

W. S. SOUTHWICK.
MAGAZINE FOR AUTOMATIC WEFT REPLENISHING LOOMS.

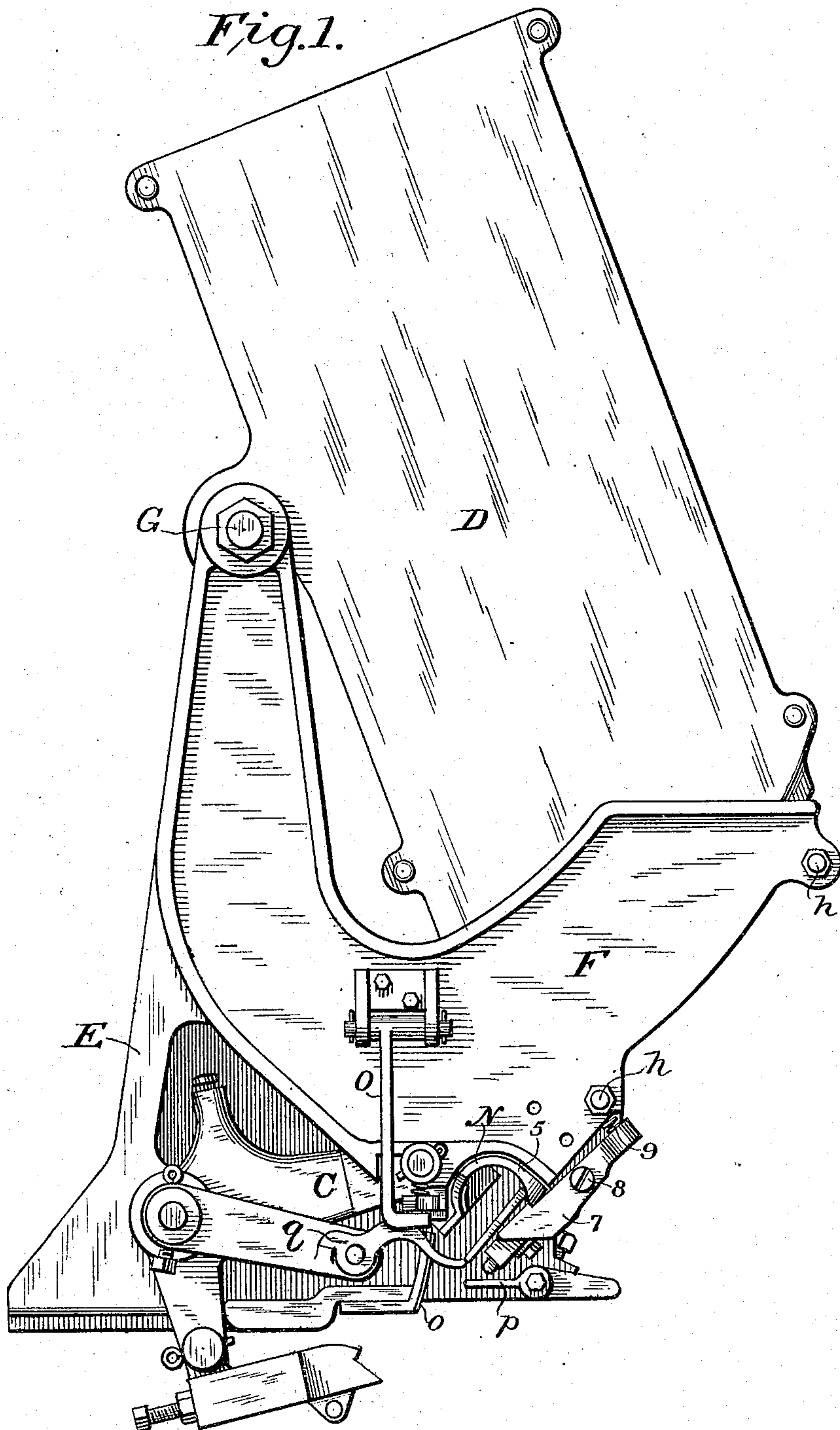
APPLICATION FILED APR. 1, 1904.

930,812.

Patented Aug. 10, 1909.

12 SHEETS—SHEET 1.

Fig. 1.



Witnesses
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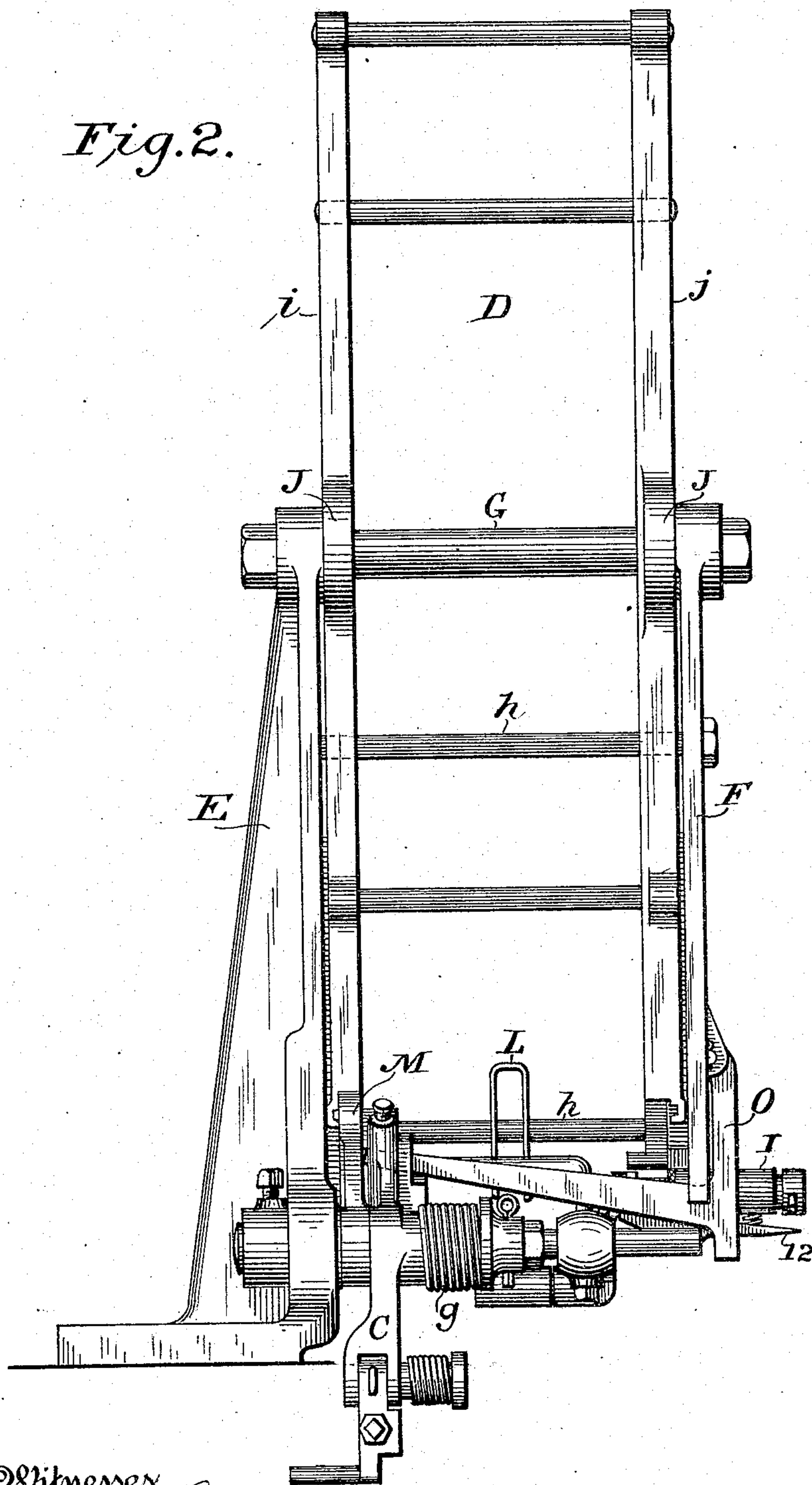
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12 SHEETS—SHEET 2.

Fig. 2.



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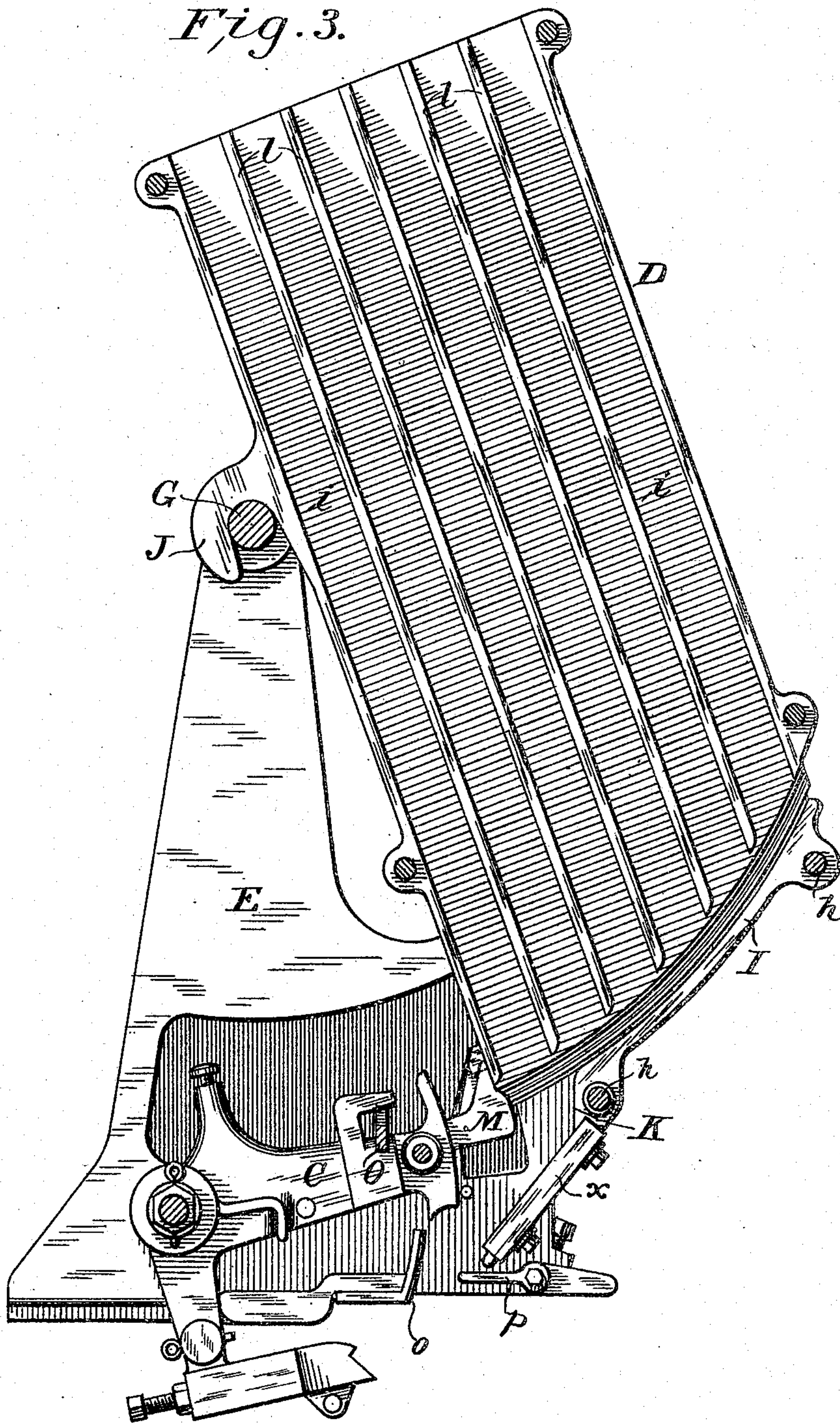
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12 SHEETS—SHEET 3.

Fig. 3.



