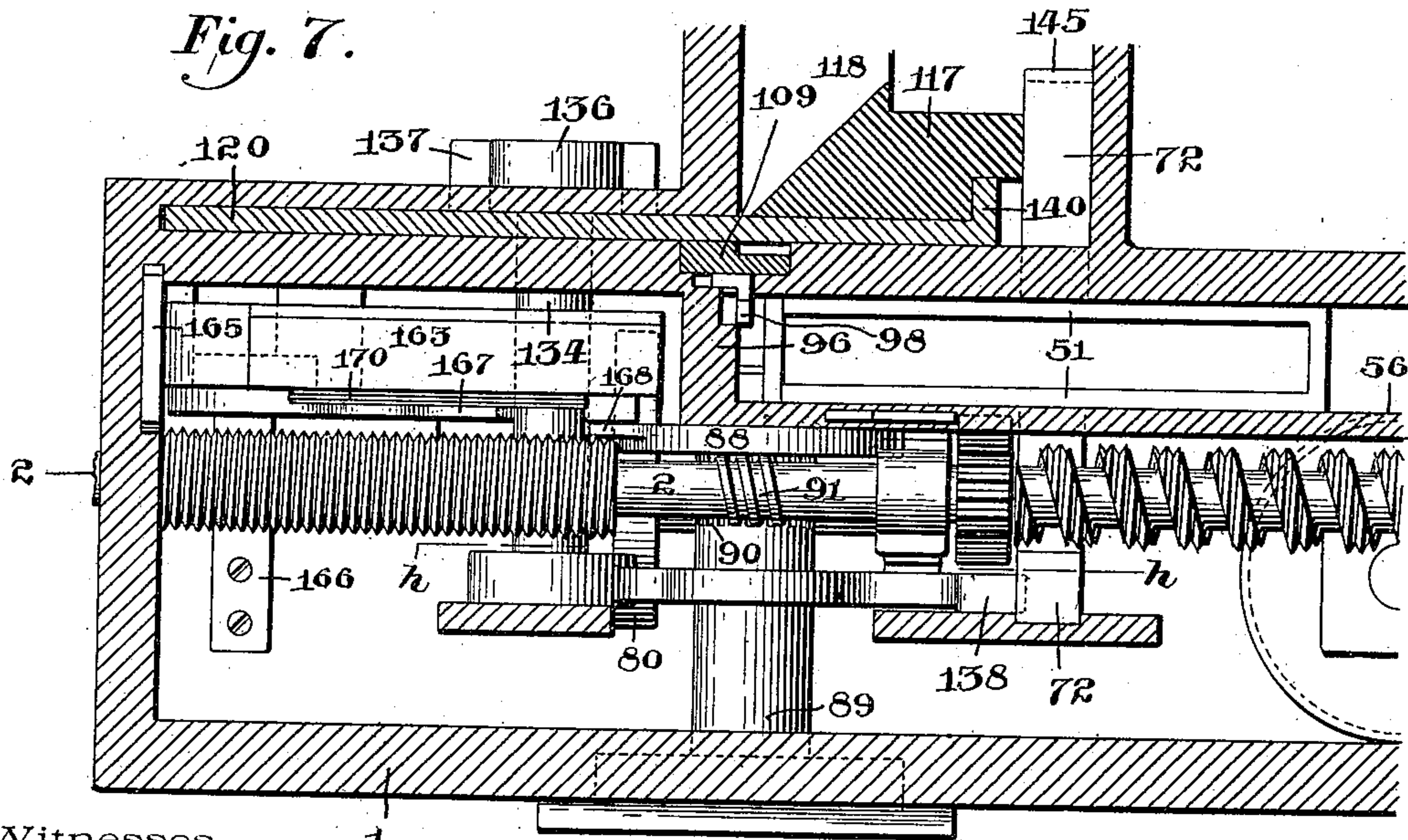


Fig. 7.



Witnesses.

1

Inventor.

A. V. Groupes  
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Jefferson D. Chalfant,  
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Attorney.



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Fig. 8.

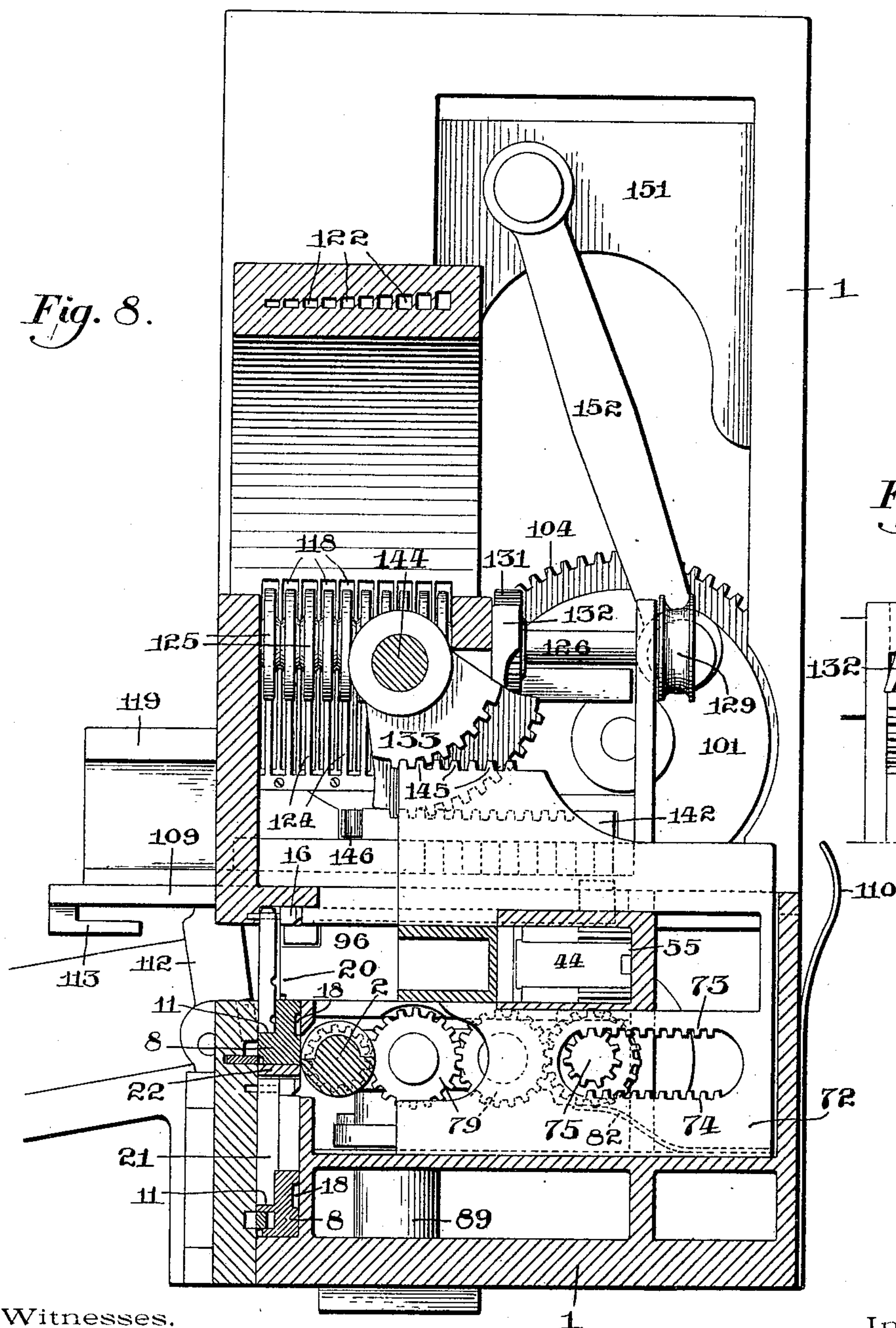
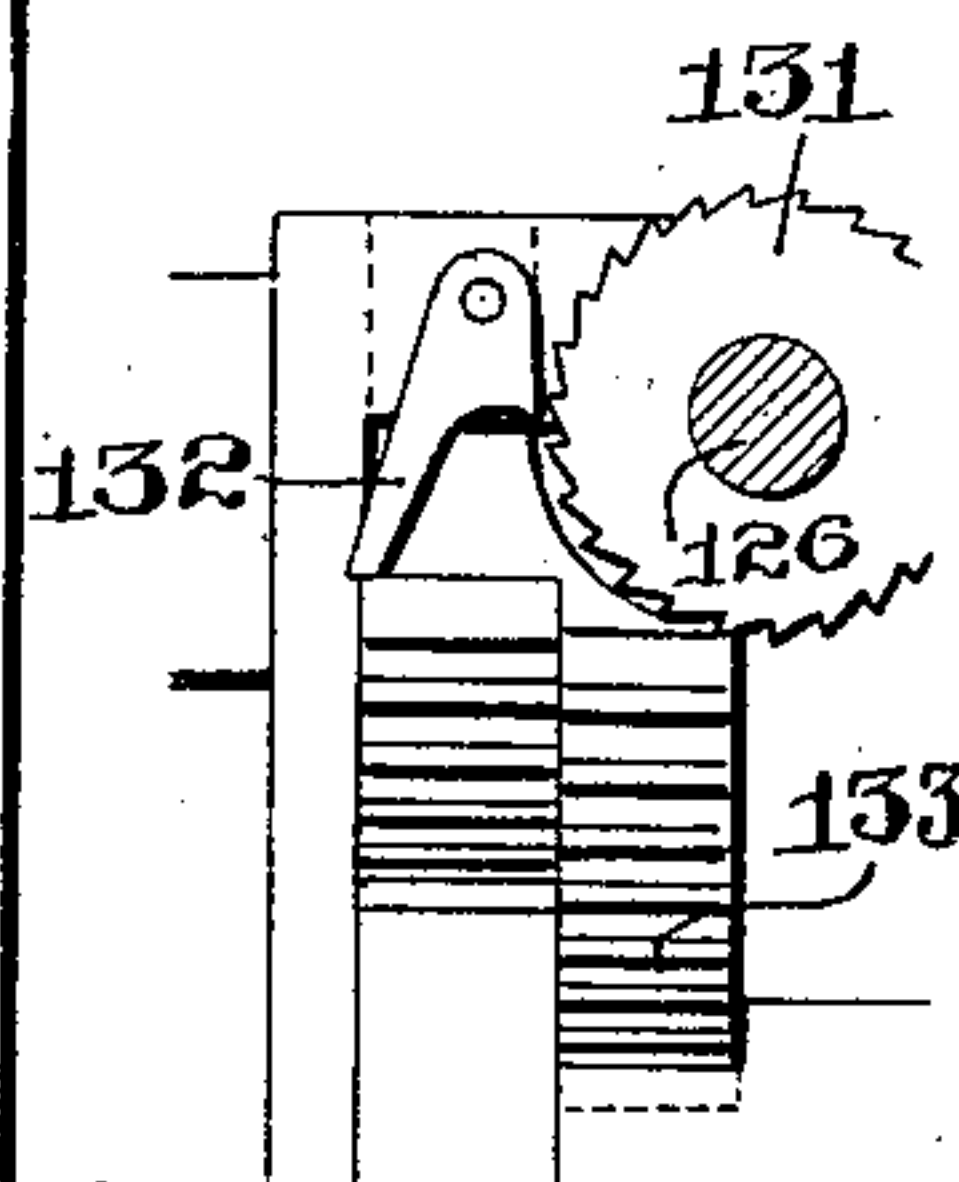


Fig. 8<sup>a</sup>.



Witnesses.

A. V. Group

A. V. Blackwood.

Inventor.

Jefferson D. Chalfant  
per John F. Nolan

Attorney.



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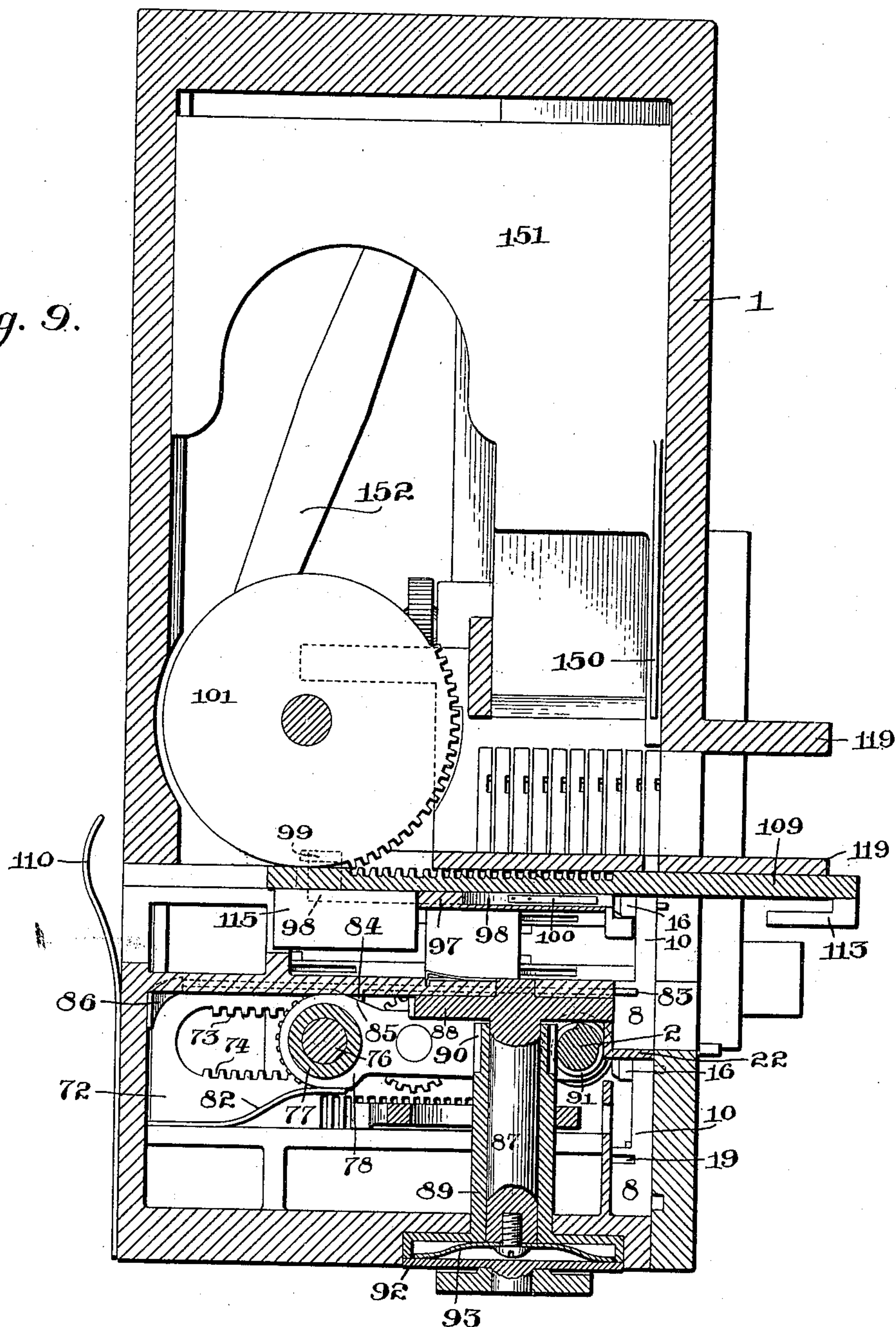
**J. D. CHALFANT.**  
**MACHINE FOR JUSTIFYING TYPE.**

(Application filed Jan. 3, 1896.)

(No Model.)

**15 Sheets—Sheet 9.**

*Fig. 9.*



Witnesses.

A.T. Groups

A. V. Blackwood

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No. 614,319.

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(Application filed Jan. 3, 1896.)

(No Model.)

15 Sheets—Sheet 10.

Fig. 11.

