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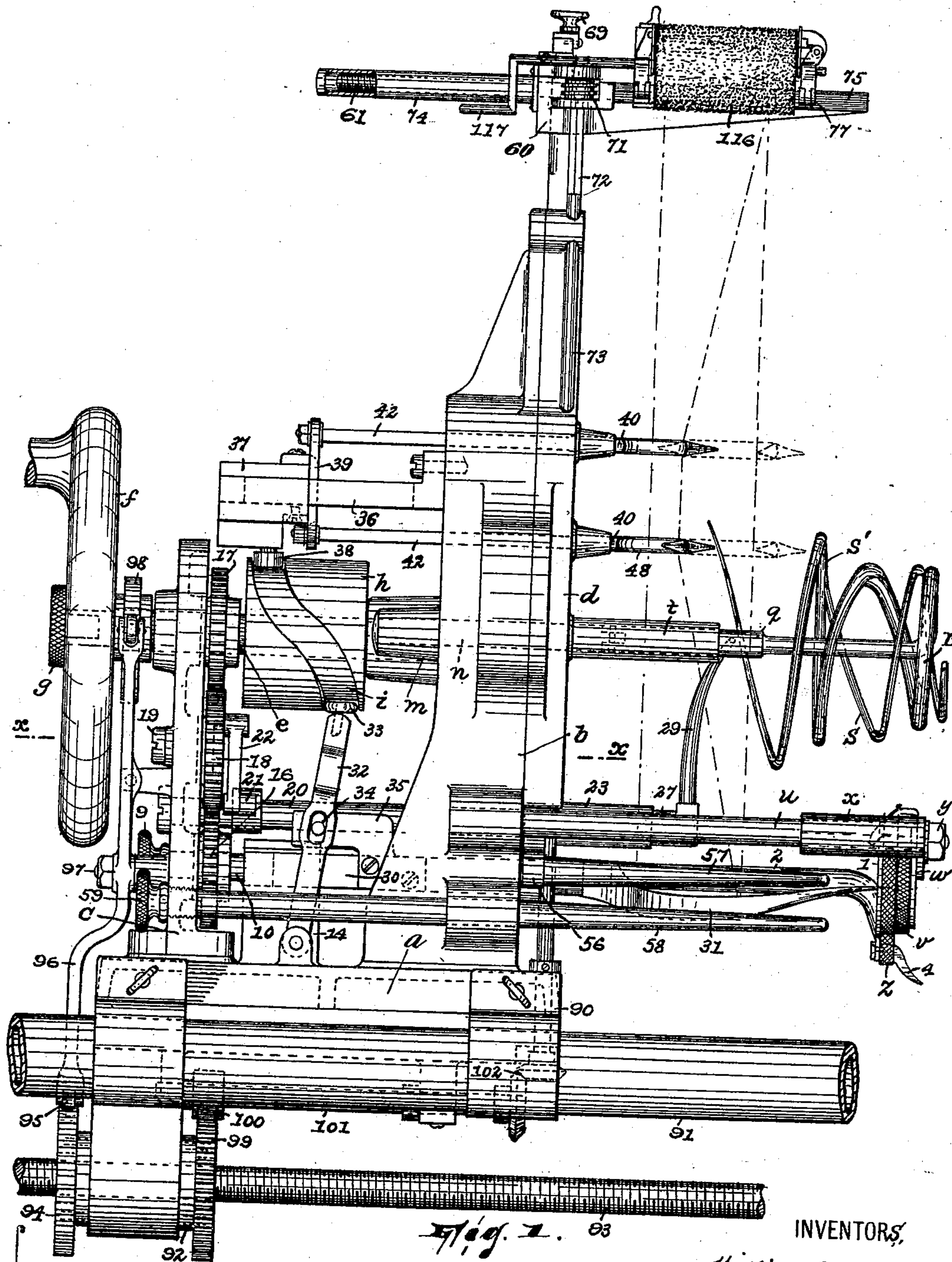
Patented Mar. 18, 1902.

W. E. KREY & A. DUPPLER.
WARP TWISTING MACHINE.

(Application filed Apr. 16, 1901.)

(No Model.)

6 Sheets—Sheet 1.



WZTRESSES.