Witnesses
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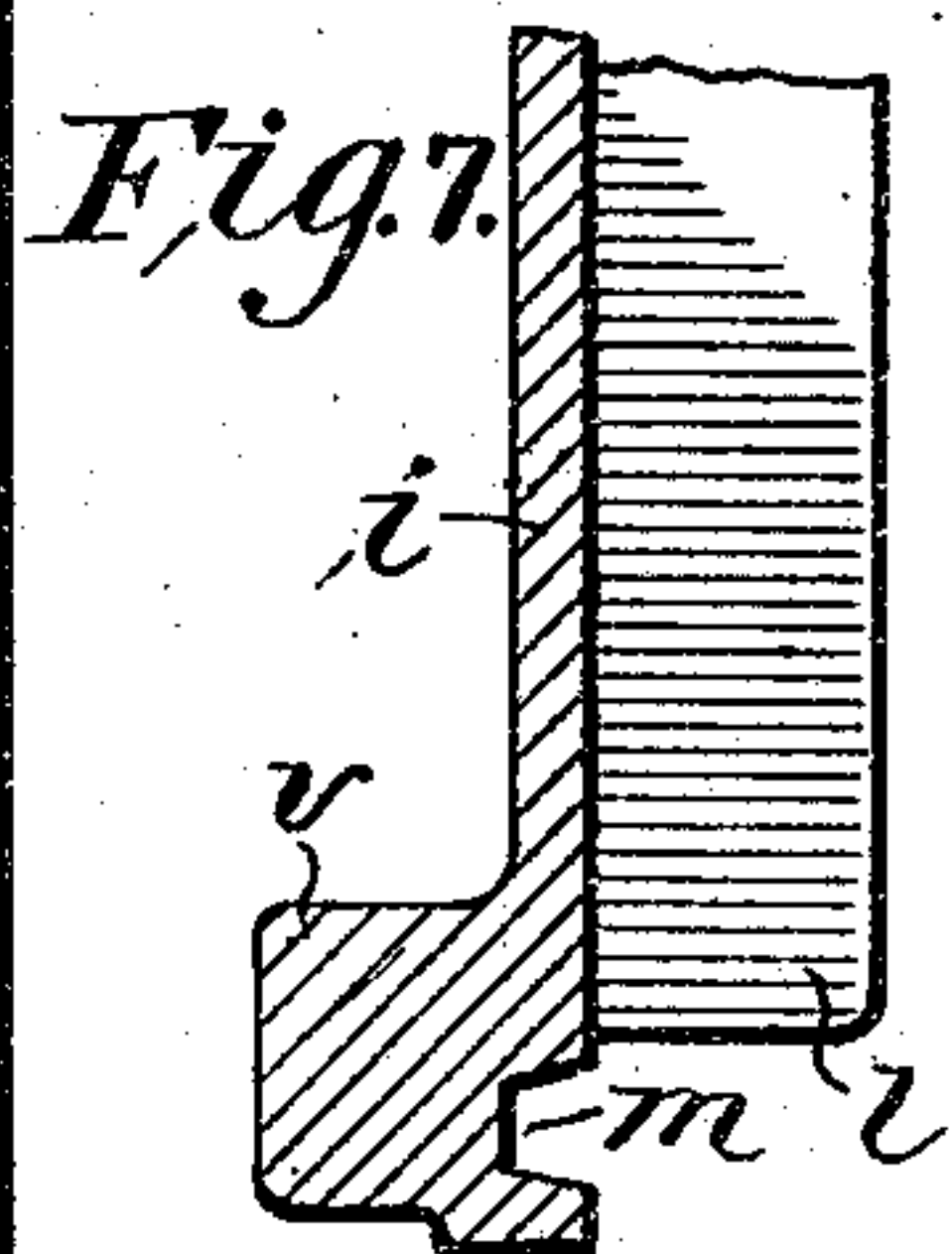
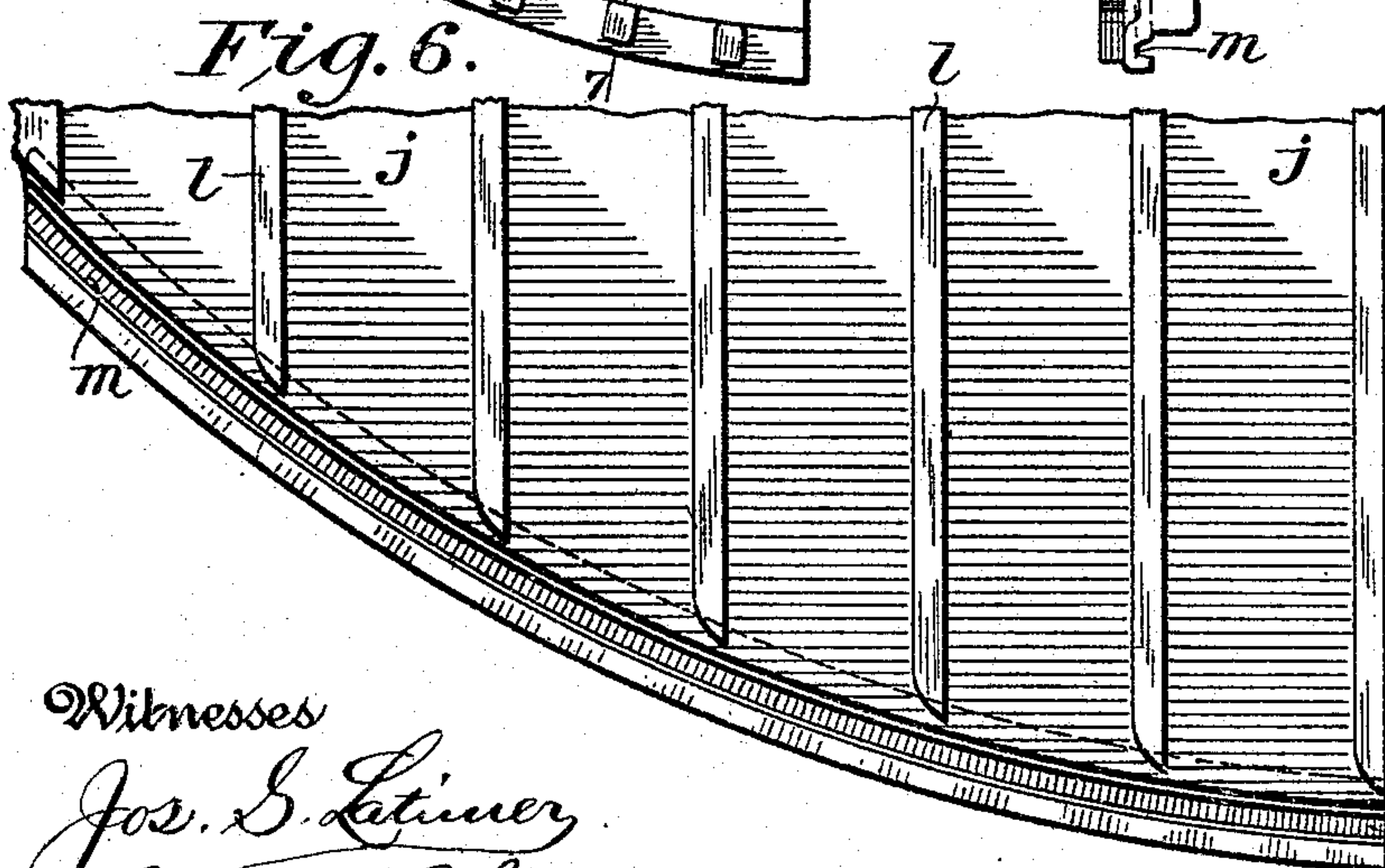
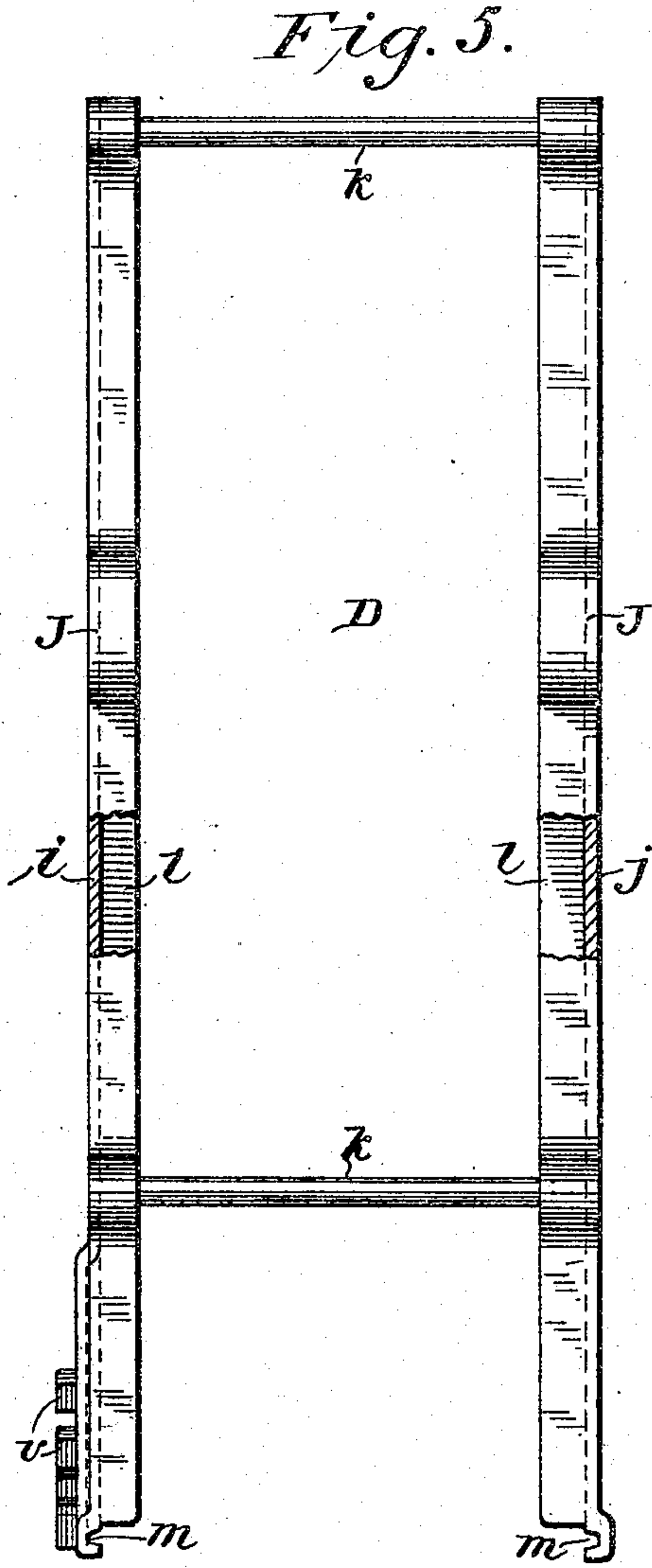
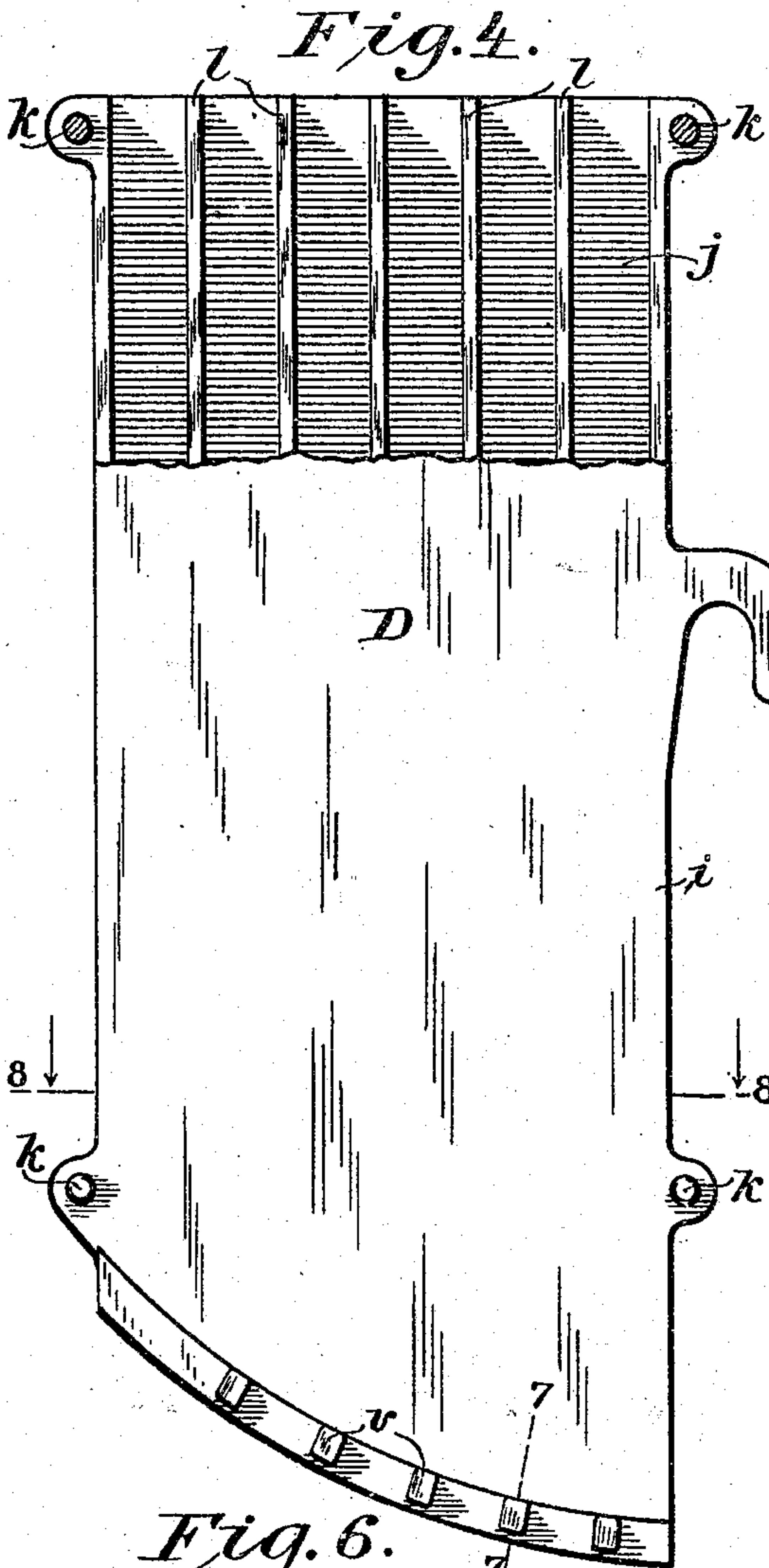
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12 SHEETS—SHEET 4.



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Fig. 8.

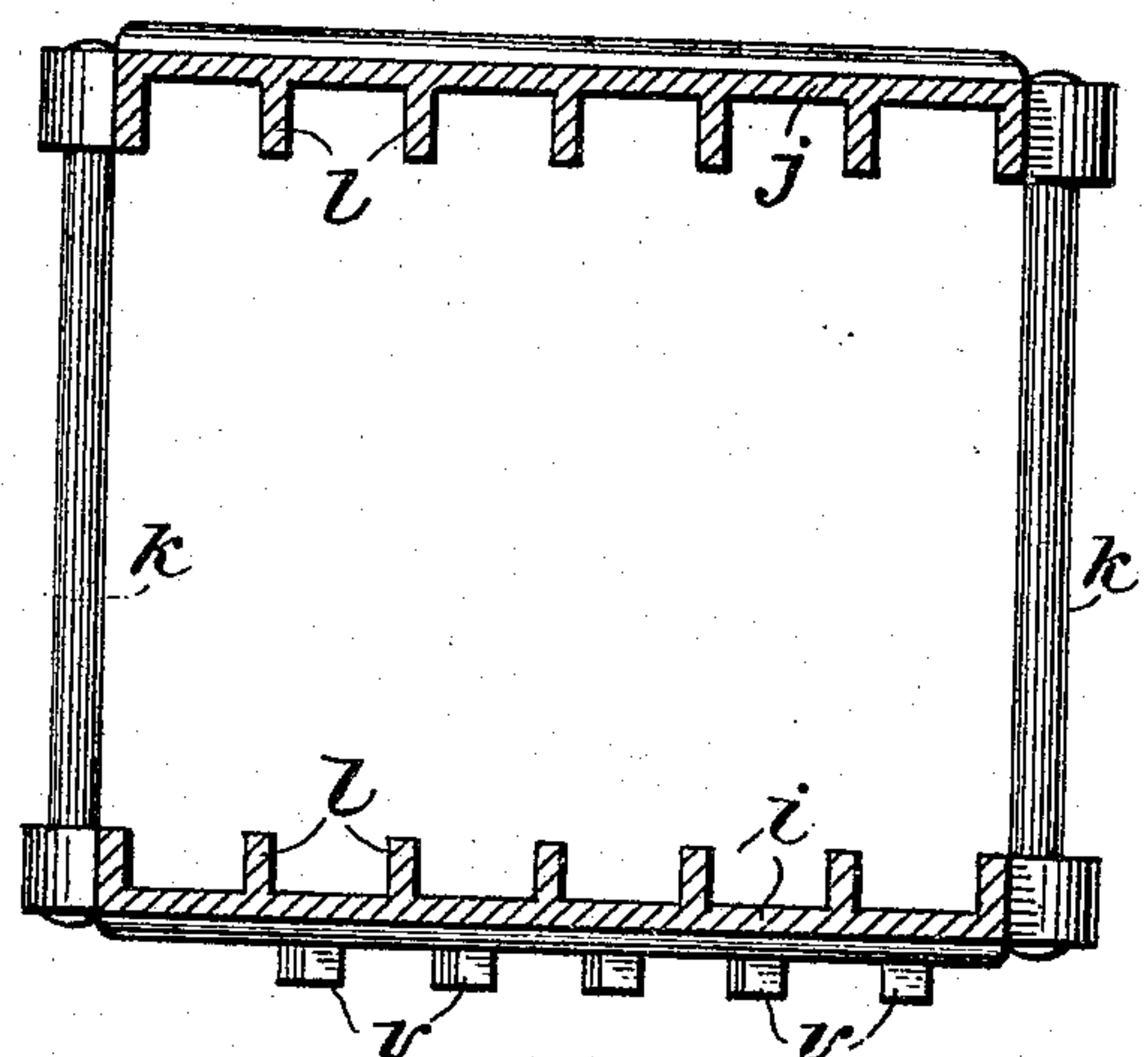


Fig. 9.

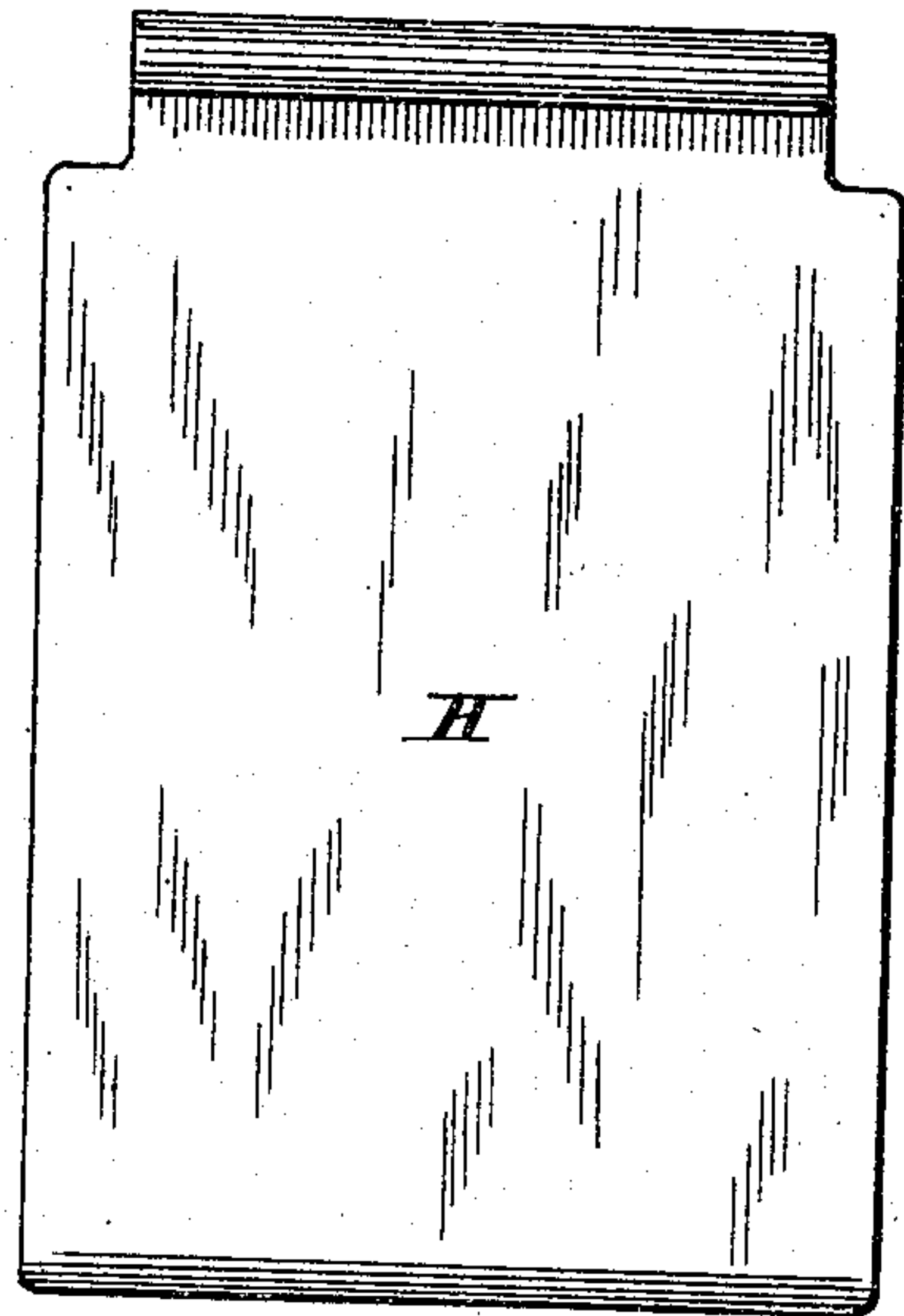


Fig. 10.