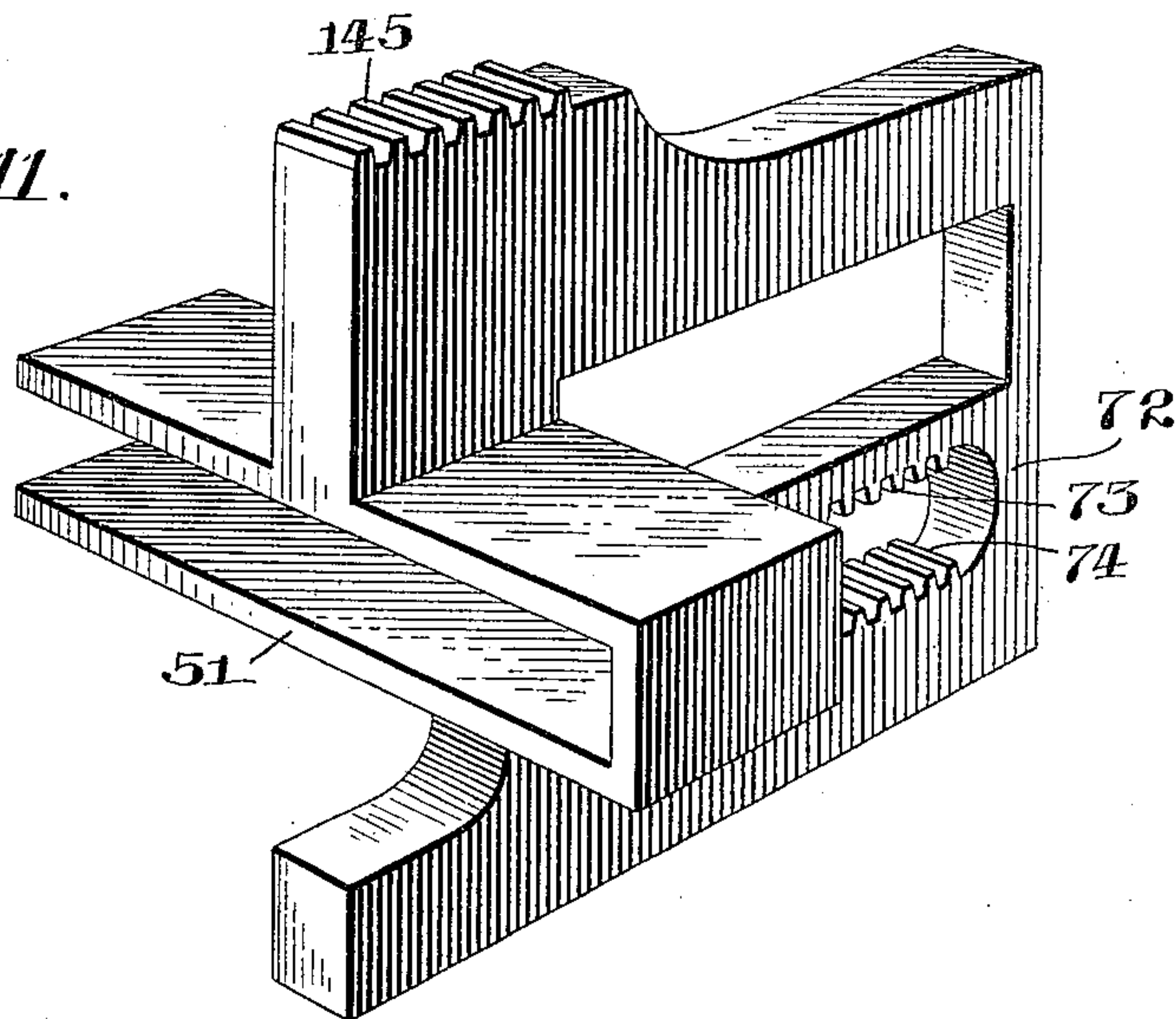
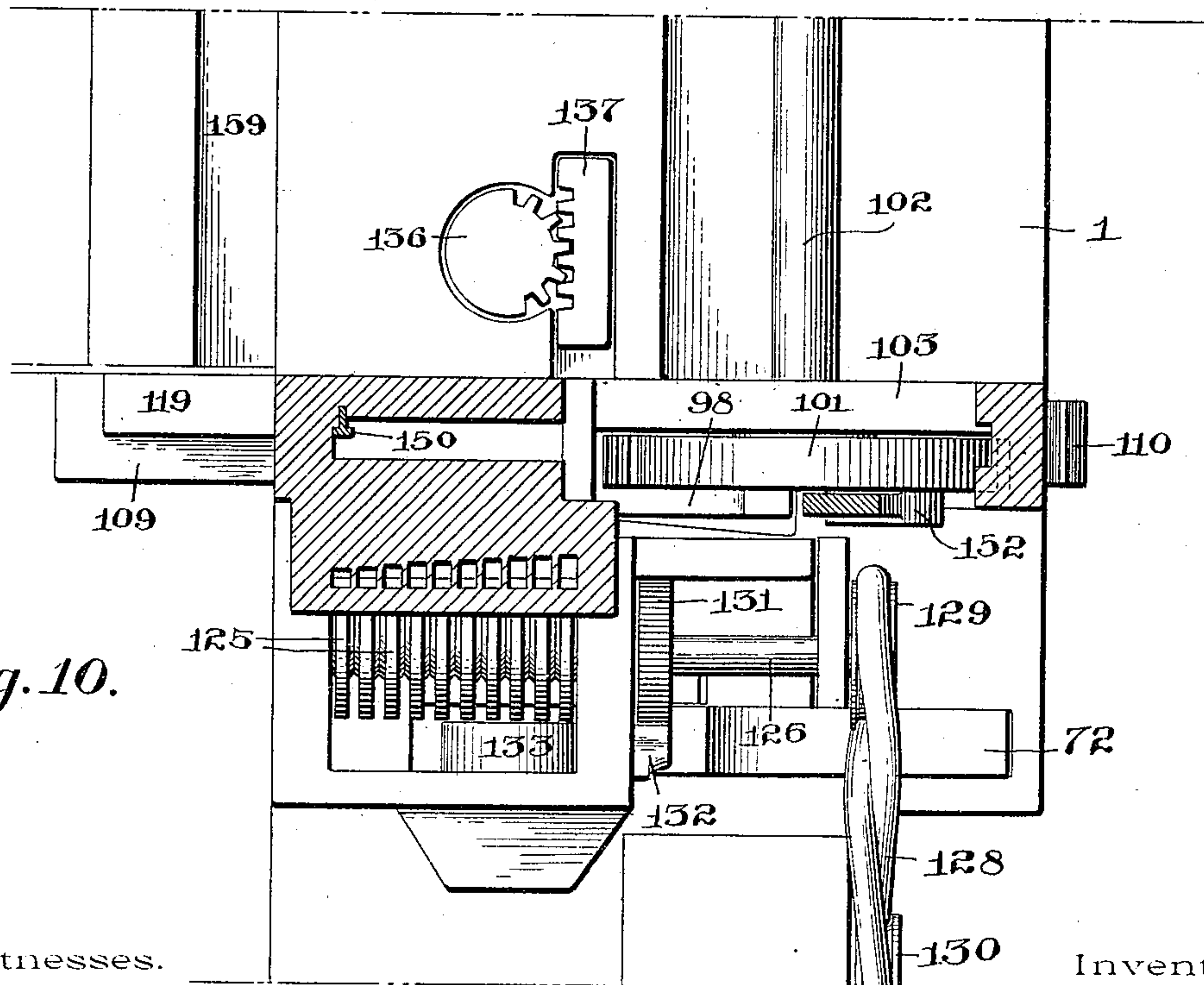


Fig. 10.



Witnesses.

A. V. Group  
A. V. Blackwood

Inventor.

Jefferson D. Chalfant  
per John F. Nolan  
Attorney.



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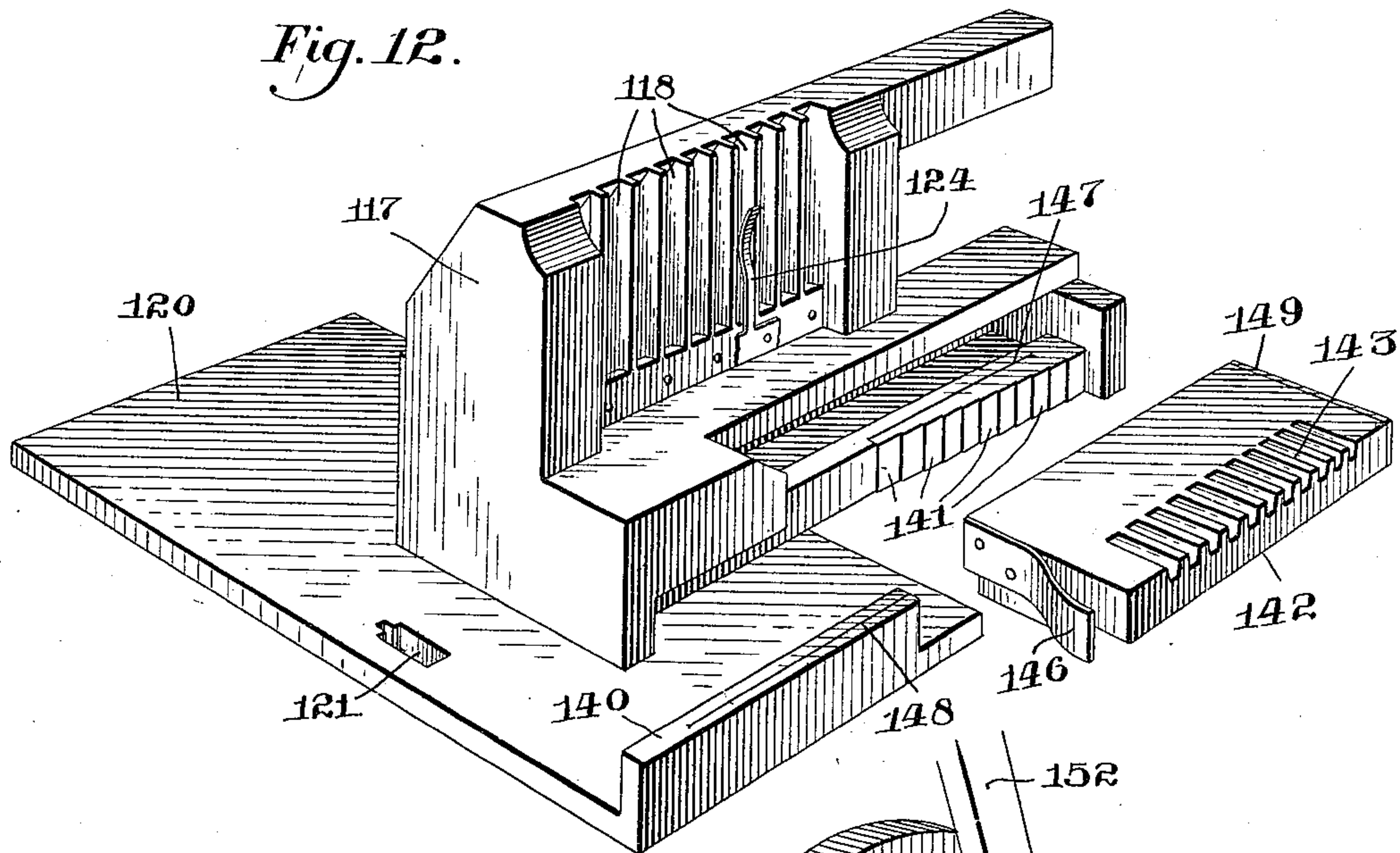
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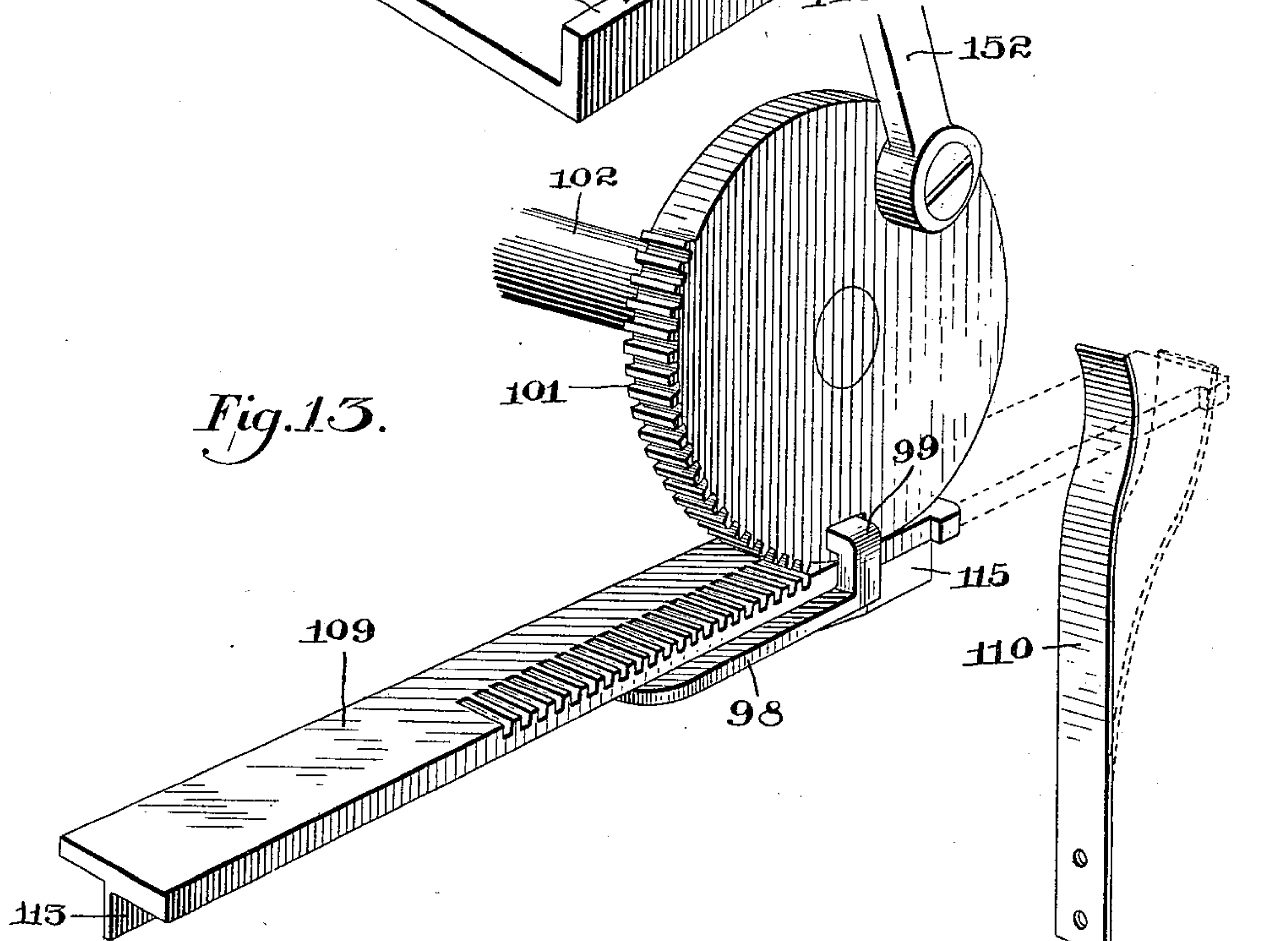
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15 Sheets—Sheet II.

*Fig. 12.*



*Fig. 13.*



Witnesses.

A. V. Group  
A. V. Blackwood

Inventor.

Jefferson D. Chalfant  
per John T. Nolan

Attorney.

No. 614,319.

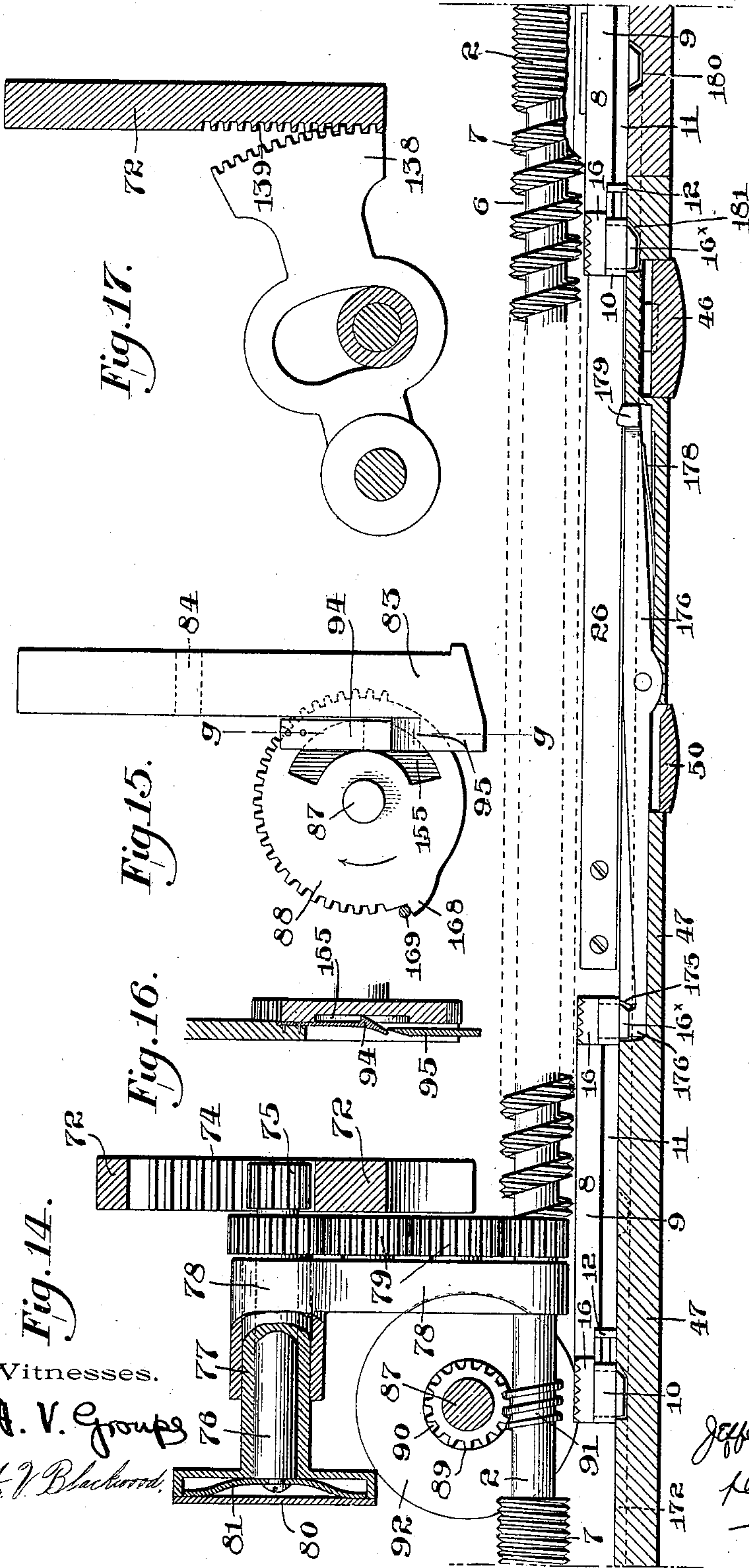
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(No Model.)