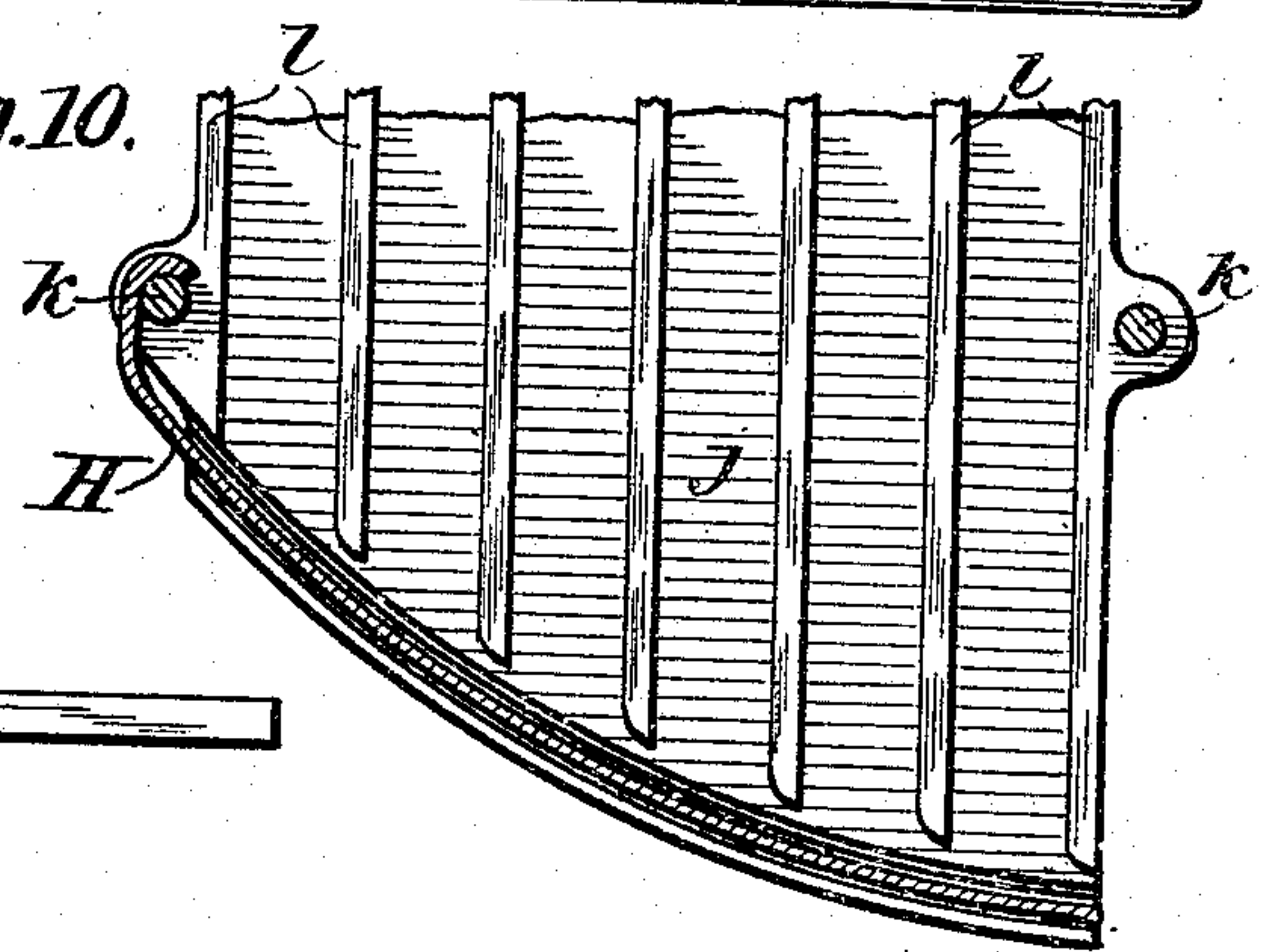


Fig. 11.

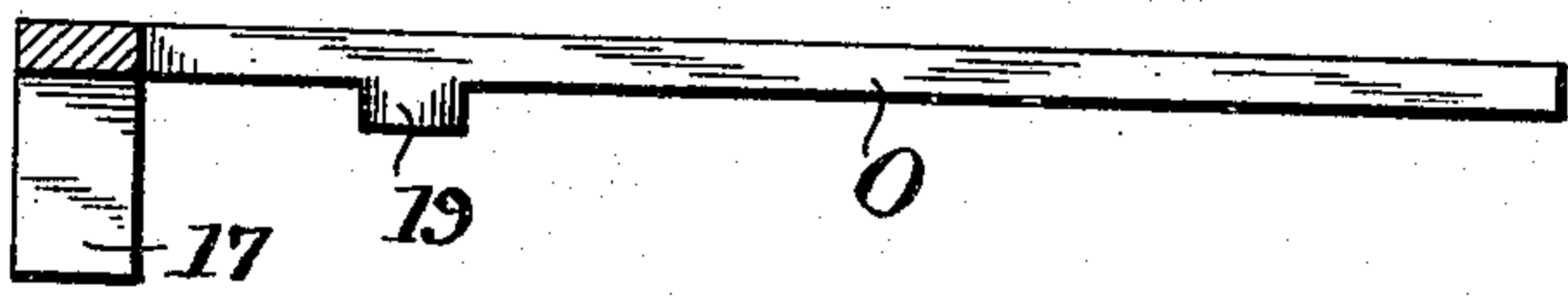
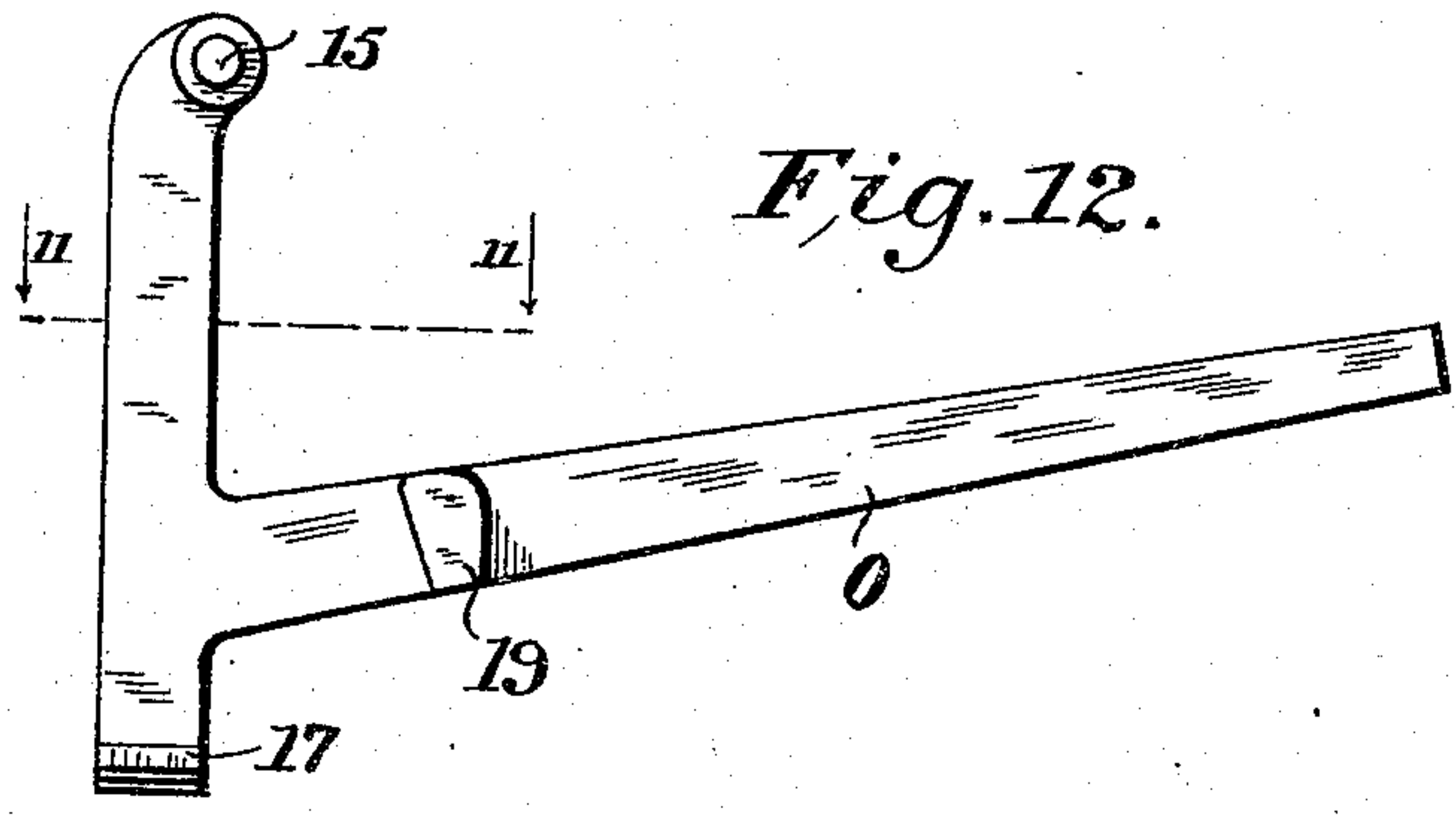


Fig. 12.



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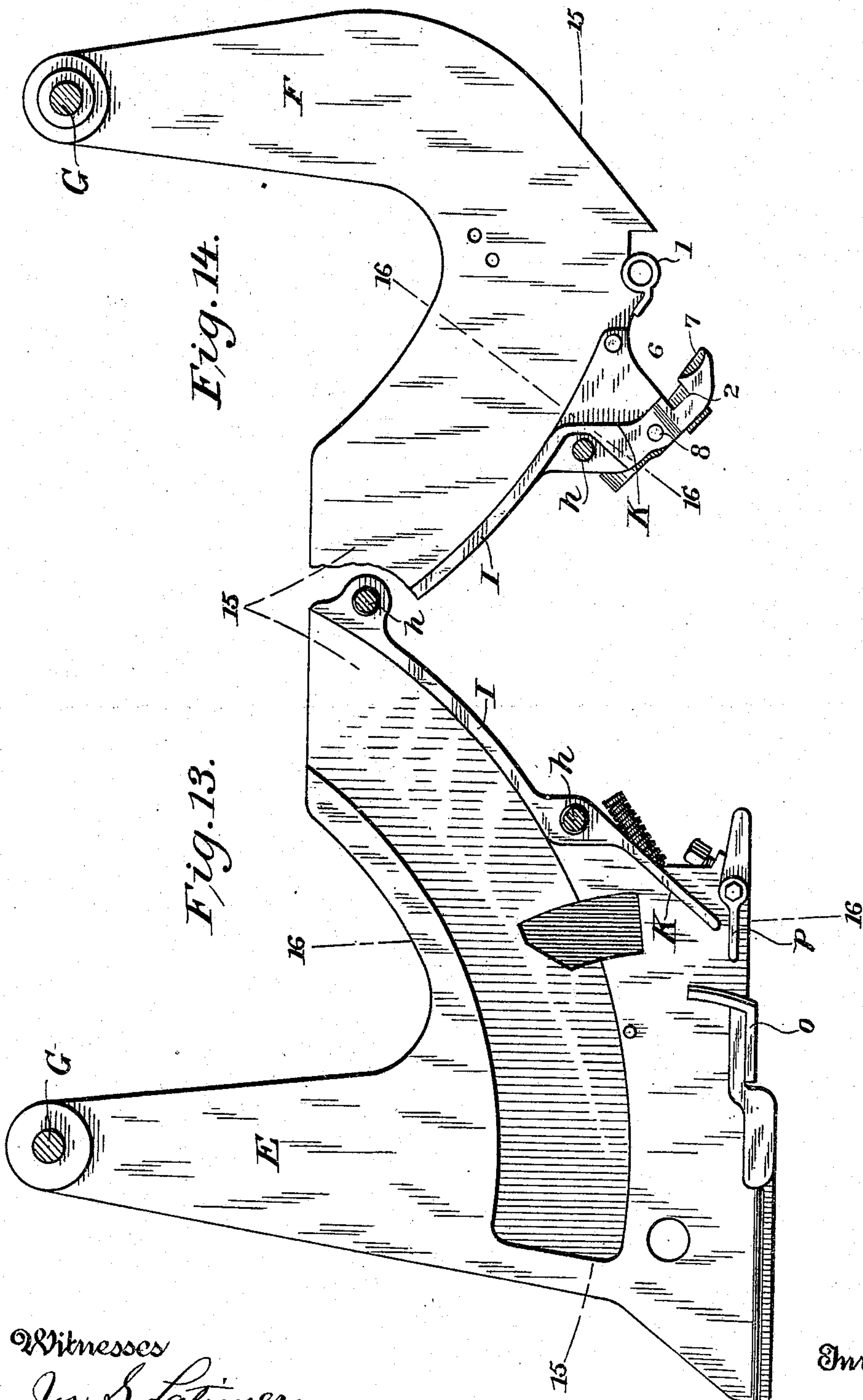
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12 SHEETS—SHEET 6.



Witnesses
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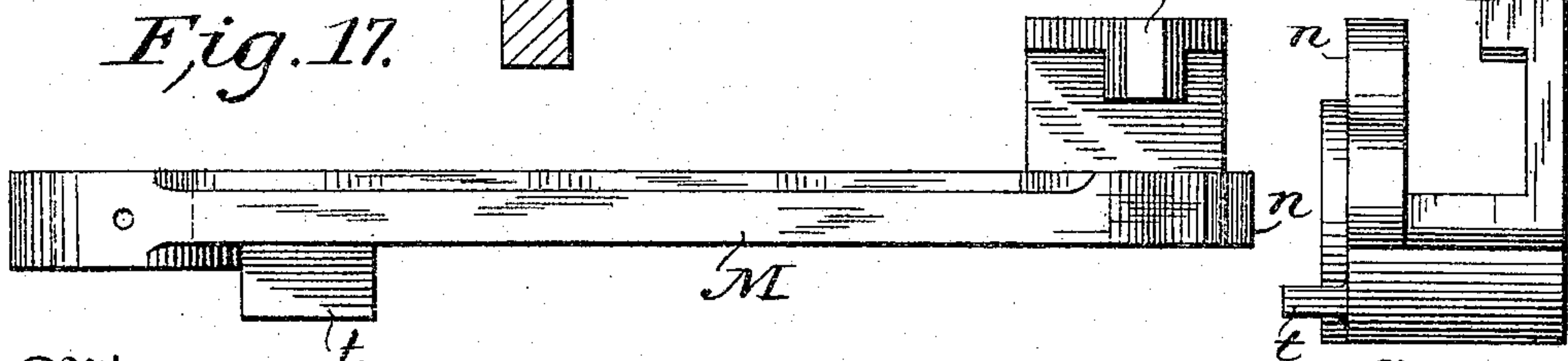
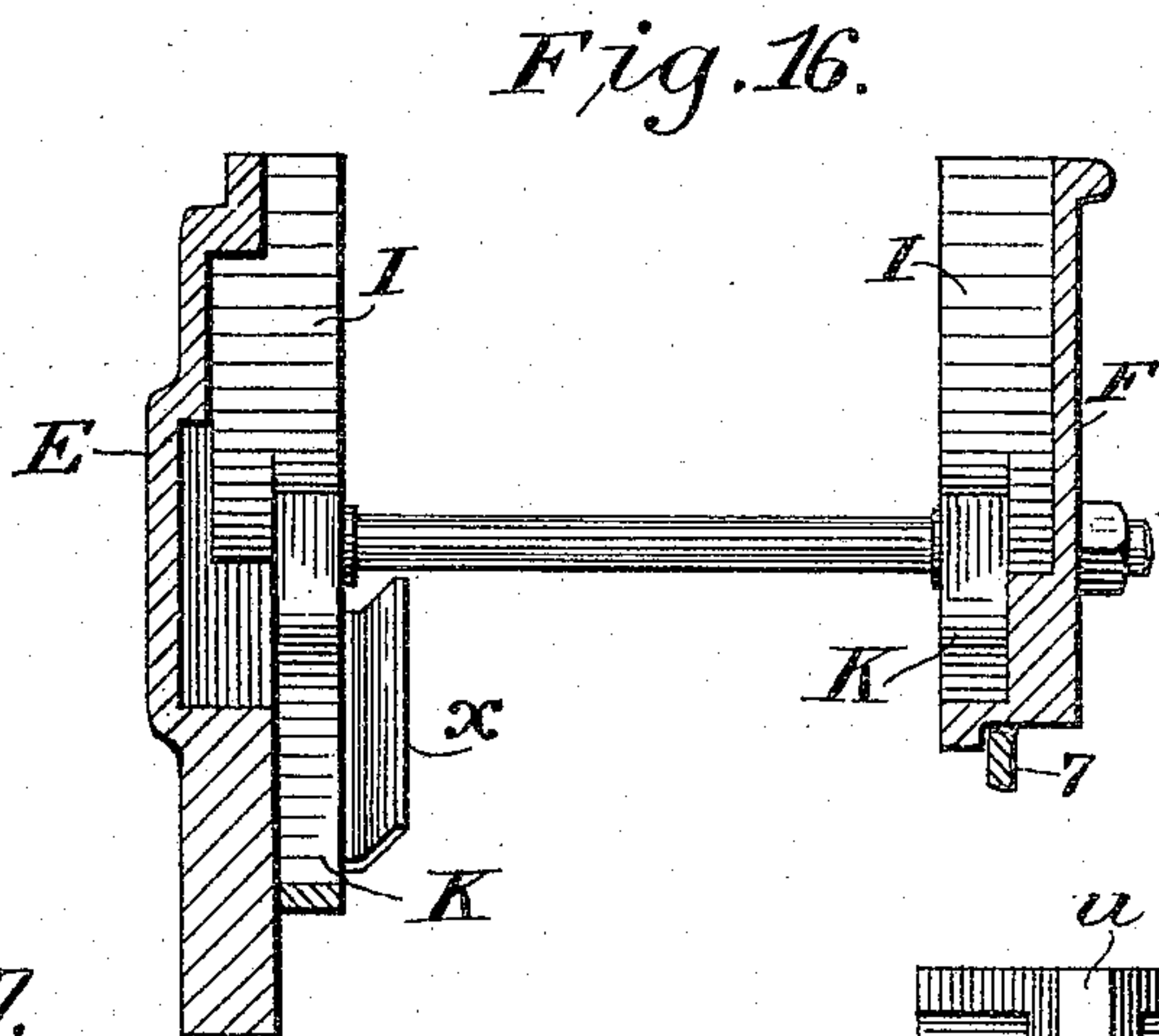
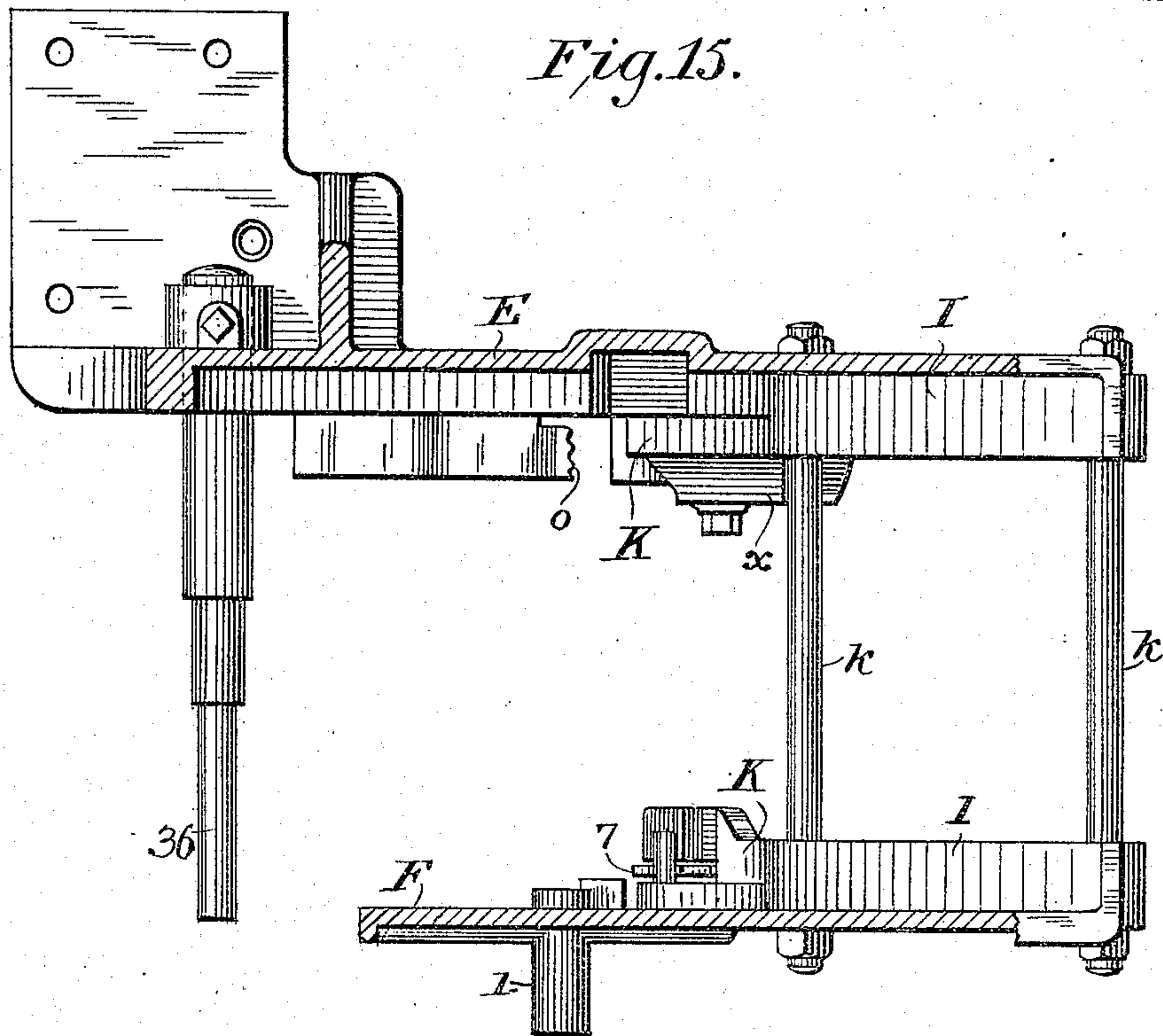
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12 SHEETS—SHEET 7.



Witnesses
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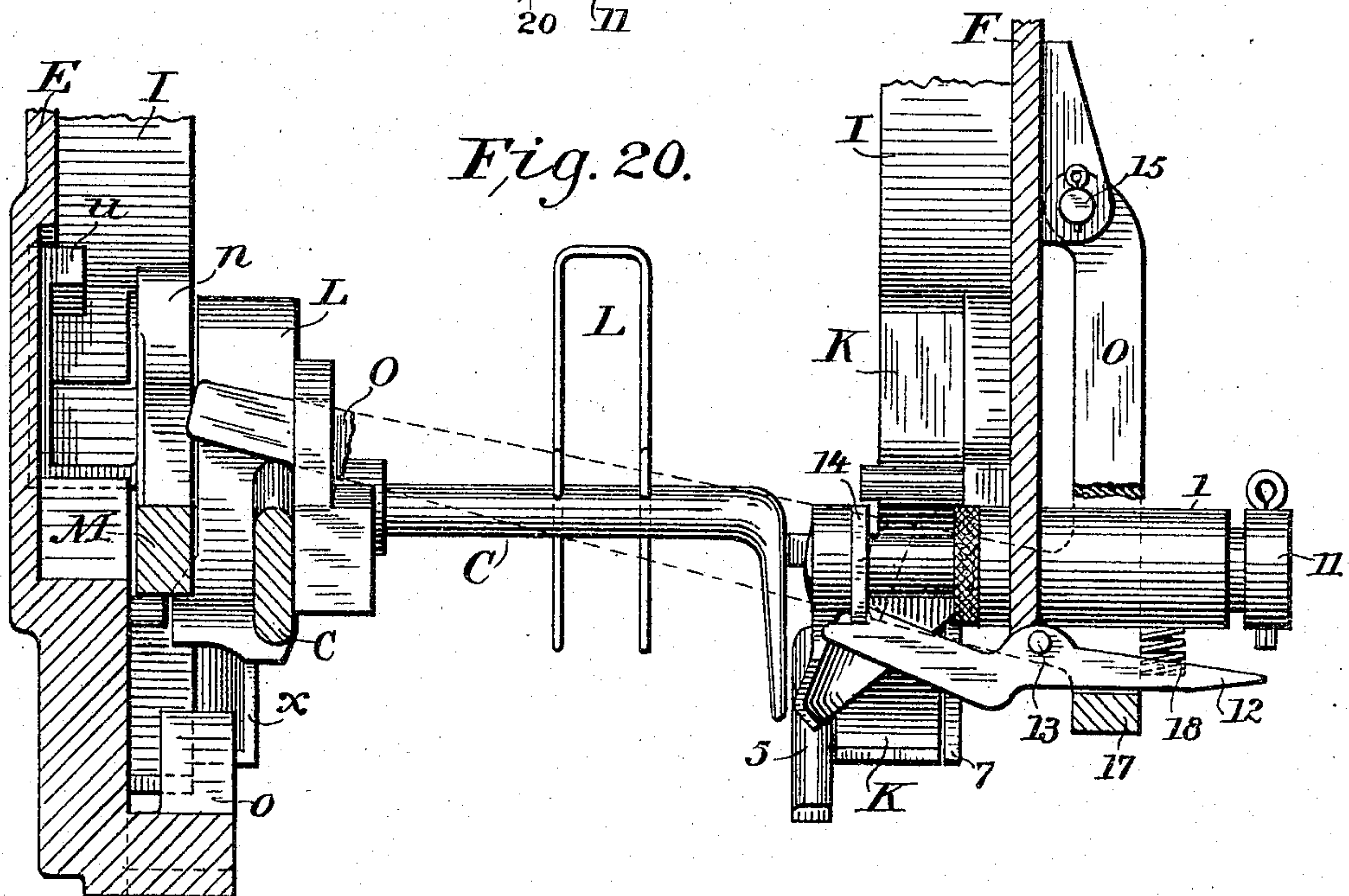
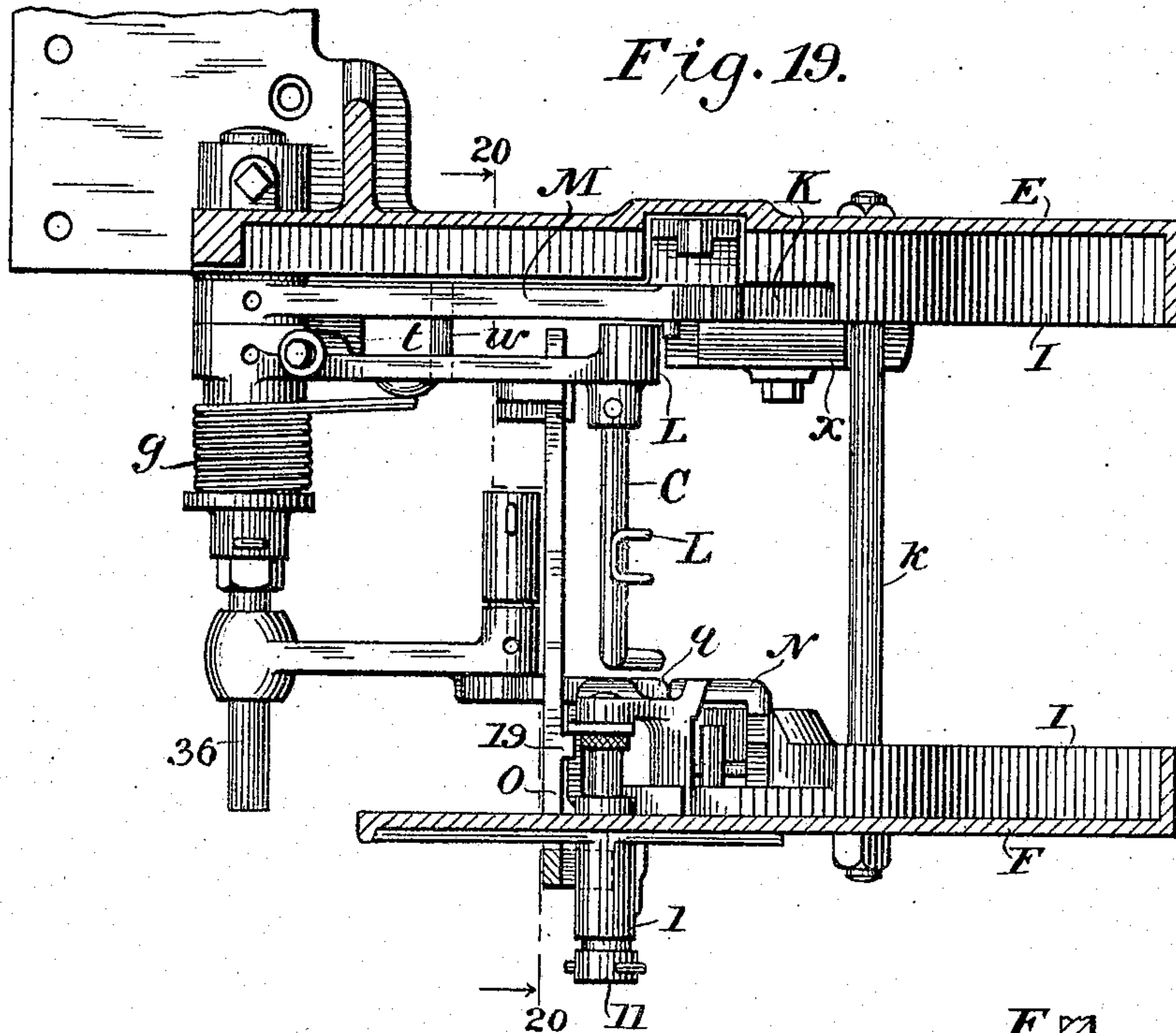
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12 SHEETS—SHEET 8.



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MAGAZINE FOR AUTOMATIC WEFT REPLENISHING LOOMS.

Patented Aug. 10, 1909.

12 SHEETS—SHEET 9.

Fig. 21.

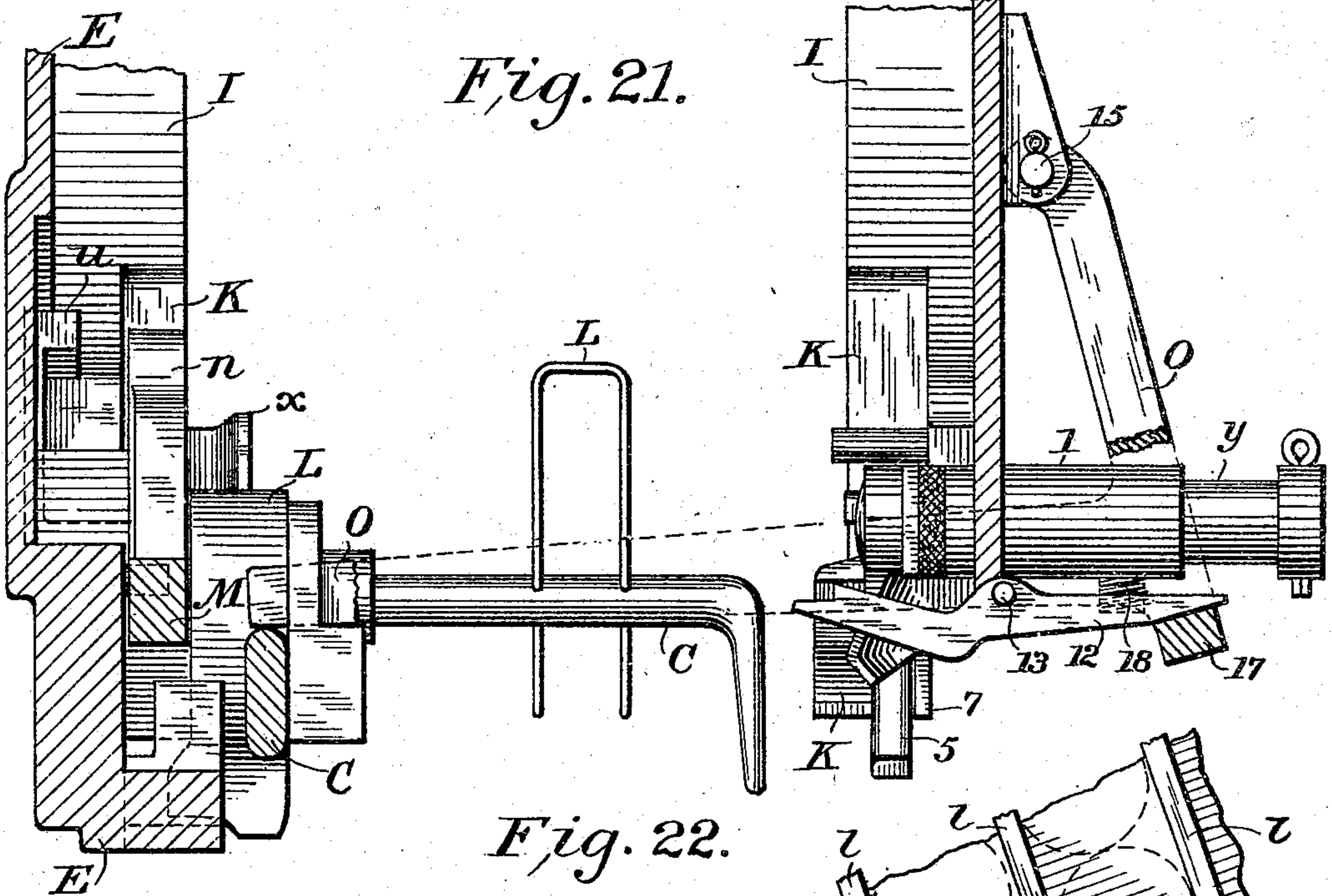
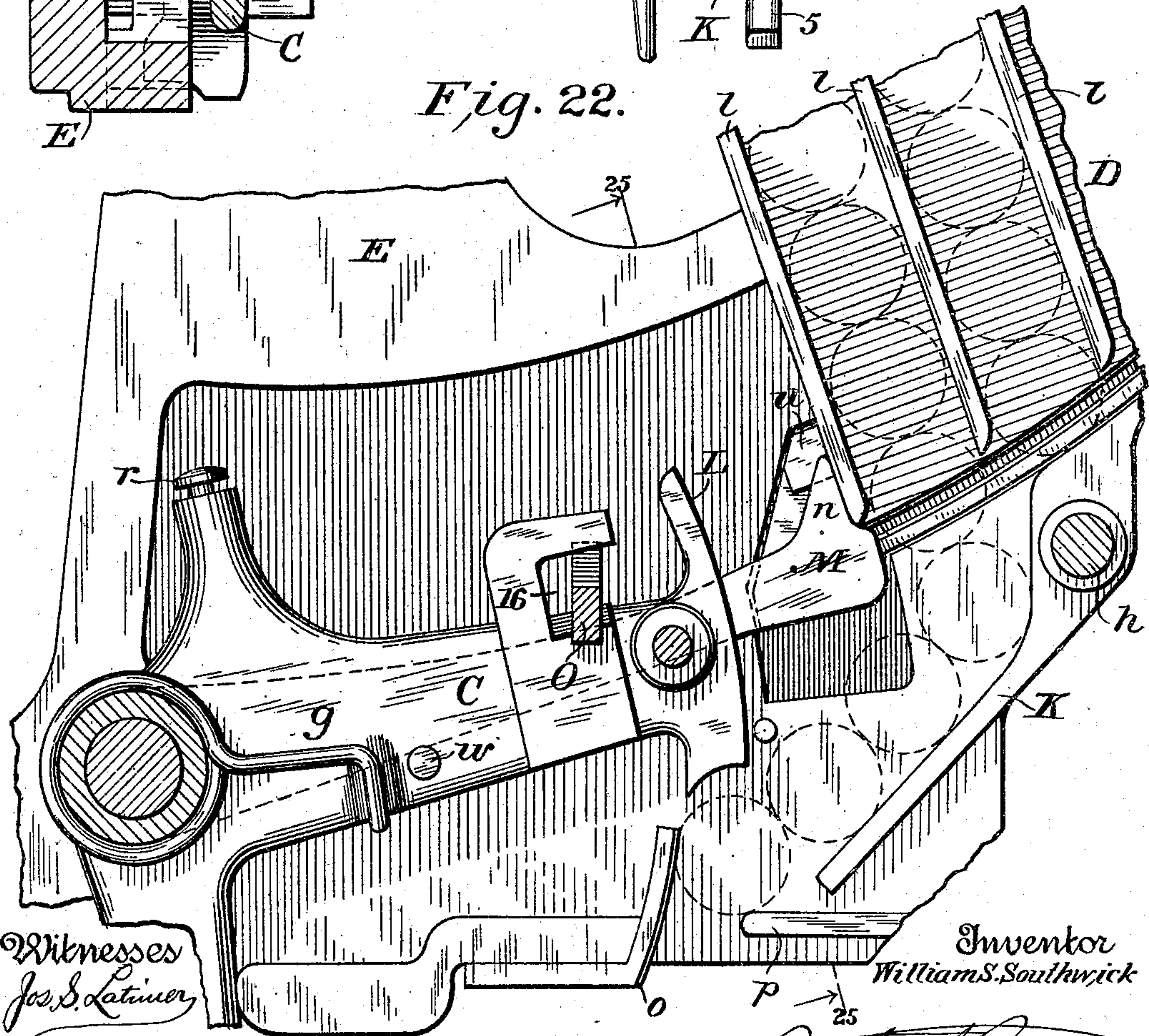