15 Sheets—Sheet 12.



Witnesses.

A. V. Group

H. V. Blackwood.

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J. D. CHALFANT.  
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(Application filed Jan. 3, 1896.)

(No Model.)

15 Sheets—Sheet 13.

Fig. 22.

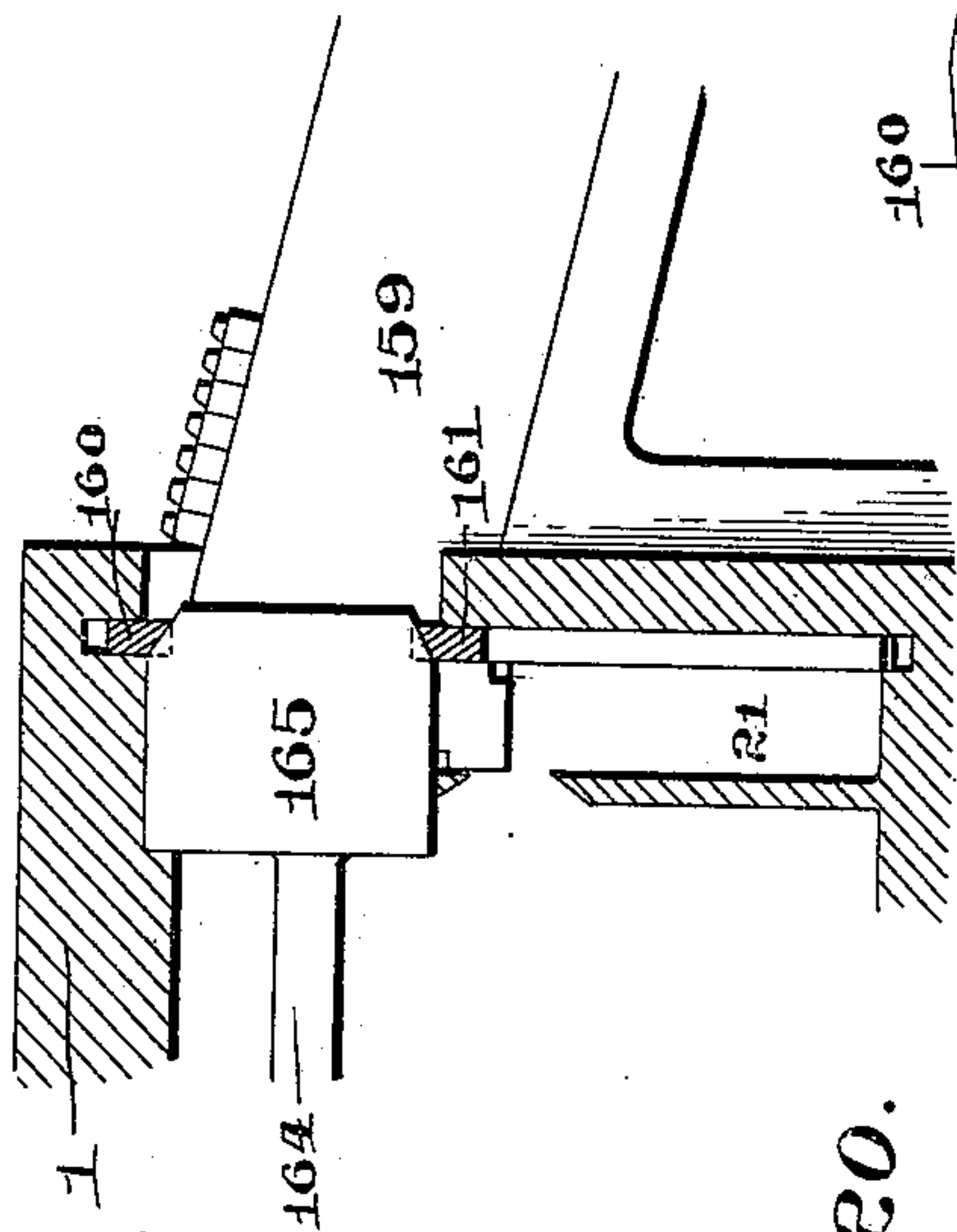


Fig. 21.

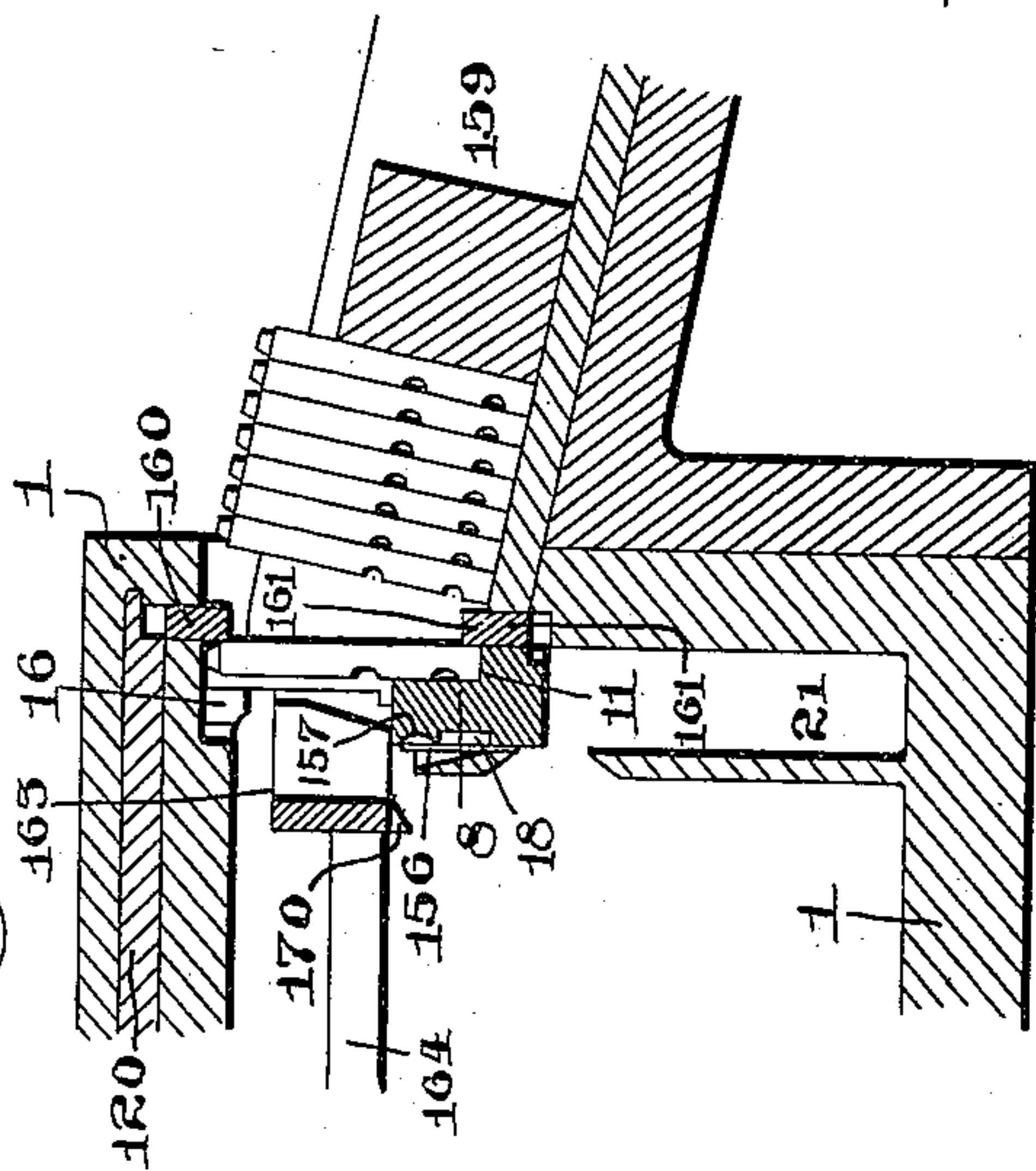


Fig. 20.

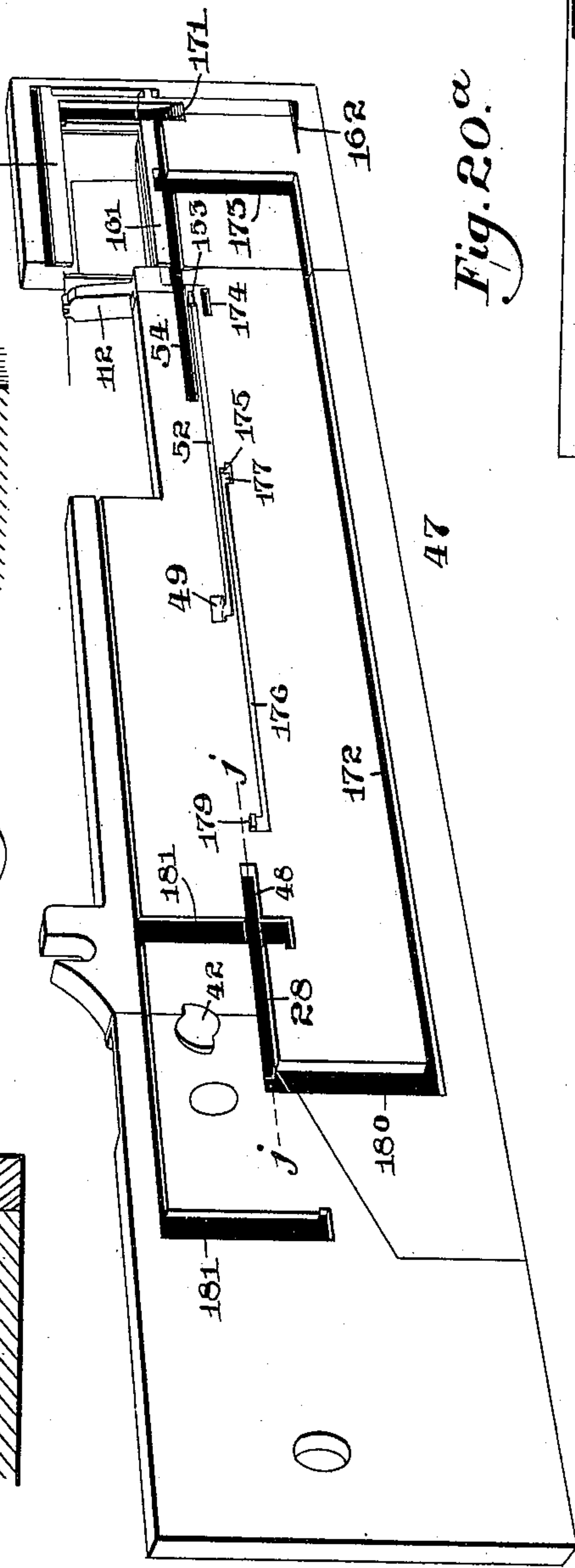


Fig. 20.



Witnesses.

A. V. Group  
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No. 614,319.

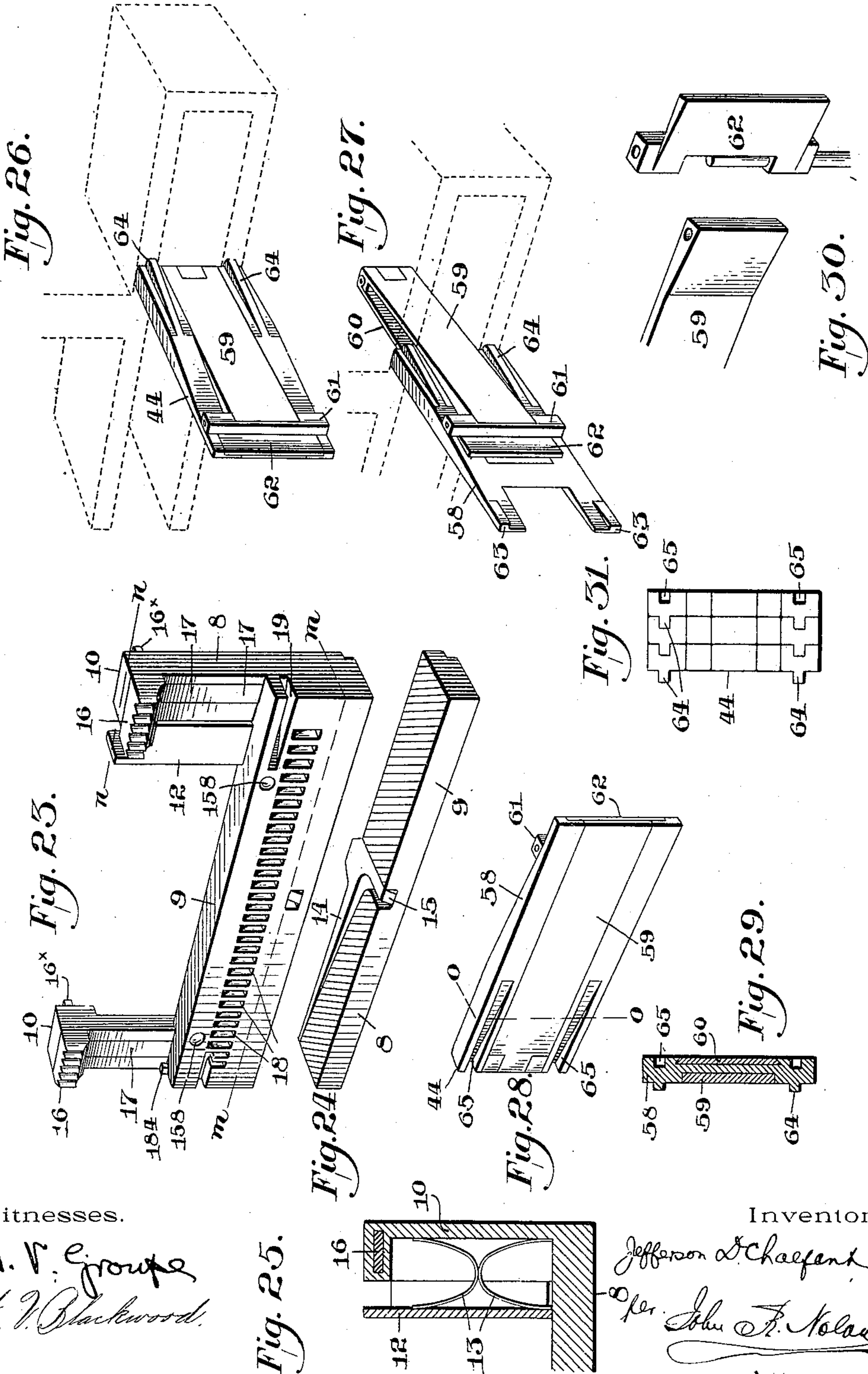
Patented Nov. 15, 1898.

J. D. CHALFANT.  
MACHINE FOR JUSTIFYING TYPE.

(Application filed Jan. 3, 1896.)

(No Model.)

15 Sheets—Sheet 14.



Witnesses.

A. V. E. Grouse  
H. V. Blackwood.

Fig. 25.

Inventor.

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Per. John F. Molloy  
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No. 614,319.