Fig. 22.



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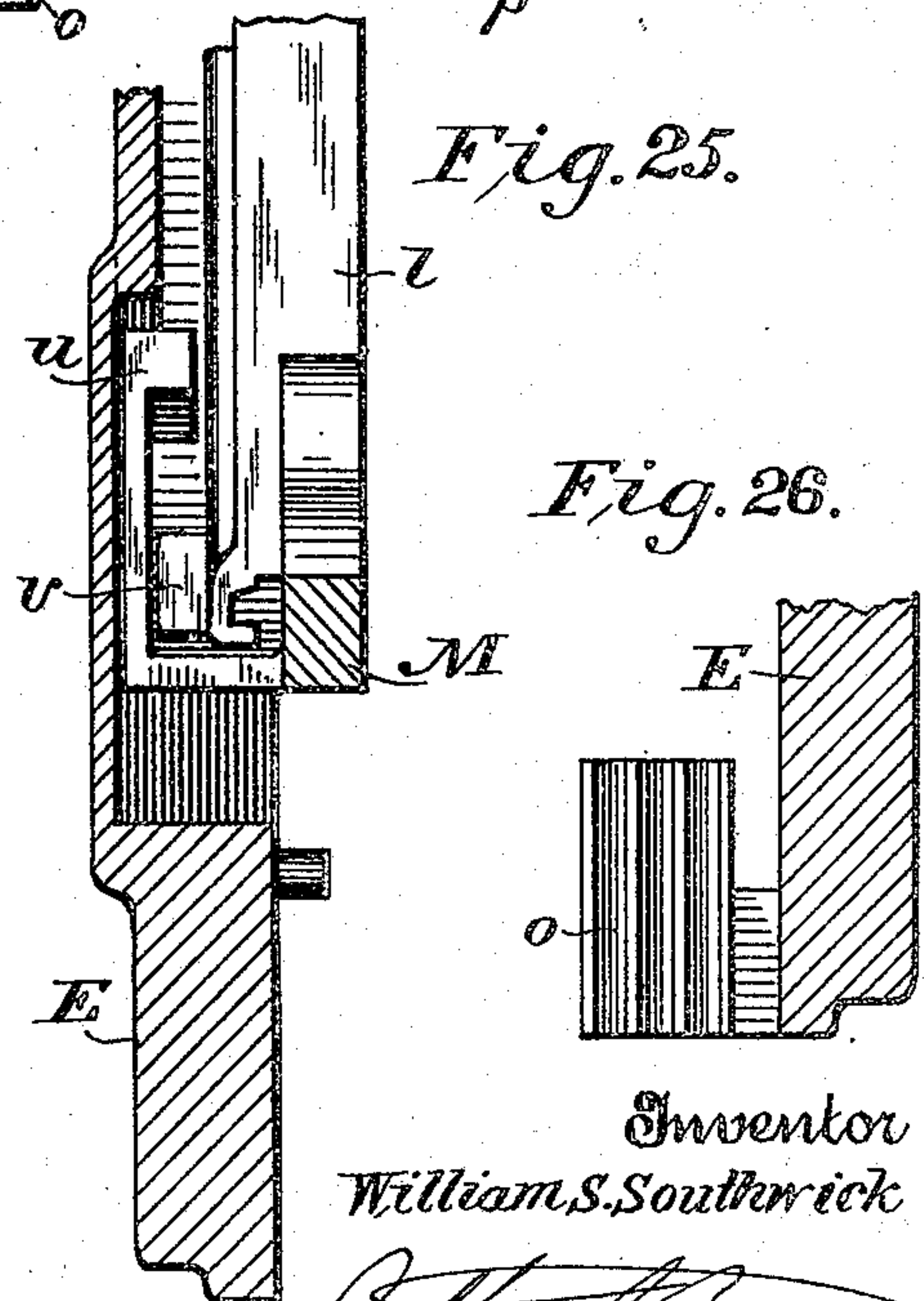
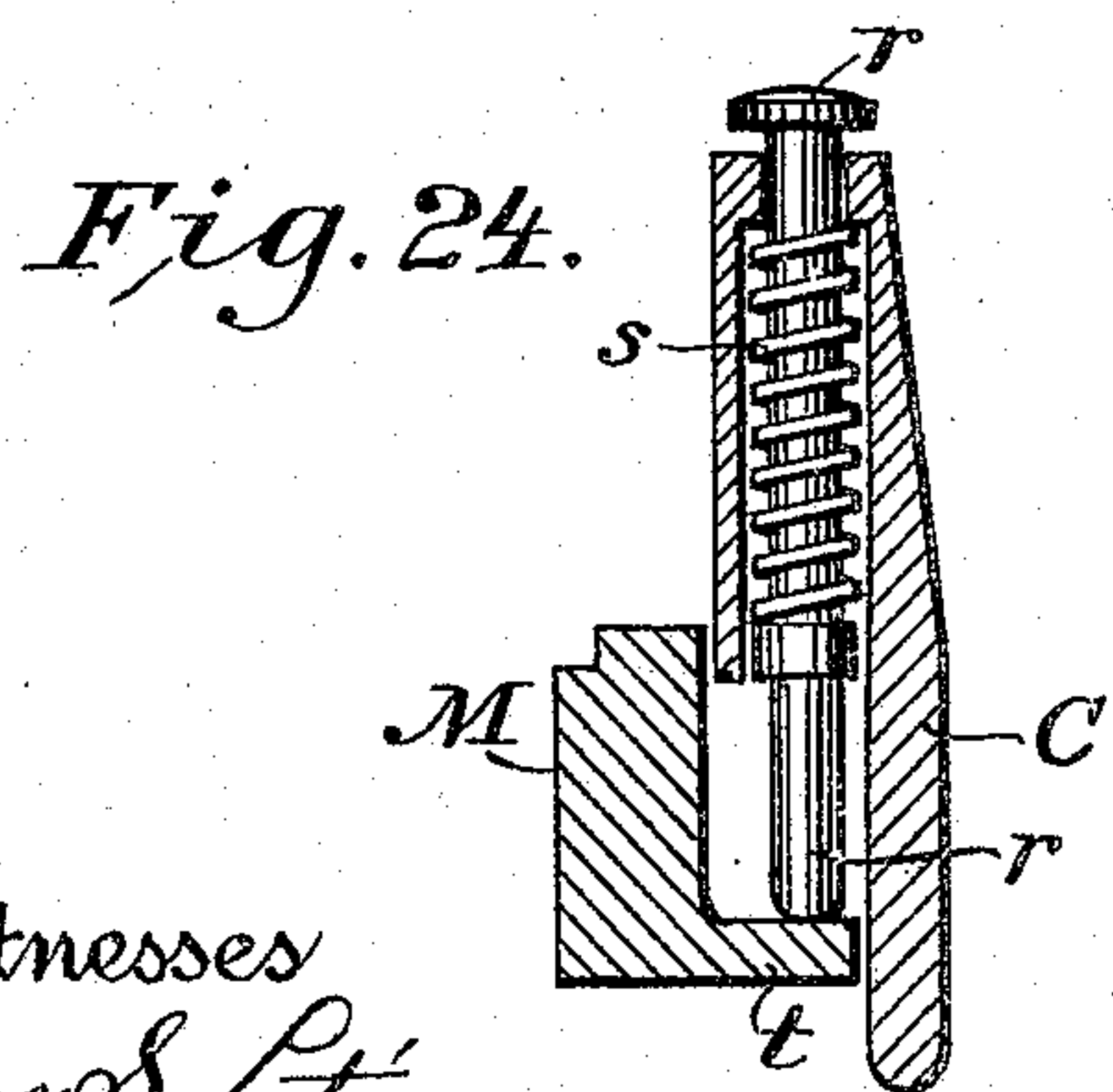
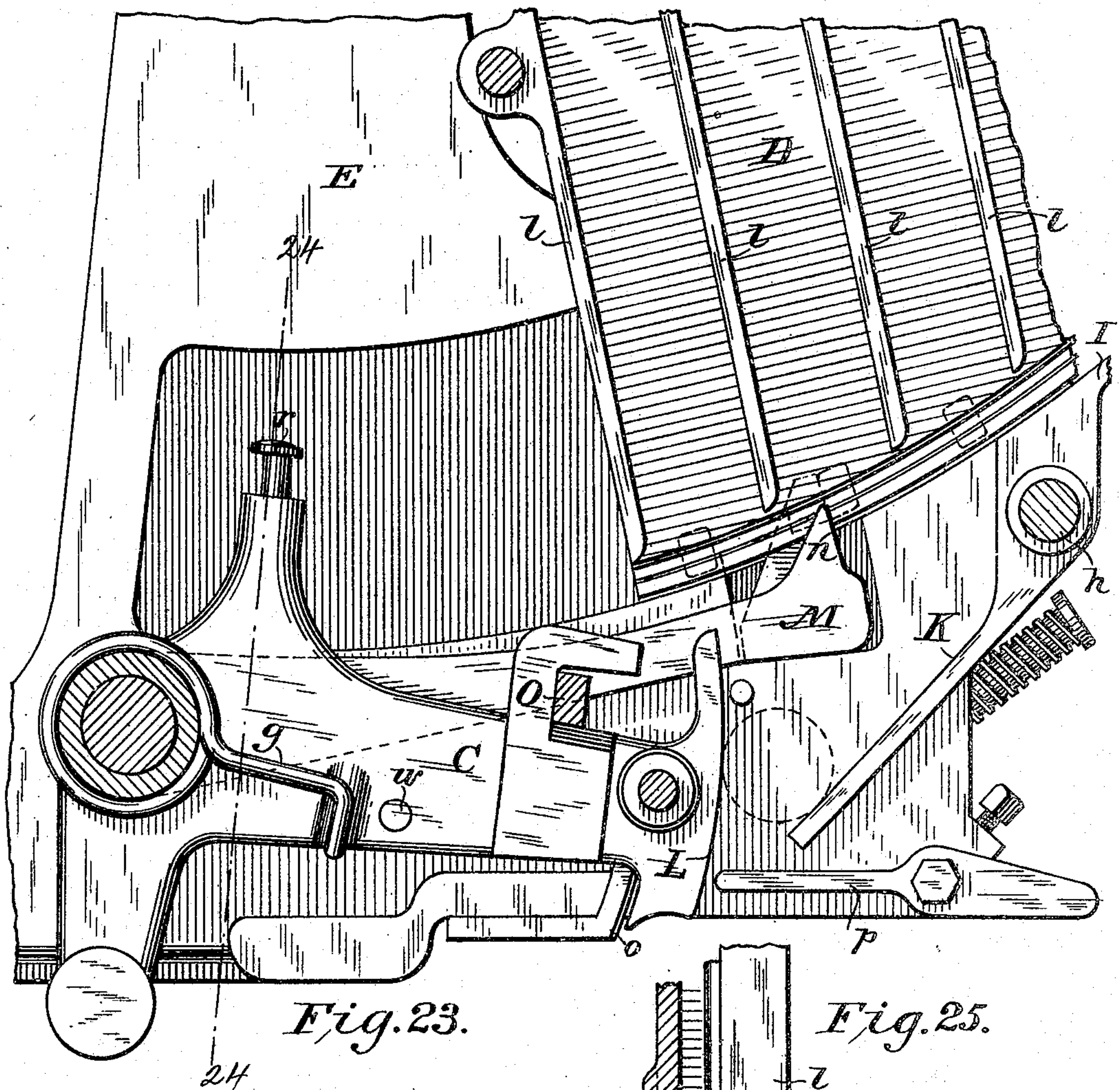
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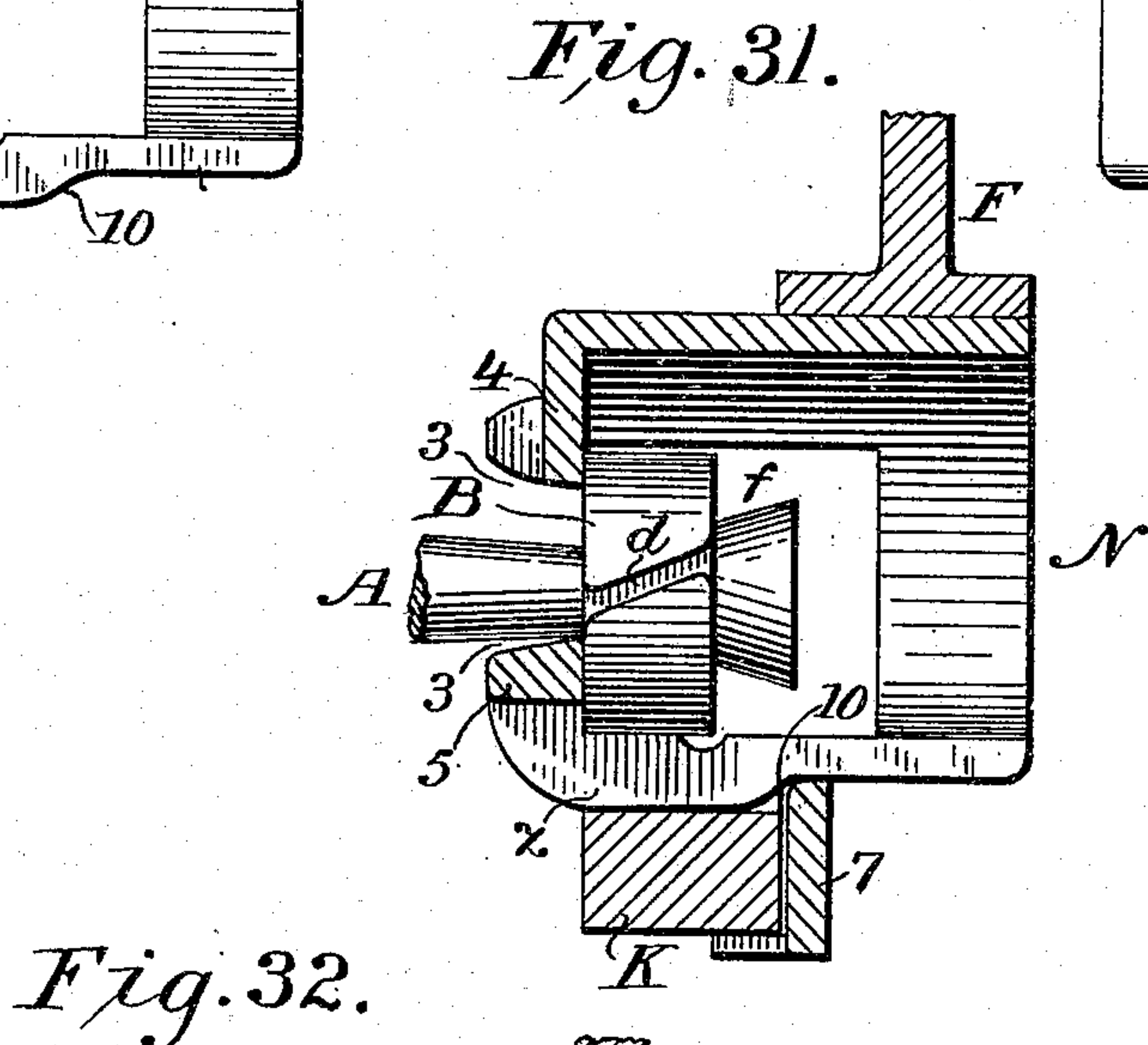
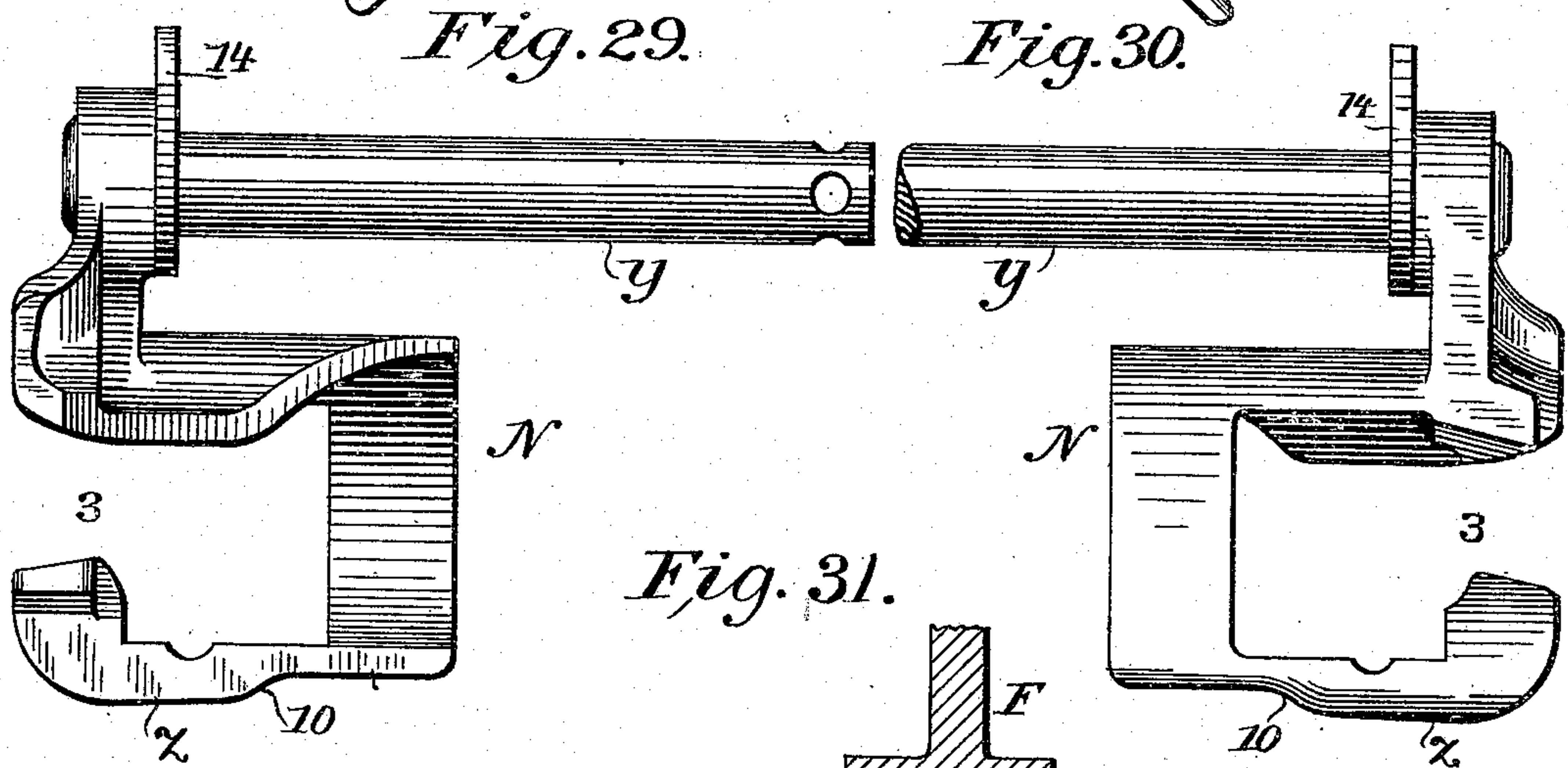
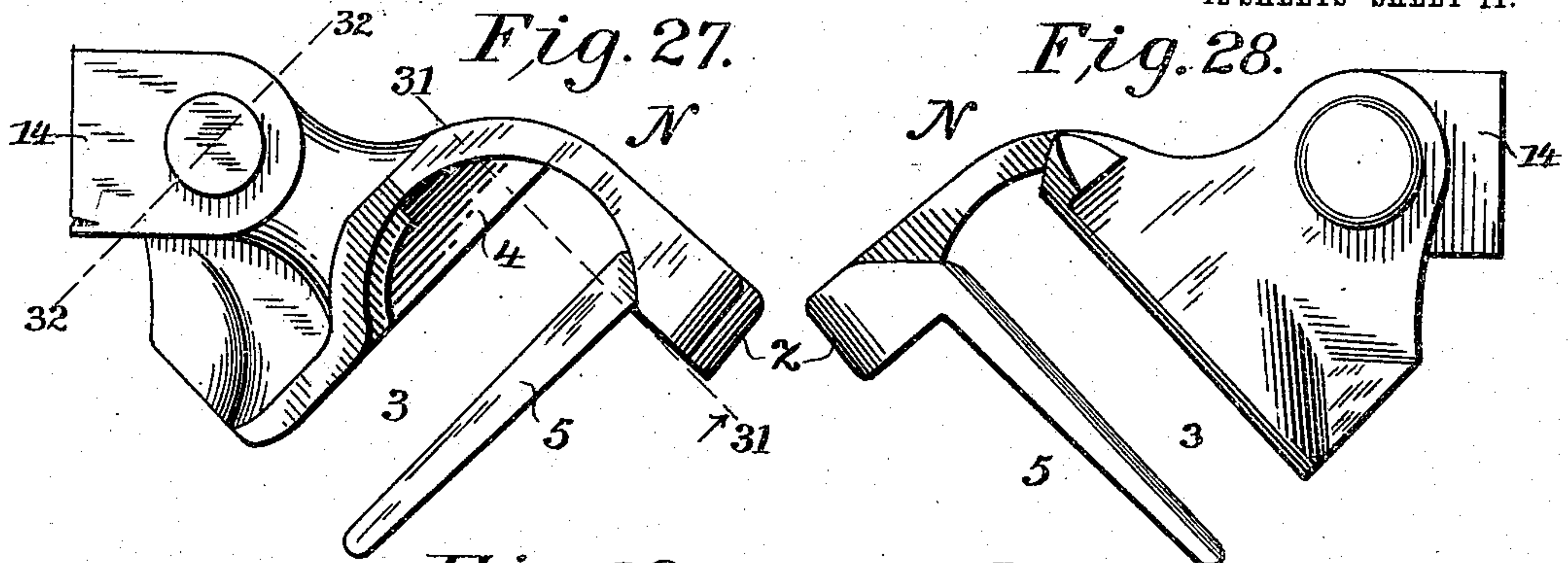
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12 SHEETS—SHEET 11.



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12 SHEETS—SHEET 12.

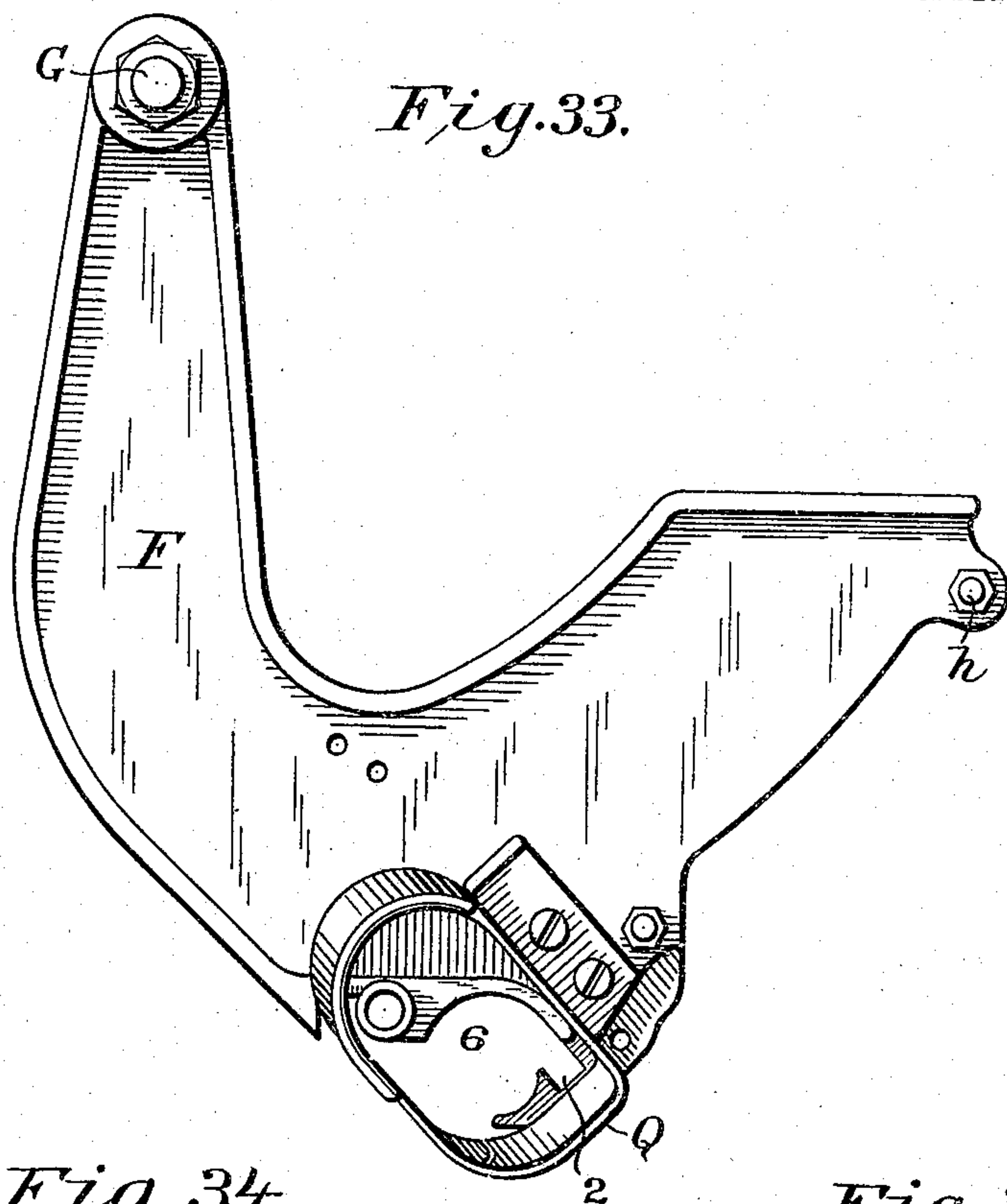


Fig. 34.

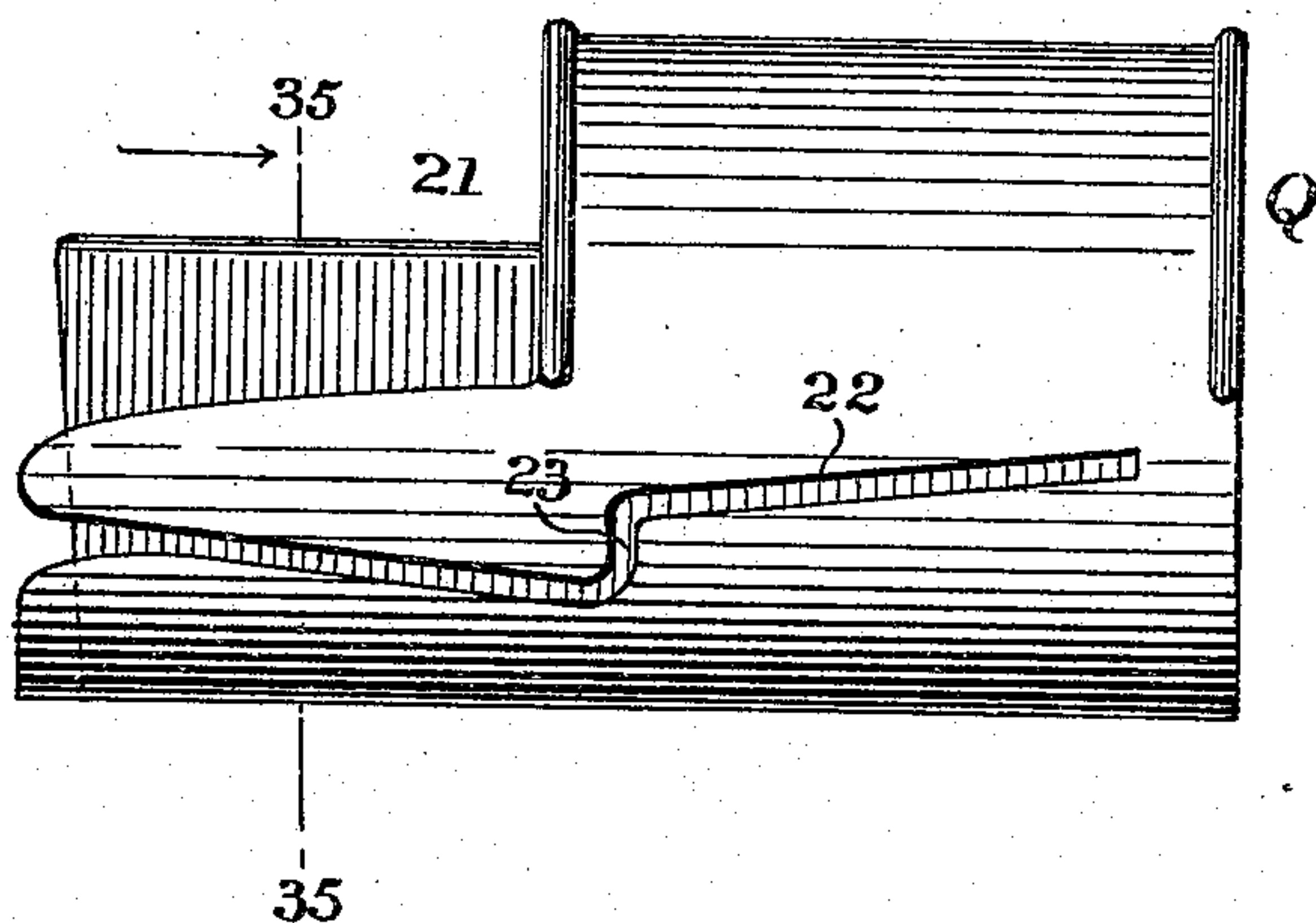
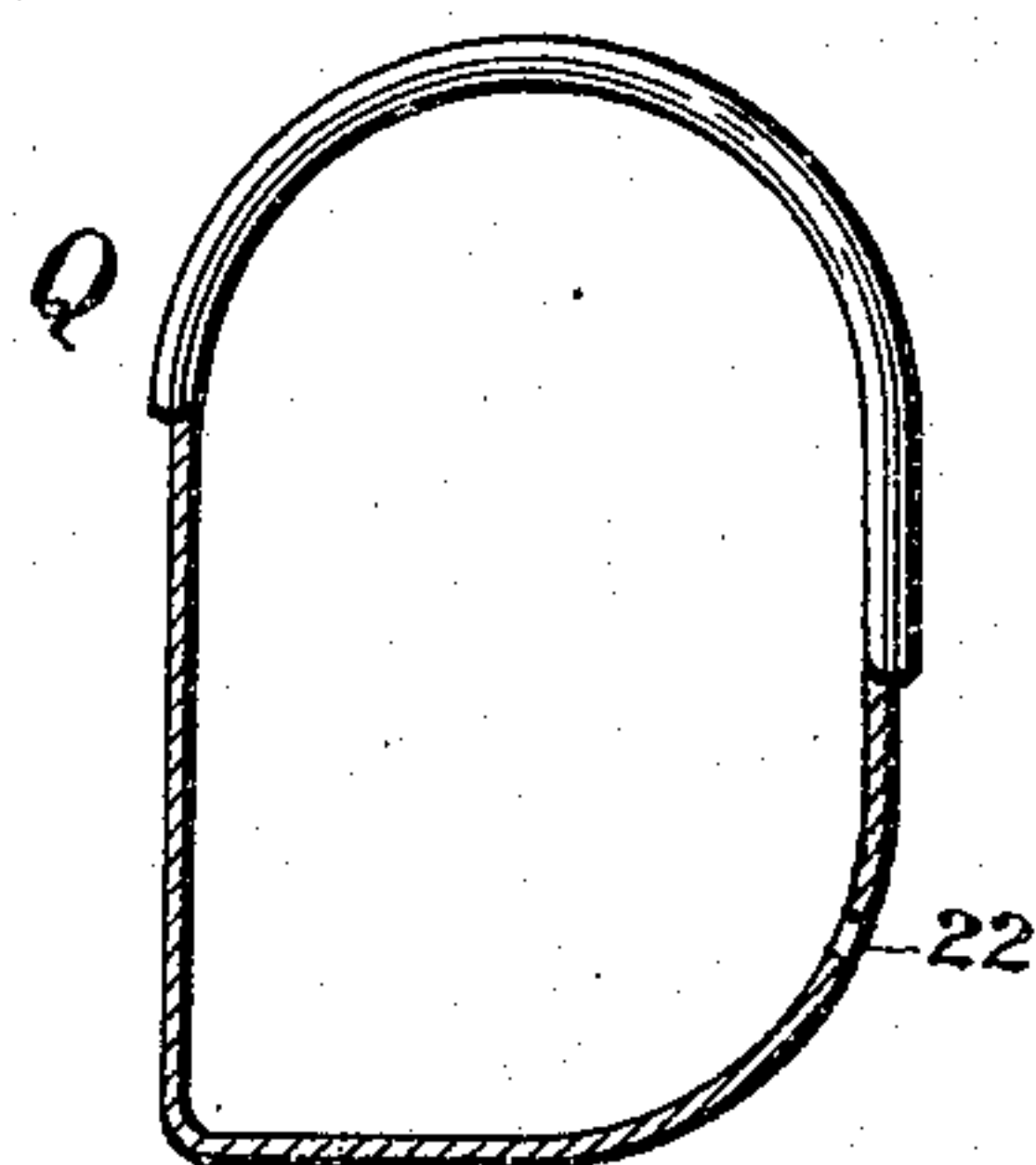


Fig. 35.