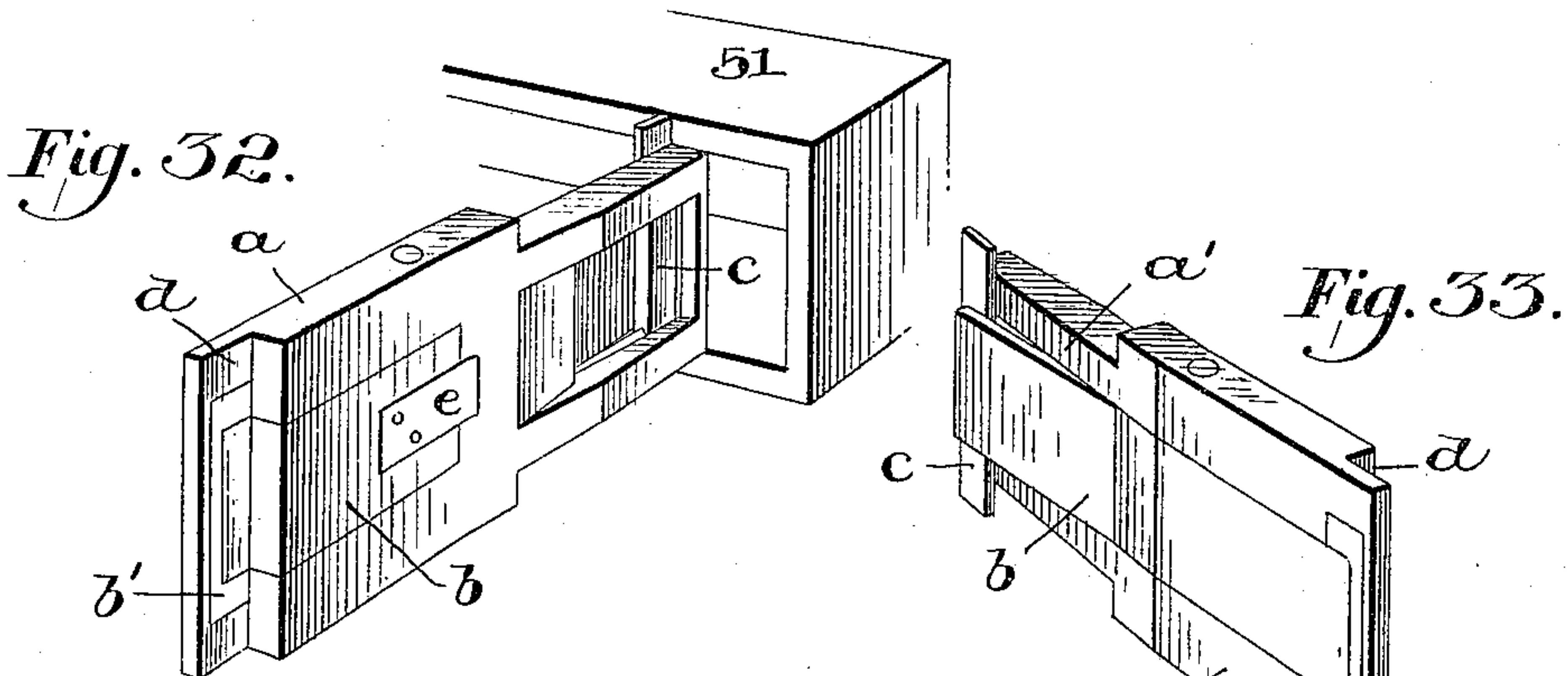
Patented Nov. 15, 1898.

J. D. CHALFANT.  
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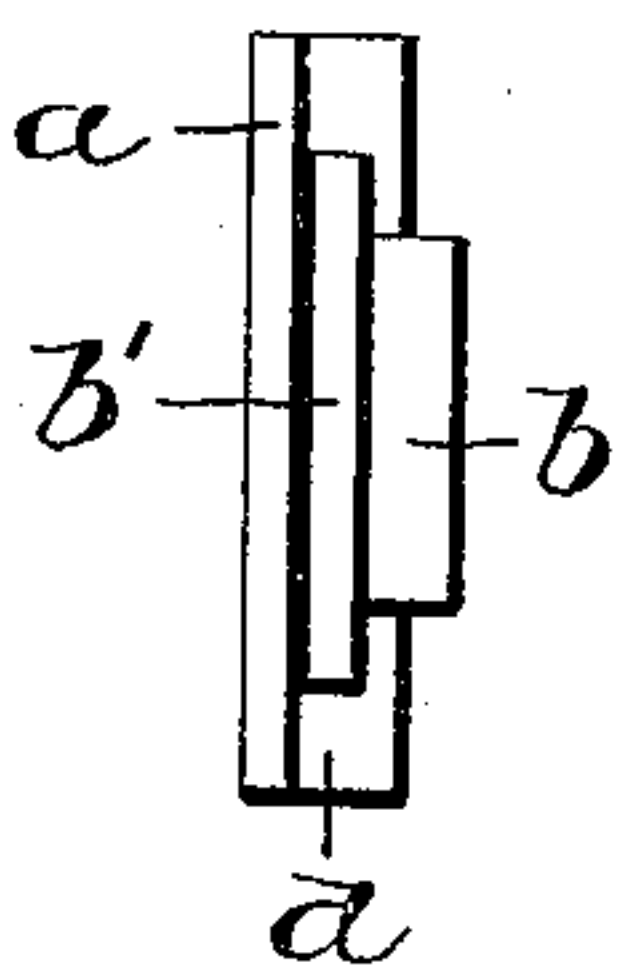
(Application filed Jan. 3, 1896.)

(No Model.)

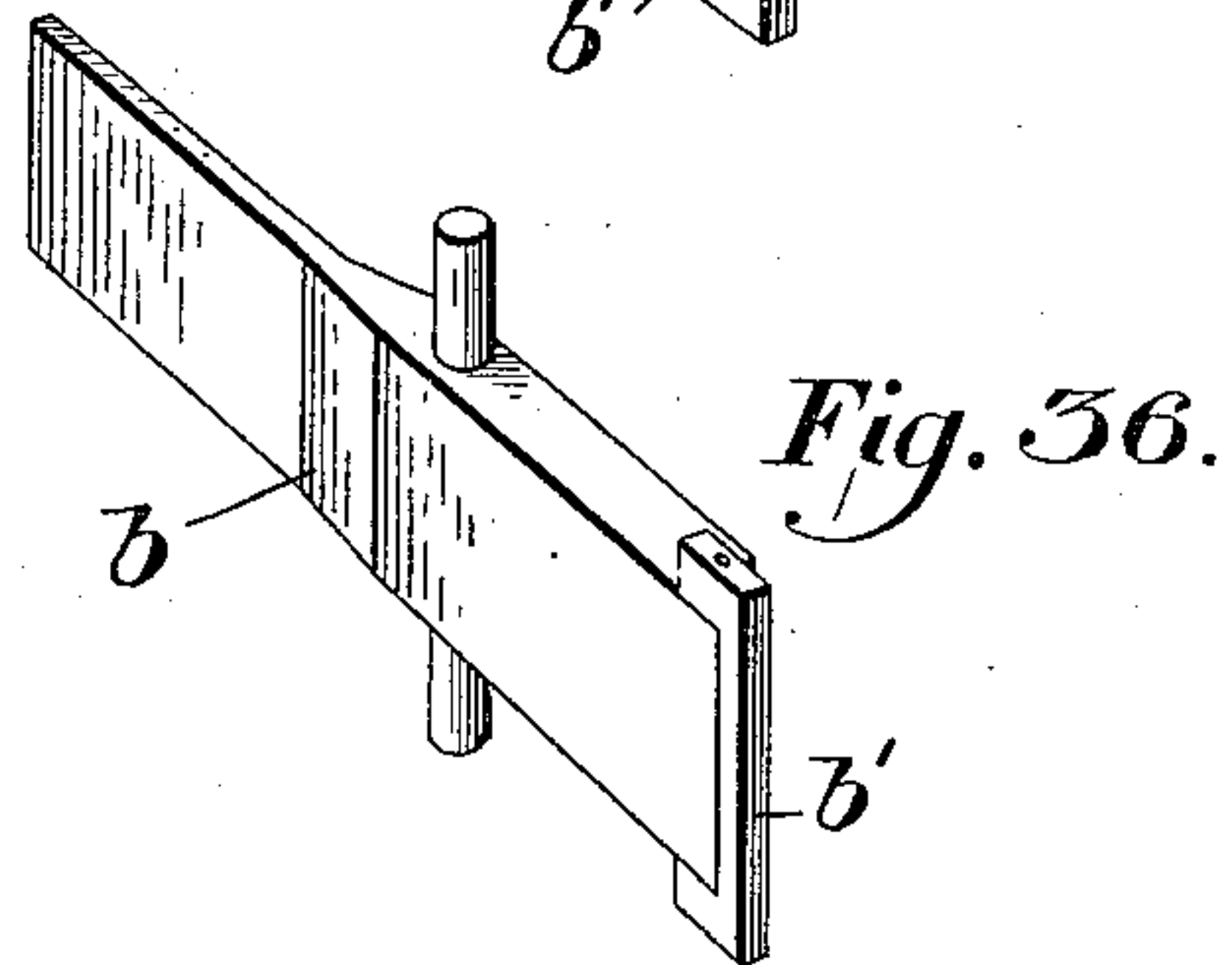
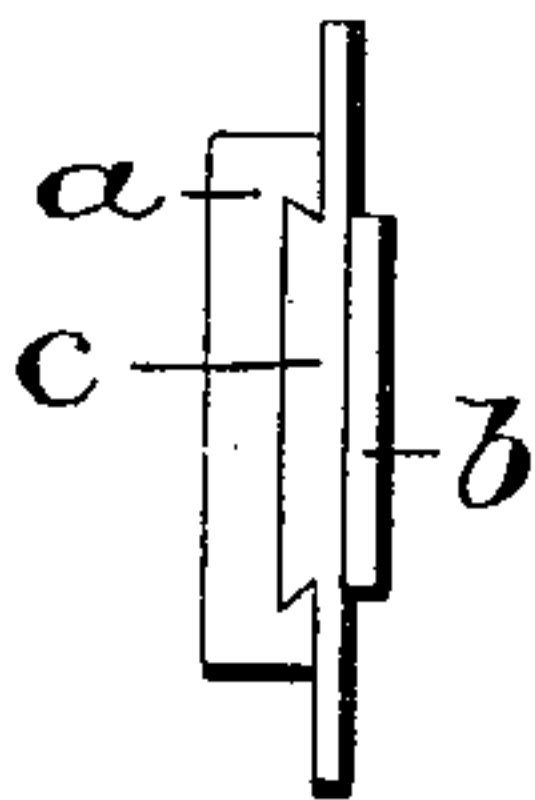
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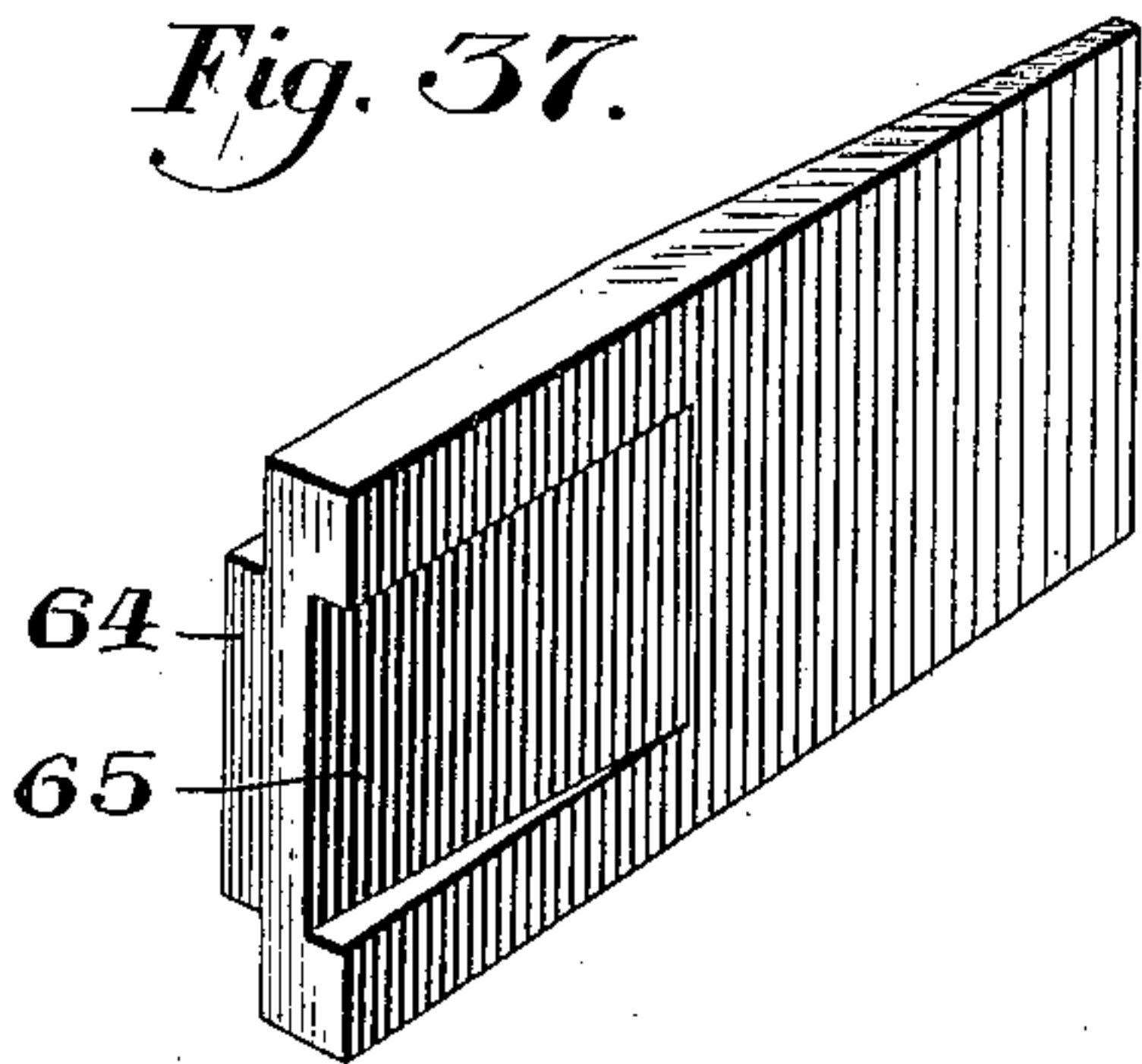
*Fig. 34.*



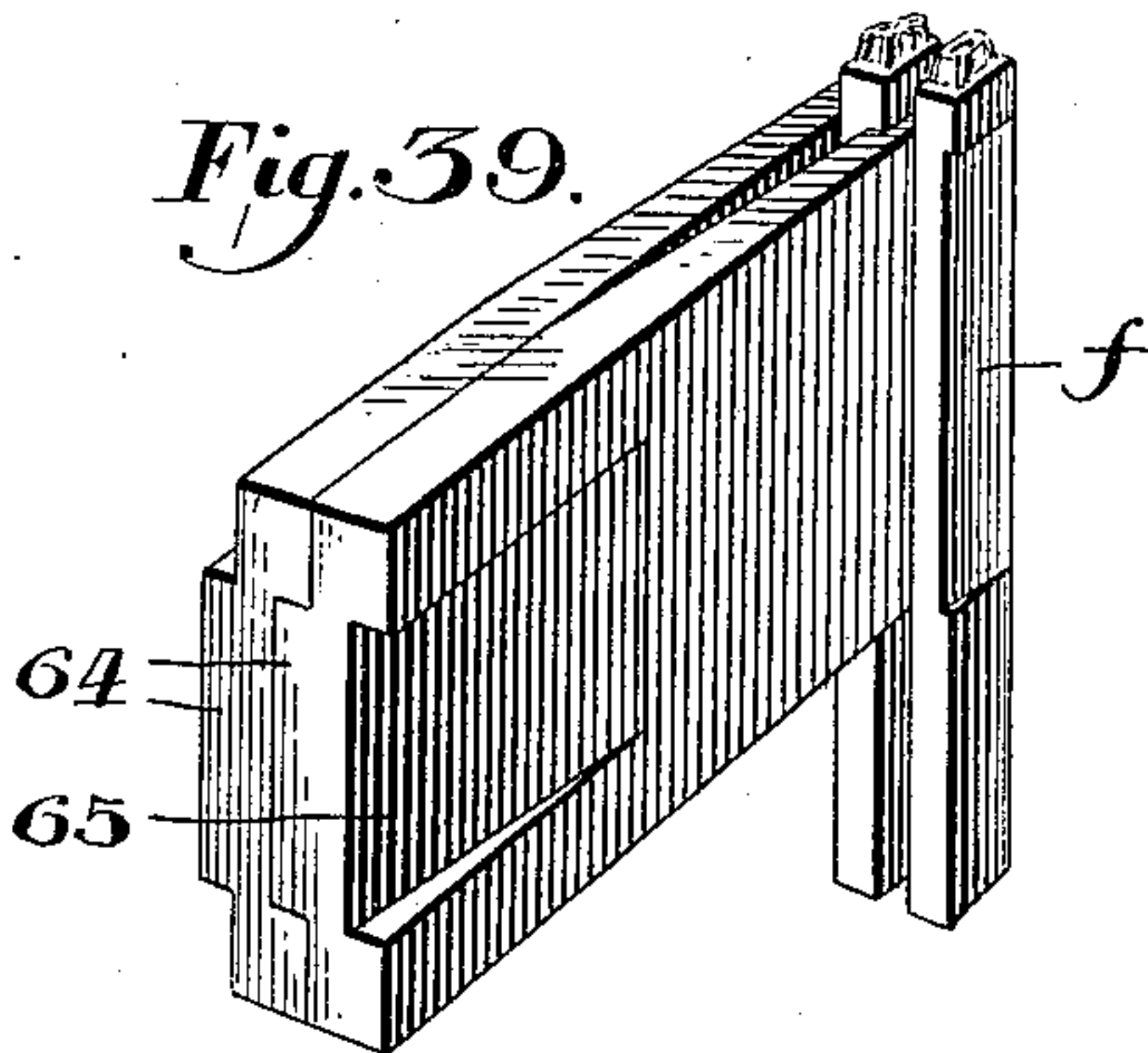
*Fig. 35.*



*Fig. 37.*



*Fig. 39.*



Witnesses.

A. T. Group

A. V. Blackwood

*Fig. 38.*



Inventor.

Jefferson D. Chalfant

per John F. Mearns  
Attorney.



# UNITED STATES PATENT OFFICE.

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YORK, N. Y.

## MACHINE FOR JUSTIFYING TYPE.

SPECIFICATION forming part of Letters Patent No. 614,319, dated November 15, 1898.

Application filed January 3, 1896. Serial No. 574,250. (No model.)

*To all whom it may concern:*

Be it known that I, JEFFERSON D. CHALFANT, a citizen of the United States, residing at Wilmington, in the county of New Castle and State of Delaware, have invented certain new and useful Improvements in Machines for Justifying Type, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to type-setting machines, having reference more especially to justifying mechanism therefor—that is to say, to means for automatically spacing composed lines of type to a given length.

The leading features of my invention comprehend, first, a novel construction of type-carrier in which the words in type are composed through the medium of an appropriate selecting mechanism and of means for reciprocating said carrier to effect its periodical traverse between said mechanism and a suitable galley into which the successively-composed lines of type are transferred; secondly, a novel construction of dividers or spacers and of means for projecting them between the words as the latter are successively set up in the carrier, so as to effect the initial or primary spacing of the words; thirdly, means for actuating said dividers or spacers to effect the final spacing of the type; fourthly, means for clamping the adjacent words of type preparatory to the removal individually of the interposed dividers or spacers; fifthly, means for removing the dividers or spacers successively; sixthly, novel permanent space containing, selecting, and actuating mechanism for effecting the introduction of an appropriate permanent space to each space between the adjacent words of type; seventhly, means for successively transferring the justified lines of type from the carriers to the galley, and, finally, various novel features of construction and organization of parts whereby advantages are gained, as will be hereinafter particularly described and claimed.

In the drawings, Figure 1 is a perspective view of the machine. Fig. 2 is an elevation of the left-hand end thereof. Figs. 3 and 3<sup>a</sup>,

taken together, represent a longitudinal vertical section through the machine on a plane in the rear of the front wall. Fig. 3<sup>b</sup> is a vertical section through the permanent-space-containing frame. Fig. 4 is a sectional detail of the device for feeding the type to the carrier. Fig. 5 is a transverse horizontal section, as on the line *a a* of Fig. 3. Fig. 5<sup>a</sup> is a similar section, as on the line *a a* of Fig. 3<sup>a</sup>. Fig. 6 is a horizontal section, as on the line *b b* of Fig. 3. Fig. 7 is a longitudinal vertical section, as on the line *c c* of Fig. 5. Fig. 8 is a transverse vertical section, as on the line *d d* of Fig. 3. Fig. 8<sup>a</sup> is a vertical section through one of the magazines of the permanent-space-containing frame. Fig. 9 is a transverse vertical section, as on the line *e e* of Fig. 3. Fig. 10 is a horizontal section, as on the line *f f* of Fig. 3. Fig. 11 is a separate view in perspective of a pusher-head hereinafter described. Fig. 12 is a perspective view of the permanent-space-containing frame, the gage-plate, and the actuating-slide. Fig. 13 is perspective view of the spacer-extracting and clamp-controlling bar and its adjuncts. Fig. 14 is a horizontal section through the front wall of the casing on a plane directly above the right-hand carrier-controlling lever, showing a portion of the screw-shaft and its connections. Fig. 15 is a detail in plan of the carrier-advancing gear and the controlling-slide therefor. Fig. 16 is a section, as on the line *g g* of Fig. 15. Fig. 17 is a sectional detail, as on the line *h h* of Fig. 7. Fig. 18 is a section, as on the line *i i*, Fig. 3<sup>a</sup>. Fig. 19 is a section, as on the line *j j* of Fig. 20. Fig. 20 is a perspective view illustrating the construction of the inside of the front wall of the casing. Fig. 20<sup>a</sup> is a plan of the lower type-sustaining bar at the mouth of the galley. Figs. 21 and 22 are vertical sections, as on the line *k k* and *l l*, respectively, of Fig. 5. Fig. 23 is a perspective view in rear of the carrier. Figs. 24 and 25 are horizontal sections, as on the lines *m m* and *n n*, respectively, of Fig. 23. Fig. 26 is a perspective view of one of the justifying-spacers. Fig. 27 is a similar view thereof, showing the wedge-section advanced, as on the justification of a line of type. Fig. 28 is



a perspective of the spacer from the opposite side to that shown in Fig. 26. Fig. 29 is a section, as on the line *o o* of Fig. 28. Fig. 30 is a perspective view of the laterally-extending device of a spacer and the end of the arm to which said device is pivoted. Fig. 31 is a rear view of a series of contiguous spacers. Fig. 32 is a perspective view of a modification of justification-spacer with the pusher-head, as indicated, adjacent thereto. Fig. 33 is a similar view of said spacer as looking at the opposite side thereof. Fig. 34 is a view of the forward end of the spacer as expanded. Fig. 35 is a view of the rear end thereof. Fig. 36 is a perspective view of the inner hinged section of said spacer. Fig. 37 is a similar view of another form of spacer. Fig. 38 is a plan thereof. Fig. 39 represents two of the last-named spacers as engaging adjoining type.

The numeral 1 designates a substantial frame or casing of appropriate shape and size for its intended purpose. Extending longitudinally of this frame is a shaft 2, which is geared with a main driving-shaft 3 by means of coacting gears 4 5, respectively. The shaft 2 is provided throughout the greater part of its length with a double screw-threaded portion—that is, it has a coarse right-hand thread 6 and a finer oppositely-cut thread 7 on and throughout the length of the coarse thread and also on the shaft beyond the ends of the coarse thread, with which threads a suitable type-carrier 8 is adapted alternately to engage and be thereby moved lengthwise of the shaft, as will hereinafter appear. In this carrier the individual type is set from a suitable selecting or distributing mechanism, the successive words of type being uniformly spaced as they are made up. They are then, while in the carrier, “spaced out” or justified to a prescribed length or “column-measure,” whereupon permanent spaces commensurate with the width of the spaces are interposed between the words preparatory to the introduction of the composed line to the galley.

The carrier comprises a bar 9, with up-projecting end posts 10, the face of the bar being provided with a ledge 11, which is adapted to receive and support the type, and one of the posts being provided with a spring-actuated slide 12, which is adapted to bear yieldingly against one end of the line of type, and thus press the opposite end thereof against the opposing face of the other end post in a manner to maintain the line of type in place during its transit and during its justification. In the present instance the spring for actuating the slide comprises two U-shaped members 13, fitted to a recess in the end post, so as to act upon the slide. Mounted on the bar is a spring-actuated dog 14. This dog is constructed of a T-shaped piece of spring metal, the head 15 of which is fitted to a perforation in the bar, while the other member is extended and fastened at its extremity to the outer face of the bar, so as to constitute, in effect,

a spring which maintains the head normally retracted within yet permits it to be projected beyond the inner face of the bar. When the dog is retracted and projected, it is respectively disengaged from and engaged with the coarse thread of the screw-shaft, as below explained. Suitably located on the inner face of each of the end posts is a transversely-movable toothed section 16, which is supported by means of a flat spring 17 and is adapted to coact with the fine-threaded portion of the screw under conditions hereinafter stated. On the inner face of the bar is a row of indentations 18, which form, in effect, a rack which is engaged with and actuated by a gear-wheel 88 at a certain stage of the operation. On this face at the leading end of the carrier is formed a beveled recess 19, which is adapted to engage and actuate a gear-controlling slide 83, as will presently appear. The carrier includes other features of construction, which will be duly referred to. This carrier travels in two longitudinal compartments or guideways 20 21, which are separated by a floor 22. During its traverse from the type-receiving end of the machine to the opposite or galley end the carrier travels in the upper compartment, and during its return to the type-receiving end the carrier travels in the lower compartment, the floor or track being appropriately cut away at each end, so as to permit the requisite transference of the carrier from one compartment to the other.

Preparatory to the introduction of the type to the carrier the carrier is supported at the right-hand end of the machine, with the forward or leading end of the carrier directly below a chute or conduit 23, leading from the type-selecting mechanism. At this stage the forward end of the bar rests upon the end of the floor, while the body of the bar rests upon a vertically-reciprocative transfer-plate 24. This plate is supported upon a block 25, which is fitted to a guideway in the inner wall of the lower compartment. It is also connected with one end of a spring-bar 26, the other end of which bar is affixed to the bottom of the casing in a manner to maintain the block, and, perforce, the plate, normally elevated. The plate in that case is on a level with the floor of the upper compartment and constitutes, in effect, a continuation thereof. By this construction, assuming the carrier to be in the lower compartment and the toothed sections thereon engaged with the screw, the carrier in its traverse toward the receiving end of the machine rides upon the spring 26, and in consequence the carrier, being held down by the opposing floor 22, depresses the spring and the plate 24. Continuing its movement the carrier arrives upon the plate, whereupon the sections 16 are disengaged from the screw, so as to check the onward movement of the carrier. This being done, and the carrier being directly below the opening in the floor of the upper compartment, the spring, resuming its normal



position, raises the plate and thereby transfers the carrier to the upper compartment. Fitted to a recess in the end wall of this compartment is an inwardly-projecting spring 27, which is pressed into the recess by the upwardly-moving carrier, to the end that when the carrier is on a level with the floor 22 the spring 27 will force the carrier slightly forward in position to receive the first type discharged from the chute or conduit. In this forward movement of the carrier by the spring 27 the forward end of the carrier will rest on the end of the floor 22, while the head of the dog 14 will be moved into a horizontal guide-channel 28, Fig. 20, in the front wall of the casing, as will farther on appear. The discharging portion of the conduit is preferably, though not essentially, curved downward. On the floor thereof runs an endless belt 29, which passes around a pulley 30 at the mouth of the chute and a pulley 31 at the upper or horizontal part of the chute. On the shaft of the pulley 30 is a spur-wheel 32, which gears with a pinion 33 on an underlying shaft 34 on the main frame, said latter shaft being driven from the main shaft by means of a belt 35, passing around appropriate pulleys 36 37 on the shafts 3 34, respectively. Hence the belt 29 is driven in the direction indicated by the adjacent arrow in Fig. 3<sup>a</sup>, so as to direct the type downward.

On the periphery of the pulley 30, at regular intervals apart, is a series of yielding fingers 38, which are constructed and arranged to engage each type preparatory to its delivery to the carrier and to maintain the type in a vertical position against a suitably-disposed backer-roller 39 and the outer wall of the conduit, as seen in Figs. 3<sup>a</sup> and 4, so as to insure the proper introduction of the type to the carrier. The belt is provided with openings 29<sup>a</sup> at intervals apart for the passage of the fingers. The fingers herein shown comprise each a strip of spring metal bent in the form of a ratchet-tooth and fastened at one end to the pulley 30, the face of the latter being provided with an appropriate notch to permit the requisite radial movement of the projecting portion of the finger. The roller 39 is set in bearings in the sides of the main frame just forward of the mouth of the conduit, which roller is preferably provided with a peripheral tire 40 of rubber, so as to present a yielding surface to the type in the carrier and press them uniformly upon the ledge. In the wall of the main frame is mounted a stud 41, on which is fixed a cam-wheel 42, that is designed, during its rotation, to bear against the type and spacers as they are individually introduced to the carrier, and thereby to advance the carrier step by step. The stud is driven from the gear 33 by means of a coacting pinion 43 on the stud. The first type introduced to the carrier is supported laterally by the spring-actuated slide 12, above referred to. The next type bears against the first type, and so on successively until a word

has been completed. A spacer or divider 44 is then fed horizontally to the carrier against the last type of the word, the cam in its rotation impinging against said spacer or divider and correspondingly advancing the carrier. The type to form the next word are then introduced to the carrier. A spacer or divider is inserted, as before. The next word is then set up, and so on until the line has been completed. A flat spring 45 on the inner wall of the upper compartment bears against the carrier while the line is being set up, thus imparting sufficient friction to the carrier to prevent its being farther advanced in its successive steps than the width of the type or spacers may require. In this operation the words are spaced to the minimum space for the same purpose as the thin spaces are used in the manual operation of composing. When the line has been set up—i. e., as many words or syllables as can be put in a given line—the dog 14 in the carrier is engaged with the coarse thread of the screw-shaft, and in consequence the carrier, with its complement of type and spacers, is impelled by said shaft. The dog is moved into engagement with the screw by means of a suitably-disposed key 46 in the front wall (preferably a hinged door) of the casing, which key carries on its shank a horizontal arm or extension 48, that lies in the channel 28, above alluded to, and takes against the head of the dog when the key is pressed inward by the operator. By means of the extension on the key the dog may be engaged with the screw at any time during the setting up of the type, as occasion may require.

When the carrier is impelled sufficiently by the screw to effect the escape of the dog from the arm 48, the head of the dog bears against the inner face of the wall 47 and is thereby maintained in engagement with the screw until the dog reaches a notch 49 in its path in the wall of the casing, whereupon the dog springs outward from the screw, so as to render the carrier quiescent. Extending into this notch is a key 50, by the inward movement of which the carrier-dog may be re-engaged with the screw to effect the continued course of the carrier until it reaches the path of a horizontally-reciprocative pusher 51, hereinafter described. Connected with the key is one arm of a horizontally-arranged lever 52, that is fitted to and fulcrumed in a horizontal slot in the front wall of the casing, a suitably-disposed spring 53 tending to maintain the left arm of the lever normally inward and the other or key-bearing arm outward. The particular function of the lever will hereinafter be explained.

At a suitable point in the inner wall of the casing in the path of the dog is a horizontal groove or channel 54, to the end that when the dog reaches this point the dog, springing into the groove or channel, will be disengaged from the screw. At this stage the carrier will be at rest in the path of the pusher re-



ferred to, whereupon the pusher will be advanced, so as to act upon the spacers in the carrier and effect the justification of the line of type set up in the carrier. This being  
 5 done, the adjacent words of type are clamped in place, the spacers are successively withdrawn from the type, and permanent spaces corresponding with the spaces formed between the words are substituted for the  
 10 spacers, all as will be hereinafter described. When the spacers are withdrawn from the line of type, they (the spacers) are transferred to a rearwardly-disposed spacer-chamber 55, having therein an endless belt 56,  
 15 which is driven from a pulley 57 on the main driving-shaft and which belt carries the spacers thereon in position to be introduced to the type being set up in a succeeding carrier.