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UNITED STATES PATENT OFFICE.

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MAGAZINE FOR AUTOMATIC WEFT-REPLENISHING LOOMS.

No. 930,812.

Specification of Letters Patent.

Patented Aug. 10, 1909.

Application filed April 1, 1904. Serial No. 201,054.

To all whom it may concern:

Be it known that I, WILLIAM S. SOUTHWICK, a citizen of the United States, residing at Hopedale, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Magazines for Automatic Weft - Replenishing Looms, of which the following is a specification.

The present invention relates to certain improvements upon the invention of Melvin L. Stone, set forth in United States Letters Patent No. 921,909, May 18, 1909. In accordance with the invention of said Melvin L. Stone, there is employed in connection with an automatic weft-replenishing loom a removable magazine, hopper, or battery, capable of containing a large reserve supply of weft-carriers (such as bobbins, cop-spindles, and the like), the capacity of the magazine being sufficient to hold all of the weft-carriers which will be used in the loom during an entire day. The removable magazine is adapted to be supplied with weft-carriers outside of the weave room and to be brought to the loom and attached thereto so that the weaver has to give no attention whatever to the supply of weft, and hence can attend to a much larger number of looms.

The present invention consists in certain important improvements in the construction of the enlarged magazine, and the novel organization of the co-acting parts of the loom.

The present improvements are illustrated in the accompanying drawings, in which—

Figure 1 is a side view of the improved magazine and coöperating parts. Fig. 2 is a front view of the same. Fig. 3 is a central longitudinal section. Fig. 4 is a view, partly in section, looking at the inner side plate of the magazine detached. Fig. 5 is a front view of the magazine detached. Fig. 6 is an enlarged view of the inner side of the lower part of the inner side plate of the magazine. Fig. 7 is a detail section in the plane indicated by the line 7—7 in Fig. 4. Fig. 8 is a cross-section of the magazine in the plane indicated by the line 8—8, in Fig. 4. Fig. 9 is a plan view of the removable bottom slide of the magazine. Fig. 10 is a longitudinal section of the lower part of the magazine showing the bottom slide in place. Figs. 11 and 12 are detail views of one of the actuating le-

vers, Fig. 11 being a section on the plane indicated by the line 11—11, in Fig. 12. Fig. 13 is an inside view of the inner standard. Fig. 14 is an inside view of the outer standard. Fig. 15 is a section of the two standards in the planes indicated by the lines 15—15, in Figs. 13 and 14. Fig. 16 is a detail section of the two standards in the planes indicated by the lines 16—16, in Figs. 13 and 14. Figs. 17 and 18 are detail views of the weft-carrier feeler which actuates the magazine. Fig. 19 is a horizontal section of the two standards showing the operating mechanism. Fig. 20 is a cross-section of the two standards in the plane indicated by the line 20—20 in Fig. 19, and showing the parts in their normal position. Fig. 21 is a view similar to Fig. 19, showing the parts in a different position assumed by them during the operation. Fig. 22 is a detail vertical section illustrating the magazine-operating mechanism in the normal position. Fig. 23 is a view similar to Fig. 22, showing the same parts in a different position assumed during the operation. Fig. 24 is a detail section in the plane indicated by the lines 24—24 in Fig. 23. Fig. 25 is a detail section through the standard and weft-carrier feeler looking toward the magazine in the plane indicated by the line 25—25, in Fig. 22. Fig. 26 is a face view of the stop for the heads of the weft-carriers. Fig. 27 is a view of the outer end of the weft-carrier displacer detached. Fig. 28 is a view of the inner end of the displacer. Fig. 29 is a front view of the displacer. Fig. 30 is a rear view of the displacer. Fig. 31 is a section of the displacer in the plane indicated by 31—31 in Fig. 27, also showing a part of the outer standard and parts mounted thereon. Fig. 32 is a section of the displacer and of the outer standard in the plane indicated by the line 32—32, in Fig. 27. Fig. 33 is an outside view of the outer standard showing the conductor for the weft-end holders in place. Fig. 34 is a front view of the conductor. Fig. 35 is a cross-section in the plane indicated by the line 35—35, in Fig. 34.

The present improvements are applicable to an automatic weft-replenishing loom such as the well-known Northrop loom, which is sufficiently shown in United States Patents No. 454,810, June 23, 1891, No. 529,940, Nov. 27, 1894, and No. 568,455,

Sept. 29, 1896. In the said Northrop loom there is employed a weft thread controlled starting-shaft which is rocked in order to set in motion the weft-replenishing mechanism whenever there is a necessity for the replenishment of weft in the running shuttle due either to the exhaustion, breakage, or approaching exhaustion of the weft in use. The effect of the movement of this starting-shaft is to bring a transferrer into action which transfers a fresh weft-carrier from the hopper battery or magazine into the shuttle on the lay, at the same time ejecting the spent weft-carrier from the shuttle. The organization and operation of this portion of the mechanism are now so well known as to require no specific illustration and description, and are fully set forth in the Northrop patents already mentioned. It is with such mechanism that the present improvements are employed and in the accompanying drawings only the transferrer, C, of this mechanism is shown. Concerning this transferrer, C, it is sufficient to say that it is held normally uplifted (as shown in Figs. 3 and 22) by a spring, *g*, and that it is moved downwardly (as shown in Fig. 23) to transfer a weft-carrier from the magazine into the shuttle and to eject the spent weft-carrier, and after the transfer has been made it is restored to its normal elevated position by said spring. This transferrer is actuated whenever the condition of the weft in the running shuttle demands, and is governed in its action by the condition of the weft thread, so that it is a weft-thread-controlled transferrer.

The improved magazine, D, is shown separately in Figs. 4 to 10, and it is removably mounted upon an appropriate stand secured to the breast-beam of the loom at one end thereof where it overhangs the shuttle-box at one end of the lay. This magazine supporting stand comprises an inner standard, E, (shown in detail in Fig. 13) which is secured directly to the breast-beam, and a second or outer standard, F, (shown separately in Fig. 14) which is arranged parallel with the inner standard and is spaced a sufficient distance therefrom to accommodate the readily removable magazine. The two standards, E and F, are rigidly and permanently connected together by appropriate tie-rods *h*, *h*, and by a pivot-rod G, (see Fig. 2) upon which the magazine is hung and swings. There are a number of important and characteristic features possessed by this supporting stand for the detachable magazine, but they will be more readily understood and appreciated after the construction of the magazine has been set forth.

The specific magazine shown consists of an inner side-plate *i*, and an outer side-plate *j*, (see Figs. 2, 5 and 6) which are arranged parallel with each other and at a distance apart determined by the length of the bobbins or

other weft-carriers, and which are secured together by appropriate tie-rods *k*. These side-plates are of sufficient height and breadth to accommodate between them a large supply of weft-carriers preferably sufficient to run the loom for a day or more. On the inner face of each side-plate there are formed a plurality of longitudinal ribs or flanges *l*, *l*, which provide between them channels for the reception of the ends of the weft-carriers. These channels, when the magazine is in use, are open both at top and bottom. These channels provide guideways for a plurality of parallel groups or stacks of weft-carriers, each stack being composed of a large number of superimposed weft-carriers. Before the magazine is placed upon the loom the bottom of the magazine is closed by a temporary slide H (shown in detail in Fig. 9) which slides in appropriate guide-ways *m*, *m*, near the bottom of each side-plate of the magazine, as best shown in Figs. 5 to 7, and this slide hooks over one of the tie-rods *k*, (as shown in Fig. 10) whereby it is retained in place. This slide extends beneath all of the channels, and serves as a temporary means for supporting each of the stacks of weft-carriers preparatory to the placing of the magazine in operative position on the loom. The magazine is supplied with weft-carriers at any convenient place, (preferably outside of the weave room) and during such operation the slide is in place and remains in place until the magazine has been placed within its supporting stand on the loom. The slide is then withdrawn and the stacks of weft-carriers are then sustained by an appropriate fixed support consisting of ledges I, I, with which the standards E and F are equipped, as best shown in Figs. 3, 13, 14 and 15.

The magazine is placed between the two standards E and F, and is movably connected therewith. As shown, the magazine is hung upon the pivot-rod G, thereof by means of the open pivot-hooks J, J, (Figs. 3 and 4) with which the two side plates of the magazine are equipped. These pivot-hooks not only serve to connect the magazine to the stand, but they also serve as pivots on which the magazine swings for the purpose of bringing successively into action the several stacks of filling carriers carried thereby. In order to facilitate the hooking of the pivot-hooks J, upon the pivot-rod G, the entrance open mouths of the pivot-hooks are made flaring, as best shown in Fig. 4.

In order to accommodate the swinging movement of the magazine, the lower edges of the side-plates thereof are curved and are concentric with the axis of the pivot-hooks J, and of the pivot-rod G when the magazine is in place. To the same end, the weft-carrier support I, of the standards E and F is correspondingly curved, and consequently

there is no vertical displacement of the stacks of weft-carriers in the reserve channels of the magazine during the swing of the magazine.

When the magazine is put into place within the supporting stand, its lower end is just above the surfaces of the support I, of the standards, and consequently when the removable slide H, is withdrawn the stacks of weft-carriers within the magazine drop down by gravity only a short distance until they are sustained by the said support, and consequently said support then constitutes a permanent bottom for the magazine, so that the weft-carriers cannot be discharged from the magazine except in accordance with the intended mode of operation. When the magazine is first placed in the stand the forward flange *l* of its inner side-plate *i*, abuts against detent *n* (see Figs. 3 and 22), thus holding the magazine in a definite position. When the magazine is thus held in place, and the temporary slide H, has been withdrawn, all of the stacks of weft-carriers carried by the magazine are supported upon the support I, of the supporting standards, with the exception of the forward stack of weft-carriers. This forward stack of carriers is then in register with a discharge opening communicating with a downwardly extending guide-chute K formed in the two standards E and F, and shown best in Figs. 3, 13, 14, 22 and 23, which permits the stack of weft-carriers thereabove to drop down until their further progress is prevented by devices similar to those which have heretofore been used in the Northrop loom. These devices comprise a stop *o*, (Figs. 22, 23 and 26) on the inner standard, E, for the head of the weft-carrier, and the receiving face of which is grooved to correspond with the usual projections on the head of the weft-carrier, such as are shown, for example, in the United States Patent of Northrop, No. 454,807, June 23, 1891. The face of this stop *o* is shown in detail in Fig. 26. The head of the weft-carrier then rests upon the usual spring-upheld finger *p*, (Figs. 22 and 23) such as is shown in the United States patent of Stimpson, No. 664,790, Dec. 25, 1900. The other or tip end of the weft-carrier descends until it is supported by a spring-upheld yielding finger *q*, which is similar to that shown in the United States patent of Stimpson, just mentioned. This finger is best shown in Figs. 1 and 19, of the present drawings. This stop *o*, and fingers *p* and *q*, stop the lowermost weft-carrier in position below the transferrer and above the shuttle-box (when the lay is in its forward position), so that the lowermost weft-carrier is in the proper transferring position, and consequently when a change of weft is demanded in the operation of the loom and the transferrer C, is operated, this lowermost weft-carrier is acted upon by the transferrer, is transferred into the working-

shuttle on the lay, and at the same time the spent weft-carrier in the working shuttle is ejected downwardly in the manner common to the Northrop loom. During this transferring operation, and, hence during the up-and-down movement of the transferrer C, the stack of weft-carriers in the magazine D, which is then above the guide-chute K is held uplifted by a retainer L, (composed of two members) carried by the transferrer, and best shown in Figs. 2, 20, 22 and 23. When the transferrer has completed its operation and is in its normal elevated position this retainer L, is freed from the stack of weft-carriers, and they accordingly drop down by gravity the distance of the diameter of one weft-carrier, so that the stack is again held by the lowermost weft-carrier coming against the stop *o*, and fingers *p* and *q*.

As shown in the drawings, the guide-chute K, is of a length to accommodate four of the weft-carriers at one time, but it may be shortened or lengthened as the case may be. It is deemed advisable, however, to have this guide-chute of small capacity and it has been found expedient to make it of the length shown.

The magazine remains in its initial position without movement until through the successive transfer of weft-carriers to the shuttle there have been exhausted all of the weft-carriers in the first stack of carriers, and thereafter the magazine is automatically moved forward one step so as to bring the next stack of weft-carriers sustained thereby into register with the fixed guide-chute K. This second stack then remains in register with the guide-chute until all of its carriers are exhausted, and the magazine is then moved automatically forward another step, bringing the next stack of weft-carriers into register with the guide-chute, and so on, until all of the stacks of weft-carriers have been brought into register, and until all of the weft-carriers are exhausted. Owing to the large capacity of the magazine, it will supply the loom for a long period of time, and preferably it is of such capacity that the magazine will have to be replaced not oftener than once a day. The magazine is thus fed automatically forward step by step by means of mechanism controlled by the presence of weft-carriers at the critical point in the machine, this mechanism consisting of a weft-carrier feeler M (shown in detail in Figs. 17 and 18) which is operatively connected with the weft-thread-controlled mechanism so as to move therewith only when the weft-carriers in the guide-chute have been diminished to a predetermined extent. This feeler, as shown, is an escapement-lever and it carries the detent *n* which stops the forward swing of the magazine, first because the front flange thereof comes in contact with said detent, and then because the several

intermediate flanges *l* (separating the channels) come in succession in contact with said detent. This escapement-feeler *M* is operatively connected with the weft-thread-controlled mechanism, as by being yieldingly connected with the transferrer *C*. This yielding connection consists of a plunger *r* which is slidingly mounted within a socket formed in the transferrer (shown best in Fig. 24), and which is forced downwardly by a coiled spring *s*, located within said socket and surrounding said plunger; and of a cooperating lug *t* (see Figs. 17, 18 and 24) carried by the escapement-feeler upon which said plunger rests. When the transferrer performs its transferring descent, the spring *s* is put under tension, thus tending to depress the feeler, but this is ordinarily prevented from occurring to such an extent as would affect the magazine owing to the head or forward end of the feeler then coming in contact with the head of one of the weft-carriers in the guide-chute *K*, as will be evident from an inspection of Fig. 22. When, however, the supply of weft-carriers in the guide-chute has been depleted so that there is no weft-carrier in the path of the head of the weft-carrier feeler, then the feeler is moved down to the full extent by the descent of the transferrer *C*, through the tension of the spring *s* and the intervening plunger *r* and lug *t*. This full descent of the feeler lowers its detent *n* below the plane of the inner side-plate *l* of the magazine, and hence leaves the magazine free to move forwardly by gravity.