20 Having thus in a general way explained the function of the spacers, I shall, preparatory to a more detailed description of their *modus operandi*, describe the construction of a form of spacer which I consider to be efficient and  
 25 desirable, reference being had more especially to Figs. 26 to 31, inclusive, of the drawings, as follows: 58 designates a plate, one side of which is beveled to constitute a wedge, and 59 60 a pair of hingedly-connected arms  
 30 embracing the plate from its rear or thicker end, so that if the wedge be moved forwardly the arms will be spread apart thereby. The forward or free end of the arm 59 on the beveled side of the wedge is preferably thick-  
 35 ened, while a vertical bar 61 is hingedly connected thereto. On this bar is a forward extension 62, that lies against the face of the wedge, the inner face of such extension being beveled correspondingly with the wedge  
 40 face, so that the outer face of the extension will be parallel with the plane side of the wedge irrespective of the forward position of the latter between the arms. In virtue of the hinged connection the extension will hug  
 45 the face of the wedge in its movement, so as to insure the parallelism mentioned. The arm 60 is fitted to a longitudinal recess in the contiguous face of the wedge, so as to be flush with such face, while the other or beveled  
 50 face of the wedge is provided at its point with upper and lower shoulders 63, whose outer faces are parallel with the plane face of the wedge. The width of the extension 62 is such that when the wedge is in the normal  
 55 or extreme rearward position the extension fits snugly between and flush with the shoulders 63, as indicated in Fig. 26. Thus the point of the spacer when in its normal or closed position presents two parallel vertical  
 60 sides. One of the sides of the wedge at its rear end is provided with longitudinal tapering ribs 64, which constitute a continuation of the beveled face, while the other side of the wedge is provided with corresponding  
 65 grooves 65, to the end that when the spacers are laterally adjacent to each other or side by side the ribs of one will register with the

grooves of the other. Thus while the plate 58 constitutes a wedge from end to end there is permitted the introduction of the spacers  
 70 on each side of the letter "I" or other narrow character in the line being set up in the carrier—that is to say, the laterally-adjacent spacers may be fitted into each other, as indicated in Fig. 31. There is also insured the  
 75 close lateral contact of the spacers in the chamber 55 and their proper disposition by the belt 56 in respect to the usual keyboard pusher device 66 for transferring them successively to the type-carrier. As the spacers  
 80 are carried on the belt toward the pusher 66 they are guided by contact with the rear wall of the casing and with a longitudinal division-wall 67 in the latter. (See Fig. 5<sup>a</sup>.) When the leading spacer is in the path of the pusher,  
 85 it abuts against the end wall 68 of the casing, to the end that when the pusher is moved bodily forward by the action of an appropriate keyboard-lever or the like the spacer  
 90 is forced forward, so as to enter the type-carrier adjacent to the end type of the word last set up, as above described. A channel 69 to guide the spacer in its forward movement is formed by the end wall 68 of the casing and an end portion on the division-wall, a spring  
 95 70 on said latter wall tending to press the point of the spacer toward and against the wall 68 and thus to direct the point into the carrier laterally of the contained type in a manner to escape the otherwise opposing end  
 100 of the last preceding spacer should a single letter or character, as "I," have been last inserted. It is the narrow parallel-faced end of the spacer that is introduced to the carrier at this juncture, the width of such face being that of the minimum word-space. As before explained, the spacers are introduced at the end of each word, (excepting the last, of course,) the carrier being advanced step by  
 110 step. The spacers in their step-by-step movement and in their subsequent onward advance by the screw are guided and maintained in place by the front wall of the casing and a longitudinal division-wall 71 therein. As also previously mentioned, the carrier, preparatory to the justification or spacing of the  
 115 type, comes to rest forwardly of a reciprocative pushing device 51, which will be presently described. This device thereupon advances against and presses the wedges 58 forward simultaneously, thus uniformly spreading the extensions 62 laterally and correspondingly moving or spacing the words of  
 120 type in the carrier to effect the length of the line prescribed by the column or page to be printed. By the described construction of spacer the sides of the type between which the spacer is interposed are not subjected to undue wear by sliding contact of the wedge, but, on the other hand, the wear is mini-  
 125 mized, in that the type are spaced by lateral pressure applied directly thereto in the line of movement or justification of the type in the carrier.  
 130



Although there is more than one way whereby the wedge-sections of the spacers may be advanced, I shall describe a simple and efficient mechanism which I have devised for the purpose, having reference to Figs. 5, 7, 8, 9, 11, and 14 of the drawings. 72 designates a transversely-reciprocative head suitably guided in the main frame. In the forward portion of this head is formed or arranged longitudinally of the machine a rectangular chambered section 51, the forward part and the left end of which are open. The length of the chamber is equal to or greater than that of the longest line of type to be set up in the carrier, while the width of the chamber is slightly greater than that of the hinged arms 59 60 of a spacer. This chambered section lies directly rearwardly of the spacers preparatory to the justification of the type thereby, to the end that when said section is advanced by the forward stroke of the head the top and bottom walls of the section impinge against the rear ends of the wedges and force the latter forward with the effect stated, said walls in their movement thus simply incasing the hinged arms of the respective spacers. This being done and the spacers having been withdrawn and quads substituted therefor, as below described, the head is retracted in readiness for a similar operation upon the spacers in a succeeding line of type. The reciprocation of the head may be effected in any appropriate manner. In the present instance the lower portion of the head is slotted longitudinally, the upper and lower edge of the slotted part being provided with gear-teeth to constitute racks 73 74, respectively. Into the slot extends a driven pinion 75, that is constructed and arranged to be engaged with the racks alternately, and thereby to move the head forward or backward, as desired. The pinion-shaft 76 extends through a sleeve 77, having its bearings in a rock-arm 78, which is loosely mounted on a plane portion of the screw-shaft 2. The sleeve is geared with and positively driven from the screw-shaft by a train of wheels 79, the intermediate wheels of the train being supported on the rock-arm, to the end that the sleeve will be actuated irrespective of the angle or position of the arm in relation to the screw-shaft. On the outer end of the sleeve is a hollow head 80, while on the like end of the pinion-shaft is fixed a spring-plate 81, that bears against the inner face of the head in a manner to constitute a frictional connection therewith. Hence during the rotation of the sleeve the shaft and pinion are driven. Assuming the pusher-head 72 to be retracted and the pinion to be engaged with the lower rack, the head is in consequence moved forward to effect the action of the spacers, as above stated. When the spacers have been moved far enough to space or fill out the type in the carrier, the forward movement of the pusher-head is resisted, in consequence of which the pinion-

shaft overcomes its frictional connection with the sleeve and the latter runs idly. It will be obvious that this frictional or an equivalent conditional action of the means for advancing the pusher-head is an important feature of the invention, as otherwise the justification of the numerous varying lines of composed type could not be attained.

The free end of the rock-arm 78 is supported upon a suitably-arranged spring 82, which tends normally to raise this part of the arm and to maintain the pinion in engagement with the upper rack. Fitted to an appropriate guideway immediately above this arm is a transversely-reciprocative slide-bar 83, on the under side of which is a beveled tooth or projection 84, that is adapted in the rearward movement to engage a corresponding tooth or projection 85 on the rock-arm, and thus depress the latter in a manner to effect the engagement of the pinion with the lower rack preparatory to the advancement of the pusher toward the spacers. This slide-bar is normally pressed forward by means of a suitably-disposed spring 86, the forward end of the bar in that case projecting into the path of the carrier. The arrangement of the parts is such that before the carrier arrives in the path of the pusher-section and comes to rest therein, as hereinafter explained, the beveled recess 19 on the leading end of the carrier receives the projecting correspondingly-beveled end of the slide-bar 83 and pushes the latter inward, thereby shifting the gearing to effect the forward movement of the pusher-head, as and for the purpose stated.

Upon the justification of the line of type by the spacers and preparatory to the clamping of the type, the withdrawal of the spacers, and the substitution of appropriate permanent spaces therefor the carrier is moved onward by appropriate mechanism, such as that which I shall now describe, as follows: Mounted on a vertical shaft 87, adjacent to the slide-bar, is the gear 88, hereinbefore mentioned, a part of the periphery of which gear is plane or untoothed. The toothed portion of the gear in its rotation is adapted to engage the rack 18 on the carrier and move the latter bodily onward. The shaft 87 is mounted in a sleeve 89, stepped in the base of the casing, the upper portion of the sleeve being provided with the peripheral gear-teeth 90, with which engages a worm 91 on the carrier-shaft 2, whereby the shaft is positively driven at a given rate of speed in relation to that of the shaft last named. Shaft 87 has a frictional or conditional connection with the sleeve, so that the sleeve under certain circumstances will turn the shaft and the wheel 88, while at other times the sleeve will turn idly without affecting the shaft. In the present instance the frictional connection is similar in construction to that above described in respect to the shaft 76 and sleeve 77—that is to say, on the lower end of the sleeve 89 is a hollow



head 92, and on the like end of the shaft 87 is secured a spring 93, that bears yieldingly against the inner wall of the head.

Normally bearing upon the upper face of the wheel 88 is a spring or spring-actuated dog 94, that is secured to a portion of the casing, the action of the dog upon the wheel being sufficient to overcome the frictional connection between the shaft 87 and the sleeve 89. The forward end of the dog is turned upward and beveled, while on the adjacent edge of the slide-bar 83 is a finger 95, that lies directly forward of the beveled end in such wise that when the bar is forced rearward by the action of the carrier, as above stated, the finger will impinge against the beveled end of the dog and raise it from engagement with the wheel, whereupon the wheel, being unrestrained, will be rotated by the sleeve in the direction indicated by the arrow in Fig. 15.

Preparatory to the rearward movement of the slide-bar just mentioned the wheel occupies a position in which the plane portion thereof is forward and the teeth in place to engage the rack 18 on the carrier immediately upon the movement of the wheel, and thereby move the carrier with the adjusted type and spacers. The carrier is advanced until the first or leading spacer abuts against a permanent wall 96 in its path, whereupon the motion of the carrier is arrested, the restraint thus occasioned overcoming the frictional connection of the sleeve with the shaft 87. Hence the wheel is temporarily at rest.

Let into a recess in a portion 97 of the main frame is a horizontally-disposed lever 98, the forward arm of which extends into the path of the spacer as it approaches the wall 96, while the other or rearward arm is provided with a projection 99, that is adapted by means of a suitably-arranged spring 100, Fig. 9, to be held normally in engagement with a peripheral notch in a gear 101 in such manner that when the spacer abuts against the lever-arm the projection is disengaged from the notch. This gear is mounted on the inner end of a horizontal shaft 102, having its bearings on posts or standards 103 on the main frame. On the outer or left end of this shaft is loosely mounted a spur-wheel 104, while adjacent to the wheel there is affixed on the shaft a hollow head 105, which is frictionally connected with the wheel 104 by means of a spring 106, that is fastened to the head in a manner to bear against the side of the said wheel. This wheel is geared with and positively driven by a pinion 107 on the end of the screw-shaft 2 by means of intermediate coacting gears 108 109, which are mounted on a stud on the end of the main frame. By this construction it will be seen that when the gear 101 is locked by the lever 98 the spur-wheel 104 turns idly on the shaft 102, but that when the gear is released the shaft, being unrestrained, is rotated by the frictionally-connected spur-wheel. The gear 101 is provided with a plane portion, to the end that during a

portion of the revolution of said gear the toothed portion thereof will engage the teeth of a transversely-reciprocative rack-bar 109 and forcibly retract the latter a predetermined distance to and against a flat spring 110 on the main frame, whereupon the rack, being liberated by the advance of the plane portion of the wheel, will be returned to its original or forward position by the rebound of the spring. When the wheel 101 has made a complete revolution, the lever 98 engages the notch and locks the wheel in place in readiness for a succeeding operation. On the forward end of the rack-bar is secured a spring-dog 111, which when the bar is in the normal or forward position engages the notched upper end of a pivoted clamp-arm 112. This arm lies directly in front of that edge of the wall against which the spacer abuts, as above stated, to the end that if the arm be forced forward it will bear against the type on each side of the spacer, and thus firmly clamp such type against the bar of the carrier. The arm also bears against the carrier-bar and serves to clamp the carrier bodily in place. The arm, as will be observed, is eccentrically mounted, so that when it is moved forward gravity as well as friction tends to maintain it in the clamping position. It will be seen that the dog 111 in the initial rearward movement of the bar 109 will effect the described clamping action of the arm. On the under side of the rack-bar, forward of the spring-dog, is a projection 113, which is so disposed that immediately upon such clamping action it (the projection) during the continued movement of the bar will abut against the forward end of the opposing spacer, eject the latter from the carrier, and move the spacer back into the chamber 55 in position to be directed to and upon the endless belt 56 before described, a suitable channel or way 114 being provided for the passage of the spacer to said chamber.

On the rear of the rack-bar is a depending wedge 115, which is so arranged that in the forward or return movement of the bar it (the wedge) enters between the spacer and the wall of the frame in a manner to force the spacer laterally toward the belt. Hence when the receiving end of the chamber 55 has been charged with ejected spacers such spacers are successively delivered to the belt during the introduction of the following spacers to the chamber. A light spring 116 is arranged at the mouth of the channel, so as to prevent the individual spacers being forced back into the latter during the advancement of the wedge 115.

Immediately upon the withdrawal of the spacer from the type a permanent space corresponding with the space between the words or slightly smaller, as the case may be, is substituted for that spacer in a manner presently explained. It is at this period that the rack-bar moves forward, the dog 111 thereon thus engaging the teeth of the clamp-arm and



disengaging it from the type and carrier. The carrier and type thus being unrestrained, the wheel 88 advances the same until the next or leading spacer in the carrier abuts against the permanent wall 96, whereupon the carrier is stopped, the type and carrier are clamped, and the spacer is retracted in the manner just described preparatory to the insertion of the permanent space. Thus the several spacers are successively retracted from the carrier and the requisite permanent spaces introduced. This being done, the carrier has been advanced opposite to the galley in position to enable the appropriate type-ejecting mechanism to be brought into play.

The permanent-space containing, selecting, and inserting mechanism which I shall now describe is of a simple and efficient character, although I would have it understood that this feature of my invention is not limited to the particular construction, the same being susceptible of modification in many respects. Referring to Figs. 3, 7, and 12 of the drawings, 117 designates the permanent-space-containing frame, the same being provided with a series of graduated chambers or magazines 118, in which the correspondingly-graduated permanent spaces are contained preparatory to their introduction to the type-carrier. Each of the chambers is inclined downwardly from its receiving to its discharging end, so that the permanent spaces will descend by gravity. This frame is fitted to a transverse guide-piece 119 on the main frame and is mounted upon or in close relation to a longitudinally-movable gage-plate 120, which is arranged on the top plate of the casing. The frame 117 is intermittently movable at right angles to the direction of movement of the gage-plate 120 in such a manner that the magazines in the forward movement of the frame are brought successively above an opening 121 in said plate, which opening is directly above the open space formed between the type in the carrier by the removal of the spacer. When the frame 117 is in its normal or rearward position, the receiving ends of the magazines lie directly below a series of corresponding permanent-space chutes 122, which lead from an appropriate source of quad-supply, to the end that the magazines will be charged as rapidly as the permanent spaces are ejected therefrom—that is to say, when the lowermost permanent spaces are ejected from the advanced magazine the remaining permanent spaces in the latter will move downward a number of spaces determined by the number of permanent spaces ejected, whereupon when the magazine is retracted permanent spaces will be introduced to the magazine to take the place of those ejected into the line of type.

In the upper portion of the wall of each of the permanent-space magazines is a rib 123, that extends parallel with the top and bottom of the magazine, while correspondingly in the edge of each of the permanent spaces is a

transverse groove with which the rib is adapted to register during the descent of the permanent space, to the end that the lower portion of said permanent space will depend from the rib by gravity, and thus the permanent space be maintained in a vertical position during its descent. At the mouth of each of the magazines is a vertically-extending spring 124, which, acting against the permanent spaces, aids them in their descent. It insures the entrance of the permanent spaces to the magazine and prevents them from falling outward.

The feeding of the permanent spaces from the conduits to the magazines is effected by means of frictional rollers 125, which are mounted on a transversely-disposed shaft 126 intermediate the conduits and the magazines. These rollers correspond in number with the conduits and are arranged to act against the lowermost permanent spaces therein and direct them positively into the magazines, such permanent spaces being maintained against the peripheries of the respective rollers by means of spring-actuated presser-studs 127, that are fitted to recesses in the supporting-frame diametrically opposite the individual rollers. The shaft 126 is driven by means of a belt 128, which passes around a pulley 129 on said shaft and a pulley 130 on the shaft of the roller upon which turns the spacer-return belt, above described. Fixed on the shaft 126 is a ratchet-wheel 131, with which, under certain conditions, normally engages a pawl 132, that locks the shaft and prevents its rotation, the belt in that case simply slipping on the pulley. When the permanent-space frame is in its rearward or receiving position, the pawl is disengaged from the ratchet-wheel, and in consequence the shaft 126 and its rollers are free to turn; but when the said frame is moved forward the pawl is engaged with the ratchet-wheel and the parts are locked. In the present instance the pawl is disengaged at the proper time from the ratchet-wheel by means of a swinging sector 133, which in its movement abuts against a depending arm on the pawl.

Obviously if the feeding action of the rollers were continued after the frame had been withdrawn from the conduits the permanent spaces would be uselessly discharged from the latter.

The advancement of the permanent-space-containing frame in order to insure the proper disposition of the prescribed permanent spaces in respect to the spaces formed between the words in the justified line of type is controlled by the pusher-head hereinbefore described. In this connection reference may be had to Figs. 6, 7, 8, 12, and 17 of the drawings, as follows: 134 represents a suitably-disposed vertical shaft rising through an elongated slot 135 in the gage-plate. On the upper end of this shaft is a pinion 136, which engages a rack 137 on said plate, while to the lower portion of the shaft is affixed a sector



138, which coacts with a rack 139 on the side of the pusher-head. Hence when this head is advanced to act upon the spacers the gage-plate is relatively moved to the right, as indicated by the arrow in Fig. 6. On the right-hand end of the plate is an up projecting flange or rib 140, which is fitted to the recessed end of the permanent-space-containing frame and is adapted to coact with a series of graduated steps 141 on the latter in a manner to regulate and determine to a nicety the forward movement of said frame. Fitted to a longitudinal recess in this frame is a slide-bar 142, provided on its upper face with teeth 143, which are engaged by one face of a double sector 133 on a suitably-located stud-shaft 144, the other face of the sector engaging rack-teeth 145 on the upper edge of the pusher-head, to the end that when the latter is moved forward the slide-bar is correspondingly actuated. This bar is somewhat shorter than the recess in the frame, a spring 146 on the forward end of the bar occupying the remaining space and bearing against the opposing wall of the recess, whereby if the slide-bar be moved forward while the permanent-space-containing frame is held the spring will be compressed, and if then the frame be released the spring, rebounding, will move the frame forward. If the operation be repeated successively, the frame will be advanced step by step. Each step is equal to the distance between two adjacent permanent-space chambers, and provision is had to advance the frame as many steps as there are chambers. The movements are controlled by the coöperation of the graduated steps and the rib above referred to—that is to say, when the frame is in its normal or retracted position the edge of the first step takes against the opposing end of the rack-bar. When the gage-plate is being advanced by and during the forward action of the pusher-head, the sector 133 is moving the slide-bar forward against the action of the spring. The moment the rib on the gage-plate clears the edge of the first step the permanent-space-containing frame, being released, is moved forward by the reaction of the compressed spring until the edge of the second step impinges against the rib. If the movement of the pusher be checked at this stage, the delivery end of the first permanent-space magazine will come to rest directly above the last space in the line of type from which the spacer has been drawn, the size of the permanent spaces in such magazine corresponding with that of the space. If, however, the pusher be advanced still farther before it is checked, the rib will clear the second step and the frame will be moved forward to bring the delivery end of the second permanent space into position, and so on the frame will be advanced step by step until the requisite permanent-space magazine is in line with the space.

The edge of the frame upon which the graduated steps are formed is split longitudinally,

as at 147, so that the step-section may have slight independent elastic or yielding lateral movement, and the rib is correspondingly split, as at 148, to the same intent. Hence as the acting end of the rib is escaping the opposing edge of a step the parts yield slightly, and thus reduce the frictional and wearing action.

The rear end of the slide-bar is provided with an appropriate cushion, as 149, which yieldingly receives the impact when the frame is shot forward, and thus protects the edges of the gage-steps from undue wear against the end of the gage-rib.

The means for ejecting the lowermost permanent space from the magazine and introducing it into the underlying space in the line of type comprises a vertically-reciprocative plunger 150, depending from a cross-head 151, which works in an appropriate guide-frame. The cross-head is connected with the gear-wheel 101, above described, by means of a pitman 152, to the end that during the rotation of said wheel the cross-head is reciprocated. The parts are so timed that the descent of the plunger to act upon the permanent space takes place when and only when the prescribed permanent-space magazine has been brought into position.

It will be understood that the permanent-space-containing frame is not returned to its normal position until the line has been completed by the insertion of the requisite permanent spaces in the line. It will also be understood that while in some cases a line may be justified with one particular size of permanent spaces, yet in other cases it may require two sizes, of which one will be just one unit of space different from the other. In the latter event the first permanent space introduced to the space between the words will be slightly smaller than the space provided for it, and hence on the release of the clamp the fractional space will be taken up by the advancement of the spacers. At the same time the permanent-space magazine will be advanced to the next-sized permanent space, if it be required; but if not then the succeeding small permanent space will be inserted and the spacers will be advanced again. Thereupon the permanent-space magazine will be advanced to present the next-sized permanent space to the space between the words, and so on until the line has been justified. The space between the last two words in the line will correspond with that of the permanent space directed thereto, as the line is made up of a given number of units.

From the foregoing it will be seen that the forward movement of the pusher-head to effect the justification of the type, the advancement of the carrier word by word, the clamping of the type and carrier at the end of each word, (except the last,) the withdrawal of the spacers successively, the forward movement and adjustment of the permanent-space frame, and the operation of the mechanism



for introducing the predetermined permanent spaces to the spaces between the consecutive words are brought about in prescribed order through the rearward movement of the slide-bar 83 by the impact thereagainst of the advancing carrier.

While the carrier is advancing word by word, the slide-bar 83 is held in the rearward position by the opposing side of the carrier-bar; but when the permanent space has been introduced to the space between the last two words in the line of type the carrier escapes the end of the slide-bar. In consequence the bar is shot forward and, perforce, the pusher-head, permanent-space gage-plate, and the permanent-space-containing frame return to their original position in readiness for a succeeding carrier, which during the preceding operation had come to rest by its dog 14 entering the notch or keyway 49 in the face of the wall 47. It will be remembered that the key 50, which operated in this notch or way, was connected with one arm of a spring-actuated lever 52, that maintained the key normally retracted. The other arm of this lever lies within a slot in the wall of the casing and extends horizontally beyond the slide-bar, the extremity of such arm being turned inward to provide a stud 153, that projects normally into the path traversed by the lower forward corner of the carrier as the latter escapes the slide-bar 83. This corner of the carrier is offset throughout its length, excepting at the rearward end, where a shoulder 154 is formed, which shoulder, as the carrier escapes the slide-bar, bears against the stud 153 on the lever-arm and forces the latter outward. Consequently the other lever-arm and, perforce, the key 50 are moved inward, the carrier-dog thus being engaged with the screw to effect the movement of the carrier to the path of the reciprocative pusher-head, as and for the purpose hereinbefore described respecting the preceding carrier.

When the slide-bar 83 is moved forward upon the escape therefrom of the carrier with the justified line of type, the spring-dog 94 lies in a segmental channel 155 in the gear 88, and therefore, even though the finger 95 on the slide-bar is disengaged from the dog, the gear is permitted to turn until the end of the channel impinges against the dog. During a part of this final movement of the gear 88 the carrier is impelled thereby into position in front of the galley, whereupon the gear escapes the rack-teeth on the carrier and the latter remains quiescent. The floor of the upper compartment being cut away in front of the galley, the carrier is temporarily supported in place by means of spring-fingers 156, which are secured to a wall of the casing, such fingers being provided with protuberances 157, that spring into sockets 158 in the bar of the carrier. (See Figs. 21 and 23.) While the carrier is thus sustained, the line of type is prevented from prematurely falling into the galley 159 by means of horizon-

tally-disposed slide-bars 160 161, which are fitted to the front wall of the casing at the upper and lower edges, respectively, of the opening to the galley, so as normally to support the line of type at top and bottom. The bars are vertically movable in opposite directions, so that they may be moved from the opening to permit the transference of the type to the galley at the proper time. In the present instance the lower bar is maintained in the normal position by means of a suitably-disposed spring 162, bearing against a depending guide portion of the bar, while the upper bar is maintained therein by gravity. Immediately in rear of the line of type thus sustained at the mouth of the galley is a horizontal bar 163, which is carried by a horizontally-reciprocative plunger 164. The body of this bar is equal in length to the space between the end posts of the carrier, or substantially so, and it is provided with an extension which carries a vertical plate 165, having its upper and lower corners beveled. The plate is fitted to a recess in the end wall of the casing and is so disposed that during the forward movement of the plate the beveled corners thereof impinge against the opposed edges of the bars 160 161 and force them apart, following which the bar 163 bears against the line of type and pushes it into the galley. The plunger is then retracted in position for a similar operation upon the line of type in a succeeding carrier, and so on repeatedly until the desired matter has been composed. The plunger, which is maintained normally retracted by means of a spring 166, is connected with one arm of a horizontally-disposed lever 167, the other arm of which is slotted to embrace the shaft 134. The carrier-feeding wheel 88 is provided at a suitable point in its periphery with a lug 168, which at a proper time during the rotation of the wheel impinges against a stud 169 on the slotted arm of the lever and raises such arm sufficiently to effect the described forward action of the plunger. Upon the lug clearing the stud the plunger and its connections resume their normal position.

On the under side of the bar 163 is a beveled projection 170, which is so disposed that when the line of type has been pushed into the galley by the forward movement of the bar the projection bears against the opposing corner of the carrier and forces the latter downward in a manner to free it from the grasp of the spring-fingers, whereupon the empty carrier drops into the lower compartment. During the descent of the carrier the projecting ends of the guide-studs 16<sup>x</sup> of the toothed sections 16 bear, respectively, against a bevel 171 in one end of the bar 161 and against the opposing beveled face of the clamp-arm 112, which sections are thus pressed inward against the action of the springs 17 in a manner to effect their engagement with the teeth of the return-screw.

It will be observed that the groove or chan-



nel 54, (in the wall of the upper compartment,) in which the head of the dog 14 travels while the carrier is being moved opposite to the galley, is connected with a lower horizontal groove 172 in the wall of the lower compartment by means of a vertical channel 173. When the carrier comes to rest in front of the galley, the head of the dog lies at the mouth of the latter channel, and hence when the carrier drops the dog is guided by the vertical channel into the lower horizontal or return channel. It will also be observed that the studs 16, bearing against the wall of the casing, maintain the toothed sections in engagement with the screw. Hence the empty carrier is moved toward the receiving end of the machine. Before this carrier reaches the spring lifting-bar 26 on the floor of the lower compartment the movement of the carrier is arrested by the disengagement of the toothed sections from the screw, this being effected by the studs 16 springing into suitably-located notches 174 175 in the wall of the casing. In this wall is a horizontal lever 176, one arm of which is provided with a depending stud 177, which extends into the notch 175 and is normally held retracted therein by means of an appropriate spring 178, acting on the lever, while the other arm of the lever is provided with a stud 179, that is movable into and out of the path traversed by the filled carrier as it leaves the receiving end of the machine, to the end that the lever at this stage will be actuated to push the opposed toothed section on the lower or empty carrier into engagement with the screw. Such latter carrier will thus be advanced upon the spring-bar in a manner to depress the same and ride upon the lifting-plate 24, before described. At this end of the wall there is also a vertical channel 180, which connects the lower horizontal channel with the key-channel 28 aforementioned and, in conjunction with the channels 181 181 for the passage of the studs 16, permits the transference of the carrier to the upper chamber by the lifting-plate in the manner hereinbefore described.

It will be observed by reference to Fig. 5<sup>a</sup> that there is supported on the side of the wall 68, at the receiving end of the machine, a bell 182, the spring-controlled hammer or clapper of which is provided with an arm 183, that extends into the upper compartment, so as to lie directly above the plane of the upper edge of the carrier-bar 9. On one end of this bar is a stud 184, Fig. 23, which is designed at a predetermined period during the setting up of the type to abut against the arm and sound the bell, thus notifying the operator that the line has been nearly composed.

While I have not deemed it necessary to represent herein the various structural modifications comprehended by my invention, yet for purposes of illustration I have shown in Figs. 32 to 39, inclusive, of the drawings modified forms of dividers or spacers. The form represented in Figs. 32 to 36 comprises two

sections *a b*, one of which is fitted within and pivoted to the other. One side of section *a* is beveled, as at *a'*, and is provided with a longitudinally-extending dovetailed recess, to which is fitted a vertical slide *c*, that is interposed between the proximate members of the two sections, to the end that if the slide be pushed forward by the impact thereagainst of the pusher device 51 the opposing member of the section *b* will be forced outward, while the other or forward member thereof will be moved outward in an opposite direction. This forward member extends through an appropriate opening in the section *a* and is provided with a pivotal end piece *b'*, which normally lies within the latter, said sections being correspondingly offset or reduced, as at *d*, in a manner to present the minimum space to the type between which they are interposed. When the sections are spread apart, as stated, the type are similarly moved to effect the requisite justification, the pivotal piece *b'* presenting at all times a uniform bearing-surface to the type. A suitably-disposed spring *e*, fixed to one of the sections to bear upon the other, tends to maintain the sections normally closed.

In Figs. 37 to 39 the spacer is represented in the form of a wedge designed to be introduced between adjoining type, the sides of the latter being offset, as at *f*, to correspond with and receive the inclined face of the wedge. In this construction the sides of the wedge are provided with a tapering tongue 64 and groove 65, respectively, similarly to and for a like purpose as the corresponding parts in the spacer first described.

I claim as my invention—

1. In a type-justifying machine, the combination of a type-support, means for feeding type thereto, means for introducing adjustable spacers between adjoining words, means for actuating the spacers to effect the spacing out or justification of the line of type, means for clamping the type at adjoining words, means for withdrawing said spacers, and means for substituting permanent spaces therefor, substantially as described.

2. In a type-justifying machine, the combination of a type-support, means for feeding type thereto, means for introducing adjustable spacers between adjoining words, means for actuating the spacers to effect the spacing out or justification of the line of type, means for intermittently advancing the support with the spaced-out line of type, means for successively clamping the type at adjoining words, means for withdrawing said spacers successively, means for inserting quads in the successive spaces, and means for unclamping the type upon the introduction of the quads, substantially as described.

3. In a type-justifying machine, the combination of means for setting up a line of type and means for primarily spacing the same, of means for effecting the spacing out or justification of the line, a movable permanent-



space-containing magazine and means under the control of the last-named means for effecting the movement of said magazine in respect to the spaces between the words, substantially as described.

4. In a type-justifying machine, the combination of means for setting up a line of type and means for primarily spacing the same, of means for effecting the spacing out of the line, and tending to continue such action, a movable permanent-space-containing magazine, and means for effecting the movement of said magazine in respect to the successive spaces between the words, substantially as described.

5. In a type-justifying machine, the combination of a type-support, means for feeding type thereto, means for introducing an adjustable spacer at the end of each word as it is set up, means for acting upon the spacers and effecting the justification of the type thereby, means for successively withdrawing said spacers, a movable permanent-space-containing magazine, and means under the control of the spacer-actuating means for effecting the adjustment of said magazine in respect to the spaces between the words, substantially as described.

6. In a type-justifying machine, the combination of a type-support, means for feeding type thereto, means for introducing an adjustable spacer at the end of each word as it is set up, means for acting upon the spacers and effecting the justification thereby, a movable permanent-space-containing magazine, and means under the control of the last-named means for effecting the movement of said magazine in respect to the first space in the line and for governing the position of the magazine in respect to the succeeding spaces in the line, substantially as described.

7. In a type-justifying machine, the combination of a type-carrier in which the line is made up and word-spacers introduced, means for longitudinally moving said carrier, means for arresting the movement of the carrier, means for restarting said carrier, means for arresting the movement of the carrier preparatory to the justification of the type, means for acting upon the word-spacers to effect said justification, means for advancing the carrier intermittently from space to space, means for withdrawing the spacers at the successive intermissions of movement, and means for substituting appropriate permanent spaces for said spacers, together with means for automatically restarting a succeeding carrier when the last permanent space has been introduced in the line, substantially as described.

8. In a type-justifying machine, the combination of means for setting up a line of type, means for primarily spacing the same, means for effecting the justification of the line, clamp mechanism to act successively upon the end type in adjoining words, permanent-space selecting and inserting mechanism, and means under the control of the justifying means for

controlling said permanent-space mechanism, substantially as described.

9. In a type-justifying machine, the combination of means for setting up a line of type, means for introducing spacers between adjoining words, means for actuating the spacers to effect the justification or spacing out of the line, clamp mechanism to act successively upon the end type in adjoining words, means for withdrawing the spacers successively, permanent-space selecting and inserting mechanism, and means under the control of the justifying means for controlling said permanent-space mechanism, substantially as described.

10. In a type-justifying machine, the combination with a reciprocative pusher-head, adapted to act upon word-spacers in a line of type, of a clamp mechanism, a spacer-extracting mechanism, a permanent-space selecting and inserting mechanism, and means operatively connecting the said permanent-space mechanism with the pusher-head, substantially as described.