It will be noted that the center of mass of the magazine is at all times back of the axis of the pivot-rod *G*, on which the magazine swings, so that the force of gravity always tends to move the magazine forward, and therefore whenever the detent *n* is withdrawn the magazine moves forward. This forward movement of the magazine is automatically controlled, so that the magazine moves forward step-by-step only, by means of a pallet *u* (see Figs. 17, 18, 22, 23 and 25) carried by the feeler at its forward end, and of a series of teeth *v* carried by the inner side-plate *i* of the magazine on its outer face, (see Figs. 4 to 8) which are spaced apart correspondingly to the distances between the flanges *l*, *l*, of the magazine. Normally, this pallet *u* is above the plane of the adjacent tooth on the magazine; but, when in the descent of the weft-carrier-feeler the detent *n* loses its hold upon the cooperating flange of the magazine, said pallet is lowered into the path of the adjacent tooth *v* of the magazine and hence, when the magazine moves forward under the influence of gravity, said tooth comes in contact with said pallet, thus limiting the forward movement of the magazine. Then, when the weft-carrier-feeler rises with the transferrer and the detent comes again into the path of the next in-

wardly projecting flange *l* of the magazine, the pallet rises above the tooth *v* then in contact with it, and hence the magazine moves forward until its next flange is stopped by the detent. Hence these two steps in the operation feed the magazine forward to a distance equal to the distance between adjacent flanges *l* of the magazine. As heretofore stated, the downward movement of the weft-carrier-feeler is effected by the yielding connection between it and the transferrer. The upward movement of the feeler is positively effected by the transferrer which has a projecting pin *w* (Figs. 19, 22 and 23) on its inner side which extends out beneath the feeler and comes in contact therewith to elevate it when the transferrer rises. It will be noted that this forward movement of the magazine can only occur when the stack of weft-carriers has been so far depleted through the successive supply of fresh weft-carriers to the loom as to bring the upper weft-carrier of the stack below and out of the way of the forward end of the weft-carrier-feeler. Consequently the effective movement of the feeler to control the movement of the magazine is itself controlled by the presence and absence of weft-carriers at the critical place in the machine. It will be noted on reference to Figs. 17 and 18 that the detent *n* and the pallet *u* of the feeler are separated from each other a sufficient distance to permit the body of the inner side-plate of the magazine to pass freely between them, and that the inwardly projecting flanges can pass only when the detent is lowered, while the outwardly projecting teeth *v* can pass only when the pallet is elevated.

The inner face of the inner standard *E* is suitably recessed to accommodate the feeler and the cooperating teeth of the magazine. As shown in Fig. 6, the lower ends of the flange *l* are curved or beveled forwardly so as to facilitate the downward passage of the weft-carriers into the fixed guide-chute *K*. The guide-chute *K*, as shown, is appropriately shaped to receive and convey the two ends of the weft-carrier. For example, the inner standard *E* is shown as provided with an appropriately bent guide-plate *x* alongside the ledge *I* (see Figs. 10, 19 and 21) which is appropriately shaped to fit the head of the weft-carrier so as to prevent any end-wise displacement thereof which might cause its projections to fail to register with the corresponding depressions of the stop *o*.

In accordance with the invention of said Melvin L. Stone, each weft-carrier is equipped with a removable weft-end holder which has to be ejected after the weft-carrier has left the magazine and before it is transferred into the shuttle. In Fig. 31 is shown the tip end of a weft-carrier, *A*, to which one end of said Stone's readily removable weft-end holders *B*, is attached. As shown, the holder

B, has a thread-slot *d*, and a thread-holding stud *f*, around which the loose end of the thread is securely wrapped. The ejection of this weft-end holder is accomplished by means of an outwardly sliding displacer N, mounted to slide in the outer standard F. This displacer is automatically actuated (each time that a weft-carrier is transferred into working position on the lay) by appropriate intermediate connections with the transferrer, which include a main actuator O (Fig. 2) and other intervening devices. The guide portion of the guide-chute K, carried by the outer standard F, is appropriately constructed so as to direct the weft-end holders into position to be acted upon by the displacer N. This mechanism, therefore, involves first the construction of the displacer, second the operating devices therefor, and third, the relation of the displacer to the guide-chute, whereby the weft-end holders are brought in succession into coöperation with the displacer.

The displacer N is separately shown in Figs. 27 to 32. It has a guiding slide rod *y* and a guiding slide bar *z*, the former of which extends through and slides laterally in a hollow sleeve, 1, carried by and constituting a part of the outer standard F, as shown in Figs. 14, 15, 19, 20 and 21. The slide-bar *z* is guided by and slides laterally in a horizontal lateral way 2 formed in the outer standard F, as shown in Figs. 2 and 33. The displacer is suitably formed to provide a slot 3, for the continued passage of the tip-end of the bobbin until it rests upon the finger *g*; and it is also provided with an overhanging flange 4, which coöperates with the weft-end holder to displace the same laterally outward when the displacer performs its displacing office. This flange is preferably constructed as shown, so as to act upon a large portion of the inner face of the weft-end holder. Normally, this displacing flange occupies its inward position so that the weft-carriers as they fall down pass beneath the flange with their weft-end holders outside of the same. The displacer also has a bottom ledge 5, which serves as a support for the outer ends of the weft-carriers, and which bridges the gap between the finger *g* and the lower end of the portion of the guide-chute K, formed on the outer standard F. This bottom flange 5 thus constitutes in effect a portion of the guide-chute. The lower part of the weft-end holder extends down below the top of this ledge 5, so that said ledge also acts as a portion of the ejecting devices of the displacer.

As has been heretofore stated, the lowermost bobbin in the chute K has been deprived of its weft-end holder and its tip-end is supported by the yielding finger *g*. The bobbin next above it and upheld by it still carries its weft-end holder, and said

holder then occupies a position in line with the ejecting flange 4 and bottom ledge 5 of the displacer, and the outer standard F is cut away (as shown at 6 in Figs. 14 and 33) so as to present no obstruction to the outward ejection of the weft-end holder. In order to prevent accidental outward displacement of the weft-end holder before the time arrives for displacing it, the outer standard F is provided with a detainer 7 (see Figs. 1, 14 and 31,) which is pivoted at 8 on the outside of the standard F, and is acted upon by a spring 9, which normally holds the detainer in such position as to normally prevent the outward movement of the weft-end holder. When, however, the displacer N moves outwardly for the purpose of removing and ejecting the weft-end holder, a cam incline 10 (see Figs. 29, 30 and 31,) on the displacer acts upon the detainer 7 to swing the detainer end thereof downwardly out of the way of the weft-end holder, so that the outward path of the said weft-end holder is unobstructed. When the displacer again moves inwardly, the spring 9 restores the detainer to its normal detaining position.

The effective removal and displacement of the weft-end holders from their respective bobbins requires a substantially instantaneous outward movement of the displacer, and this is effected by means of a propelling spring P, (Fig. 32) which surrounds the slide-rod *y* of the displacer, and is inclosed within the sleeve 1, of the standard F. This actuating spring at its outer end bears against a collar 11 (see Fig. 32,) which is pinned to the outer end of said rod *y*. The displacer is normally retained in its inward position with the propelling spring P under propulsive tension by means of a spring latch 12, (Figs. 20 and 21,) which is pivoted to the standard F at 13, and which engages a lip 14, (Fig. 20) on the displacer. In order to secure the outward weft-end holder ejecting movement of the displacer, it is only necessary to release the latch 12 from the lip 14, and thereupon the propelling spring P moves the displacer suddenly and quickly outward, thus removing the weft-end holder then in coöperation with the displacer and ejecting it from the loom. This release is automatically effected at each transferring movement of the transferrer C, through the instrumentality of the intervening actuator O, (shown separately in Figs. 11 and 12). This actuator is pivoted at 15 (Figs. 20 and 21) to the outer side of the standard F, and its inner end is embraced by a slot 16, formed in a portion of the transferrer C, as shown in Fig. 22. This actuator has a tongue 17, (Fig. 11) which is coöperatively located relatively to the outer end of the latch 12, so that when the inner end of the actuator is depressed during the downward or transferring movement of the transferrer A, said tongue swings

outwardly and upwardly and operates upon said latch to swing it on its pivot and thereby release the displacer, as shown in Fig. 21. When the transferrer rises after completing its transferring operation, the actuator O rises with it, thus releasing the latch 12 and leaving it free to be restored to its normal position (locking the displacer) by means of a spring 18, provided for that purpose, and shown in Figs. 20 and 21. The actuator not only serves to release the displacer, but also serves to restore said displacer to its normal position, thereby again putting its propelling spring P under tension. To this end the actuator O is provided with a bunter 19, (Figs. 11, 12, 19 and 21) which coöperates with an abutment on the displacer, said abutment being in one with the lip 14. The initial movement of the actuator removes this bunter forwardly and out of the way of the said abutment in advance of the tripping of the latch 12, so as not to interfere with the ejecting movement of the displacer. When the actuator retracts with the transferrer the bunter 19 encounters the abutment 14, and thereby pushes the displacer inwardly until it is again caught by the spring latch 12.

The elevation of the transferrer C, and the resetting of the displacer N, are both effected by the usual transferrer restoring spring g, (see Figs. 2 and 19) which is given sufficient tension for the certain accomplishment of these results.

When the displacer removes a weft-end holder it ejects it laterally from the loom and it falls into a suitable box placed opposite the end of the loom. The weft-end holder carries with it the end of the thread, which unwinds freely from the weft-carrier, so that the thread remains intact between the weft-carrier and the displaced weft-end holder. Consequently, when the weft-carrier is transferred into the running shuttle on the lay, the end of the thread is held by the weft-end holder, and the shuttle is automatically threaded, as in the usual operation of the Northrop loom. In order to cushion the outward movement of the displacer under the action of the propelling spring, an elastic washer, 20, (Fig. 32) surrounds the slide-rod y between the abutment 14, and the standard F, thus cushioning the displacer when the propelling spring acts.

The entire operation is as follows: An attendant places a weft-end holder on the end of each weft-carrier, and secures the end of each weft thread to the outer stud of the attached weft-end holder. The detached magazine is then equipped with the removable slide, and all the channels of the magazine are filled with the weft-carriers thus equipped with the weft-end holders and with the weft-ends or threads secured. The filled magazine is then taken to the loom and

hooked on to the pivot-rod between the fixed standards. The slide is then removed, and the front stack or group of weft-carriers then drops down by gravity, so as to fill the guide-chute with weft-carriers, four weft-carriers being necessary for this purpose in the specific arrangement shown. Hence, the front stack of weft-carriers is then supported by the spring fingers upon which the head and tip of the lowermost weft-carrier rest. If this is the initial supply of weft-carriers to the loom, the weft-end holder of the bottom weft-carrier must be removed by hand and be placed in the receptacle provided for that purpose, the thread reeling off from the bottom weft-carrier and extending to the removed weft-end holder. After the loom has once been started this will ordinarily not be required thereafter, since the proper management of the loom will result in a change of magazines before all of the weft-carriers contained in the magazine in use have been exhausted. The weft-carriers are then automatically transferred one by one into the lay, as required by the conditions of the running weft, as is the case in the ordinary operation of the Northrop loom. At each transfer the bottom weft-carrier is transferred into the lay, and the weft-end holder of the weft-carrier next above the bottom one is automatically removed and ejected into the receiving box, carrying with it the thread. When the transferrer resumes its normal elevated position, thus elevating the retainer L away from its position where it upholds the front stack of weft-carriers, the front stack drops down by gravity the distance left by the transfer of the lowermost weft-carrier. This action continues from time to time until all of the front stack of weft-carriers has been exhausted from the forward channel of the magazine, and until there are only two weft end-holders left in the guide-chute. In the meantime all of the other stacks or groups of weft-carriers have been supported upon the permanent bottom for the magazine, constituted by the support furnished by the bottom ledges of the fixed standards. When the front stack of weft-carriers has been exhausted to the stated extent, then, on the next action of the transferrer, the magazine is fed forward one step through the action of the weft-carrier feeler, thus bringing the next stack or group of weft-carriers into register with the guide-chute, into which they drop by gravity until sustained by the weft-carriers at the bottom of the guide-chute. This action continues until the magazine is replaced by a filled one, or until all of the weft-carriers, both in the magazine and in the guide-chute, are exhausted. In the latter contingency, the loom will automatically stop just as the Northrop loom stops after the rotary battery has

been wholly depleted. When the magazine is entirely exhausted its further forward swing is limited by a suitable fixed stop.

It has been found in practice expedient to place the receiving box for the ejected weft-end holders some distance beyond the outer side of the magazine, so as to be wholly out of the way of the lay and of the picker-stick on that side of the loom, and this has rendered it expedient to bridge the gap thus left by means of a suitable hollow conductor Q. This conductor is not shown in the principal figures illustrating the magazine in place on the loom, because its illustration therein would tend to obscure the showing of more important parts. Its construction and relation to the rest of the mechanism is shown in Figs. 33, 34, and 35. In Fig. 33 it is shown in its proper relation secured to the outer side of the outer standard F, by appropriate screw-bolts, and the location of the holes to receive the screw-bolts is shown in Fig. 1. This conductor is simply a sheet-metal shell extending laterally and nearly horizontally from the outer face of the outer standard F, and open at both ends. It is also cut away in front, as shown at 21, on the end adjacent to the standard F, so as to enable the weaver to have easy access to the opening 6, in the standard through which the weft-end holders are ejected, which is important in order to enable the weaver to remove the bottom weft-end holder by hand in starting the loom in the first instance. This opening also allows for the movement of the displacer and of its actuator. When a weft-end holder is ejected it flies out through this conductor into the receiving box with no danger of its dropping down in a place where it might be struck by the lay, or some other moving part of the loom. The bottom of the conductor has a slot 22, cut therein, which is open at the end of the conductor next to the standard F. The purpose of this slot is to enable the thread to drop down below the standard when the bottom weft-carrier is transferred into the lay, and the peculiar shape of the slot, with the bend 23, therein, obviates any danger of entangling the loose end of the thread of the freshly inserted weft-carrier with any moving part of the loom, until after the threading of the shuttle has been automatically effected.

The improved magazine relieves the weaver of all duties connected with the supply of weft, thus enabling a single weaver to attend to a much larger number of looms. The movable magazine brings each stack of weft-carriers in succession into cooperation with the transferrer, thus insuring the depletion of the weft-carriers in one stack before the next stack is brought into register. Since the movement of the magazine is controlled by the presence and absence of the weft-carriers themselves, its

appropriate action is not dependent upon a definite number of weft-carriers in the magazine, or in one of the stacks, so that carelessness on the part of the attendant who fills the magazine can not interfere with the proper action of the magazine.

I herein specifically disclaim all features which are the invention of said Melvin L. Stone, this invention being an improvement upon the broad invention made by said Stone.

It is obvious that many changes may be made without departing from the spirit and principle of this invention. For example, although the greatest advantage of the present invention would be secured by making the magazine readily detachable in accordance with the invention of said Melvin L. Stone, nevertheless it is obvious that many of the advantages of the present invention could be secured by permanently mounting the magazine on its supporting stand, and still taking advantage of its movement relative to the stand which brings into operation its several stacks of weft-carriers. While such permanent mounting would necessitate the filling of the magazine at the loom, nevertheless this would have to be done only at remote intervals as compared with the attention to the hopper battery or magazine of the Northrop loom, and could be done after the mill had shut down for the night, or before it had started in the morning, thereby involving no interference with the work of the weaver.

I claim as my invention:

1. An automatic weft-replenishing loom having, in combination, a stand, a transferrer, a movable magazine mounted on said stand and arranged to move forwardly by gravity, said magazine having means for holding a plurality of stacks of weft-carriers, a guide-chute in said stand below said magazine, an escapement-feeler yieldingly operated by said transferrer, said escapement-feeler being normally prevented from operation by the presence of weft-carriers in said guide-chute, but when said weft-carriers in the guide-chute have been depleted to a predetermined extent, said escapement-feeler is free to operate, whereby said magazine is freed and moves forward one step by gravity.

2. An automatic weft-replenishing loom having, in combination, a stand, and a magazine for holding a plurality of stacks of weft-carriers pivoted to said stand, the said stand having a weft-carrier support concentric with the axis on which the magazine swings, and the adjacent end of the magazine being correspondingly shaped.

3. A weft-carrier holding magazine for an automatic weft-replenishing loom having means for holding a plurality of stacks of weft-carriers, a slide which extends beneath all of said stacks and retains these respective

weft-carriers in place when the magazine is remote from the loom, said slide being removed from beneath all of said stacks when the magazine is placed on the loom.

5 4. An automatic weft-replenishing loom having a readily removable magazine provided with open-mouthed pivot hooks.

10 5. An automatic weft-replenishing loom having, in combination, a stand and a swinging magazine pivoted to said stand and arranged to swing forwardly by gravity.

6. An automatic weft-replenishing loom having a pivotally mounted magazine provided with means for holding a plurality of
15 stacks of weft-carriers.

7. An automatic weft-replenishing loom having a movable magazine provided with means for holding a plurality of stacks of weft-carriers and adapted to be moved by
20 gravity.

8. An automatic weft-replenishing loom having, in combination, a movable magazine provided with means for holding a plurality

of stacks of weft-carriers, a weft-carrier guide-chute, and a weft-carrier feeler which 25 feels for weft-carriers in the guide-chute and which, on detecting a depletion of such weft-carriers, coöperates with said magazine to insure the movement of the magazine sufficiently to bring one of its fresh stacks of weft- 30 carriers into communication with said guide-chute.

9. An automatic weft-replenishing loom having, in combination, a movable magazine containing weft-carriers, a spring-actuated 35 weft-carrier feeler contacting with the weft-carriers in the magazine and coöperating with said magazine to cause movement thereof when it detects depletion of weft-carriers.

In witness whereof, I have hereunto signed 40 my name in the presence of two subscribing witnesses.

WILLIAM S. SOUTHWICK.

Witnesses:

FRANK E. DODGE, Jr.,

GEORGE OTIS DRAPER.