11. In a type-justifying machine, the combination with a reciprocative pusher-head, adapted to act upon word-spacers in a line of type, of a clamp, a spacer-extractor, a permanent-space selecting and inserting mechanism, means for transferring the line of type to a galley, and means operatively connecting the said permanent-space mechanism and transferring means with the pusher-head, substantially as described.

12. In a type-justifying machine, the combination of a pusher-head adapted to act upon spacers in a line of type, a shaft, means for frictionally or conditionally driving said shaft in one direction, coacting mechanisms on said shaft and pusher-head, and means whereby said mechanisms are oppositely engaged at predetermined intervals to effect the reciprocation of said pusher-head, substantially as described.

13. In a type-justifying machine, the combination of a pusher-head adapted to act upon spacers in a line of type, two oppositely-disposed racks on said head, a pinion, its shaft, means for frictionally or conditionally driving said shaft, and means for moving the pinion into engagement with the racks alternately, substantially as described.

14. In a type-justifying machine, the combination with a pusher-head adapted to act upon spacers in a line of type, and means for reciprocating said head, of a gage-plate, a permanent-space-containing frame movable transversely of said plate and provided with graduated stops with which said gage-plate coacts, and operative connections between the pusher-head and said frame and gage-plate, substantially as described.

15. In a type-justifying machine, the combination with means for spacing out a line of type, of a graduated permanent-space-containing frame movable transversely of said type, and provided with stops graduated in



respect to the permanent spaces, a longitudinally-movable gage-plate adapted to coact with said stops, means for operating the gage-plate, and means for yieldingly impelling the said frame in concert with the gage-plate, substantially as described.

16. In a type-justifying machine, the combination with means for spacing out a line of type, of a graduated permanent-space-containing frame movable transversely of said type and provided with stops graduated in respect to the permanent spaces, a slide yieldingly connected with said frame, means for operating said slide, a longitudinally-movable gage-plate adapted to coact with said stops, and means for operating said plate, substantially as described.

17. In a type-justifying machine, the combination with means for spacing out a line of type, of a permanent-space-containing frame movable transversely of said type, a longitudinally-movable gage-plate, said plate and frame being provided with coacting stops, of which one is graduated in series, means for operating the gage-plate, and means for yieldingly impelling the said frame in concert with the gage-plate, substantially as described.

18. In a type-justifying machine, the combination with means for spacing out a line of type, of a graduated permanent-space-containing frame movable transversely of said type and provided with stops graduated in respect to the permanent spaces, a longitudinally-movable gage-plate adapted to coact with said stops, a slide fitted to a way in said frame and provided with a spring which bears against the end wall of said way, means for operating said slide, and means for operating said plate, substantially as described.

19. In a type-justifying machine, the combination with means for spacing out a line of type, of a graduated permanent-space-containing frame movable transversely of said type and provided with stops graduated in respect to the permanent spaces, a longitudinally-movable gage-plate adapted to coact with said stops, a slide fitted to a way in said frame and provided at one end with a spring which bears against the opposing end wall of said way, a cushion interposed between the opposite ends of said slide and way, means for operating said slide, and means for operating said plate, substantially as described.

20. In a type-justifying machine, the combination of a permanent-space-containing frame, a chute or conduit for delivering permanent spaces thereto, feed-rollers to act upon the permanent spaces, and frictional means for operating said rollers, substantially as described.

21. In a type-justifying machine, the combination of a permanent-space-containing frame, a chute or conduit for delivering permanent spaces thereto, feed-rollers to act upon the permanent spaces, frictional means for operating said rollers, and locking and

releasing means for said rollers, substantially as described.

22. In a type-justifying machine, the combination of means for setting up a line of type, means for introducing spacers between adjoining words, means for actuating the spacers to effect the spacing out of the line, means for conditionally advancing the spaced-out line, a permanent wall or stop against which the spacers successively abut to arrest the advance of the line, and means for withdrawing from the line the spacers individually in successive order, substantially as described.

23. In a type-justifying machine, the combination, with means for spacing out a line of type, of a clamping-arm, a reciprocative spacer-extracting bar having provisions for controlling said clamping-arm, and means for operating said extracting-bar, substantially as described.

24. In a type-justifying machine, the combination with means for spacing out a line of type, of a clamp, a reciprocative rack-bar having provisions for actuating the clamp and means for extracting the spacer, a partially-toothed gear to coact with said rack, and conditional driving mechanism for said gear, substantially as described.

25. In a type-justifying machine, the combination with means for spacing out a line of type, of a clamp, a reciprocative rack-bar having provisions for actuating the clamp and means for extracting the spacers, a partially-toothed gear to coact with said rack, conditional driving mechanism for said gear, a permanent-space-supply magazine, a reciprocative plunger for driving permanent spaces therefrom into the spaces in the line of type, and operative connections between said plunger and the said gear, substantially as described.

26. In a type-justifying machine, the combination of a type-carrier in which the line is made up and word-spacers introduced, means for longitudinally moving said carrier at prescribed intervals, means for actuating the spacers to effect the spacing out of the line of type, a clamp, a reciprocative rack-bar having provisions for extracting the spacers, a partially-toothed gear to coact with said rack, a conditional driving mechanism for said gear, and a locking and releasing device for said gear arranged to be actuated by the type-carrier, substantially as described.

27. In a type-justifying machine, the combination with a type-carrier and means for spacing out a line of type therein, of a wheel adapted to engage said carrier and advance it space by space, and conditional driving mechanism for said wheel, substantially as described.

28. In a type-justifying machine, the combination with a type-carrier, and means for spacing out a line of type therein, of a wheel adapted to engage said carrier and advance it space by space, a positively-driven shaft,



frictional connections between it and said wheel, locking and releasing devices for said wheel, and means for controlling said devices at predetermined intervals, substantially as described.

29. In a type-justifying machine, the combination with a type-carrier, in which the line is made up and word-spacers introduced, means for longitudinally moving said carrier, means for arresting the movement of the carrier preparatory to the spacing out of the type, a pusher-head adapted to act upon said spacers, mechanism for reciprocating said head, a slide-bar to effect the operation of said mechanism, a wheel in advance of said head adapted to engage said carrier and advance it space by space, and conditional driving mechanism for said wheel under the control of the slide-bar, substantially as described.

30. In a type-justifying machine, the combination with a type-carrier in which a line of type is made up and spacers introduced between adjoining words, of a spacer-chamber, means for advancing the spacers individually therefrom to the type in the carrier, and means for deflecting the advancing points of the respective spacers laterally beyond or away from the outer side of the last preceding type set up in the carrier, substantially as described.

31. In a type-justifying machine, the combination, with a type-carrier in which a line of type is made up and spacers introduced between adjoining words, of a spacer-chamber, a guide channel or way intermediate said chamber and the path of the carrier, means to direct the individual spacers in the chamber through said channel or way, and a spring at the delivery end of said channel or way adapted to deflect the advancing points of successive spacers laterally beyond or away from the outer side of the last preceding type set up in the carrier, substantially as described.

32. In a type-justifying machine, the combination of a carrier in which the line of type is made up, means for introducing spacers between adjoining words, means for impelling the carrier, means for actuating the spacers to effect the spacing out or justification of the line of type, a reciprocative slide-bar provided with means for withdrawing the spacers from the line and transferring them to a spacer-chamber, and with means for moving the spacers laterally in said chamber, means for reciprocating said bar at predetermined intervals, an endless-belt carrier in said chamber adapted to receive the spacers and return them to position for subsequent action, and means for driving said carrier, substantially as described.

33. In a type-justifying machine, the combination, with the galley to which a justified line of type is transferred from a holder or carrier, of a shaft provided with oppositely-pitched screw-threads, means on said holder

or carrier adapted to engage one set of threads and be impelled thereby to move the holder or carrier to the entrance to the galley, means for temporarily sustaining said holder or carrier in position, means for forcing the type from the holder or carrier to the galley, and thereupon depressing the said holder or carrier in opposition to its sustaining devices and releasing the holder or carrier therefrom and means on the holder or carrier adapted to engage the other set of screw-threads when the holder or carrier is thus released, substantially as described.

34. In a type-justifying machine, the combination with the galley to which a justified line of type is transferred from a holder, vertically-movable type-sustaining bars at the entrance to the galley for temporarily sustaining the type at top and bottom, respectively, means for moving said bars vertically in opposite directions simultaneously, and means for transferring the type to the galley, substantially as described.

35. In a type-justifying machine, the combination, with the galley to which a justified line of type is transferred from a carrier, means for moving said carrier to the entrance to the galley, spring devices to sustain said carrier temporarily in position, means for forcing the type from the carrier to the galley, and means for thereupon releasing said spring devices, substantially as described.

36. In a type-justifying machine, the combination with a carrier in which the line of type is set up and justified, of a galley, a wheel adapted to move said carrier to the galley, means for operating said wheel, a reciprocative device adapted to force the type from the carrier to the galley, a lever connected with said device, and means whereby the wheel actuates the lever at a predetermined period, substantially as described.

37. In a machine for justifying type, the combination of a shaft provided with oppositely-pitched screw-threads, a type-carrier movable longitudinally of said shaft, screw-engaging devices on said carrier, and means for effecting the engagement of said devices with the threads at predetermined intervals, substantially as described.

38. In a machine for justifying type, the combination of two longitudinal ways or compartments, a shaft parallel therewith provided with oppositely-pitched screw-threads, a type-carrier movable longitudinally of said ways, means for transferring the carrier from one way or compartment to the other at alternate ends thereof, and screw-engaging devices on the carrier adapted to be engaged with the threads alternately, substantially as described.

39. In a machine for justifying type, the combination of two longitudinal ways, communicating with each other at the ends thereof, a type-carrier, means for moving the carrier longitudinally of said ways alternately, a normally-raised lifting-plate at one end of the



lower compartment, and a spring-supporting bar for said plate adapted to be depressed by the passage thereon of the carrier, substantially as described.

5 40. In a machine for justifying type, the combination of two longitudinal ways or compartments communicating with each other at the ends thereof, type-carriers, means for moving them longitudinally of said ways, 10 means for transferring said carriers from one way to the other at alternate ends of the longitudinal traverse, means for arresting the movement of the lower or returning carrier, and means for automatically releasing said 15 lower carrier through the medium of the upper moving carrier, substantially as described.

41. In a machine for justifying type, the combination of a longitudinal way, a screw-shaft parallel therewith, a type-carrier movable in said way and provided with a screw-engaging device, and a key to effect the engagement of said device with the screw, the wall of said way being constructed to maintain said device so engaged, and to permit its 25 release, at predetermined intervals, substantially as described.

42. In a machine for justifying type, the combination of a longitudinal way, a screw-shaft parallel therewith, a type-carrier movable in said way and provided with a screw-engaging device, a key at one end of said way to effect the engagement of said device with the screw, means to maintain such engagement for a predetermined period, and thereupon to permit its release, and a second 35 key to effect the reengagement of said device with the screw, substantially as described.

43. In a machine for justifying type, the combination, with a longitudinal way, a screw-shaft parallel therewith, a type-carrier movable in said way and provided with a screw-engaging device, a key at one end of said way to effect the engagement of said device with the screw, means to maintain such engagement for a predetermined period, and thereupon to permit its release, and a second 45 key to effect the reengagement of said device with the screw, and a lever constructed and arranged to be automatically actuated to effect the reengagement of said device with the screw, substantially as described. 50

44. In a type-justifying machine, the combination, with two ways communicating at their ends, a type-carrier, a screw-engaging device thereon, a screw for moving the carrier longitudinally of the ways, means for transferring said carrier from one way to the other at alternate ends of its longitudinal traverse, means for feeding type to said carrier at one end of the upper way, a spring for shifting said carrier into the path of said type-feeding means and registering the screw-engaging device with a groove or channel in the wall of the way, and a key extending into 60 said groove or channel, substantially as described.

45. The combination with a type-feeding

conduit, of a roller at the mouth thereof provided with peripheral spring-fingers, each of which comprises a strip of spring metal bent 70 in the form of a ratchet-tooth and fastened at one end to the roller, the face of the latter being provided with notches to permit radial movement of the projecting portions of the fingers, substantially as described. 75

46. The combination with a type-feeding conduit, of an endless belt at the delivery end thereof and rollers for said belt, the lower roller being provided with peripheral spring-fingers, and the belt being provided with openings for the passage of said fingers, substantially as described. 80

47. In a spacer for type-justifying machines, a wedge-shaped section, a pivotal type-spreading member in contact therewith, 85 and a movable arm to which said member is pivoted rearwardly of the basic or enlarged end of said section, whereby when said section is moved forwardly the pivoted member is forced outward, substantially as described. 90

48. In a spacer for type-justifying machines, a wedge-shaped section provided with a tapering tongue on one face thereof and with a corresponding groove on the opposite face, substantially as described. 95

49. In a spacer for type-justifying machines, a plate one side of which is beveled to constitute a wedge, while the other or plane side thereof is recessed longitudinally, and a pair of hingedly-connected arms embracing said plate from its rear or thicker end, one of said arms being fitted to the recessed side of the plate so as to be flush therewith, substantially as described. 100

50. In a spacer for type-justifying machines, a wedge-shaped section, pivotal arms embracing the same, a type-spreading member pivotally connected with one of said arms in contact with the face of said section, substantially as described. 105

51. In a spacer for type-justifying machines, a wedge-shaped section provided with the parallel shoulders at its point, pivotal arms embracing said section, and a type-spreading member pivotally connected with 110 one of said arms and adapted to fit between and flush with said shoulders, substantially as described.

52. In a spacer for type-justifying machines, a wedge-shaped section, pivotal arms embracing the same, one of said arms being fitted to a longitudinal groove in the plane side of the section and the other arm being provided at its extremity with a pivotal type-spreading member, substantially as described. 115

53. In a type-justifying machine, the combination, with a way or compartment, of a screw-shaft extending longitudinally thereof, a type-carrier adapted to travel in said way or compartment and provided with a lateral spring-actuated dog constructed and arranged to bear against the side wall of said way or compartment during a portion of the travel 130 of the carrier and be thereby maintained in



engagement with the screw-shaft, substantially as described.

54. In a type-justifying machine, the combination, with a way or compartment, of a screw-shaft extending longitudinally thereof and a type-carrier adapted to travel in said way or compartment, said carrier comprising a bar, end posts, and spring-actuated sections on said post provided with studs which are adapted at certain intervals to bear against the side wall of said way or compartment and thus maintain the sections in engagement with the screw, substantially as described.

55. In a type-justifying machine, the combination, with two parallel ways or compartments, of a shaft provided with oppositely-pitched screw-threads, as described, of a type-carrier adapted to travel alternately in said ways or compartments, and means for transferring the carrier from one way or compartment to the other, said carrier being provided with independent means to engage the respective threads, substantially as described.

56. In a type and spacer carrier for justifying-machines, the combination of a bar provided with fixed vertically-disposed end posts, and a spring-actuated longitudinally-movable slide mounted on one of said posts, substantially as described.

57. In a type-justifying machine, the combination with a way, of a type and spacer carrier therein provided at its leading end with a spring-actuated type support and clamp, means for introducing selected type and spacers individually to said carrier, and means for acting upon the type and spacers as they are individually introduced to the carrier, and thereby advancing the carrier and its contents step by step until the line has been set up, substantially as described.

58. In a type-carrier for justifying-machines, the combination of a bar, end posts thereon, toothed sections with rearward extension on said posts, and springs supporting said sections, substantially as described.

59. In a type-justifying machine, the combination with two parallel ways or compart-

ments, of a lever, the arms of which project into notches or recesses in the walls of the respective compartments, type-carriers adapted to travel in said ways or compartments and means for impelling said carriers in opposite directions in said compartments, said carriers being constructed to be disengaged from the impelling means in the lower compartment relatively to and in the path of the arm of the lever in said latter compartment, substantially as and for the purpose described.

60. In a type-justifying machine, the combination with a way or compartment, of a type and spacer carrier therein, means for introducing type and spacers thereto, means for intermittently advancing the carrier as the type and spacers are inserted, and a friction-spring acting upon the carrier during the operation, substantially as described.

61. In a type-justifying machine, the combination, with a carrier provided with a yielding slide, of means for introducing type and spacers individually to said carrier, means acting upon the type and spacers in opposition to the slide as they are individually introduced to the carrier, and thereby advancing the carrier and its contents step by step until the line has been made up, and means for subsequently engaging and impelling said carrier, substantially as described.

62. In a type-justifying machine, the combination, with a carrier provided with a yielding slide, of means for introducing a line of type and spacers singly to said carrier, and means for advancing said carrier and means for actuating said spacers to effect the justification of the line, together with means for removing the spacers, and means for substituting permanent spaces therefor, substantially as described.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

JEFFERSON D. CHALFANT.

Witnesses:

JOHN R. NOLAN,  
ANDREW V. GROUPE.