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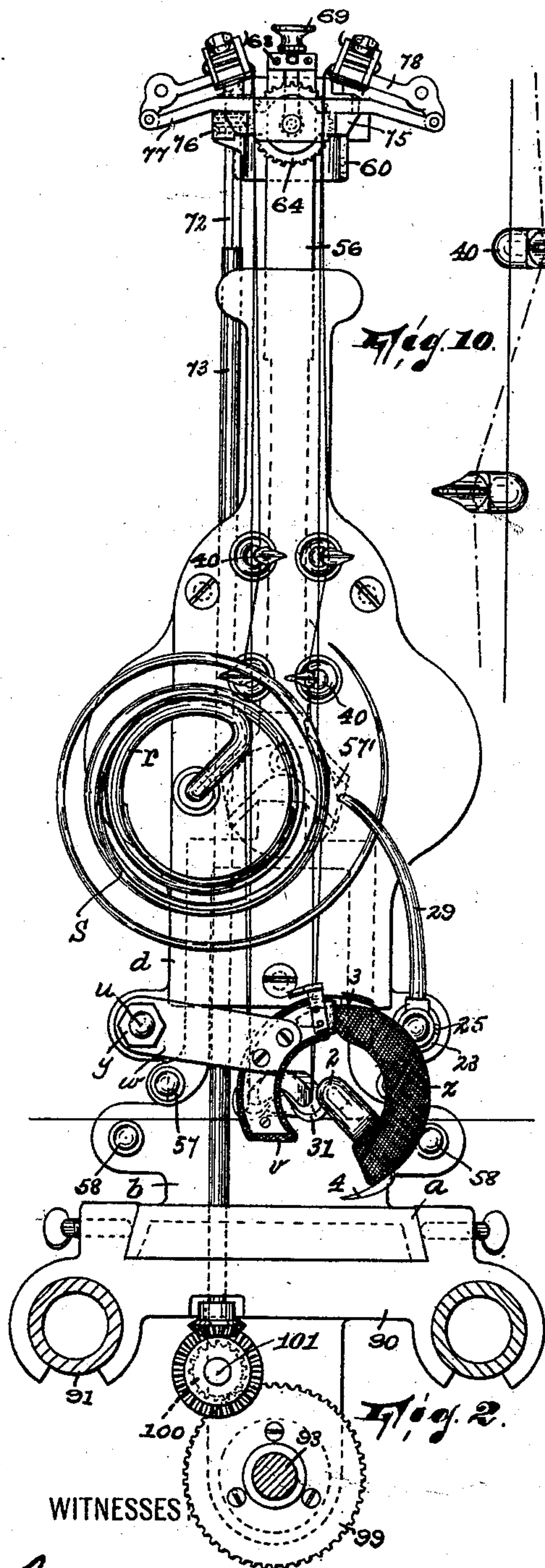
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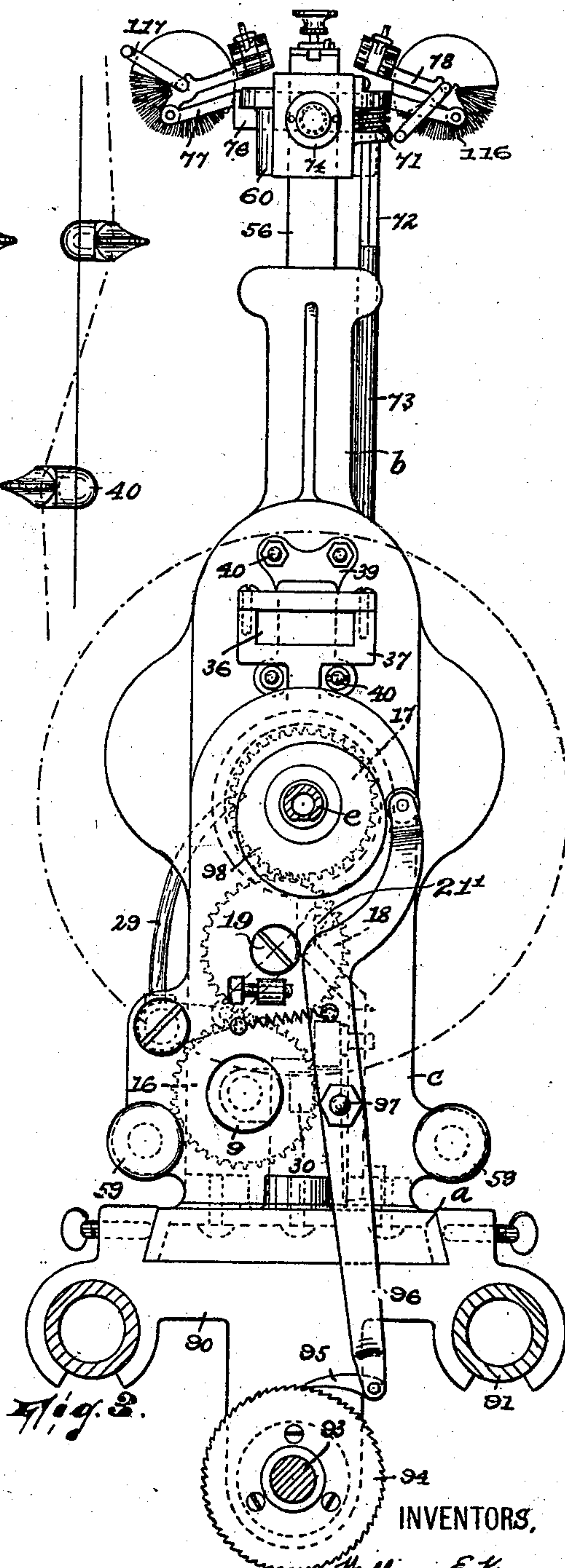
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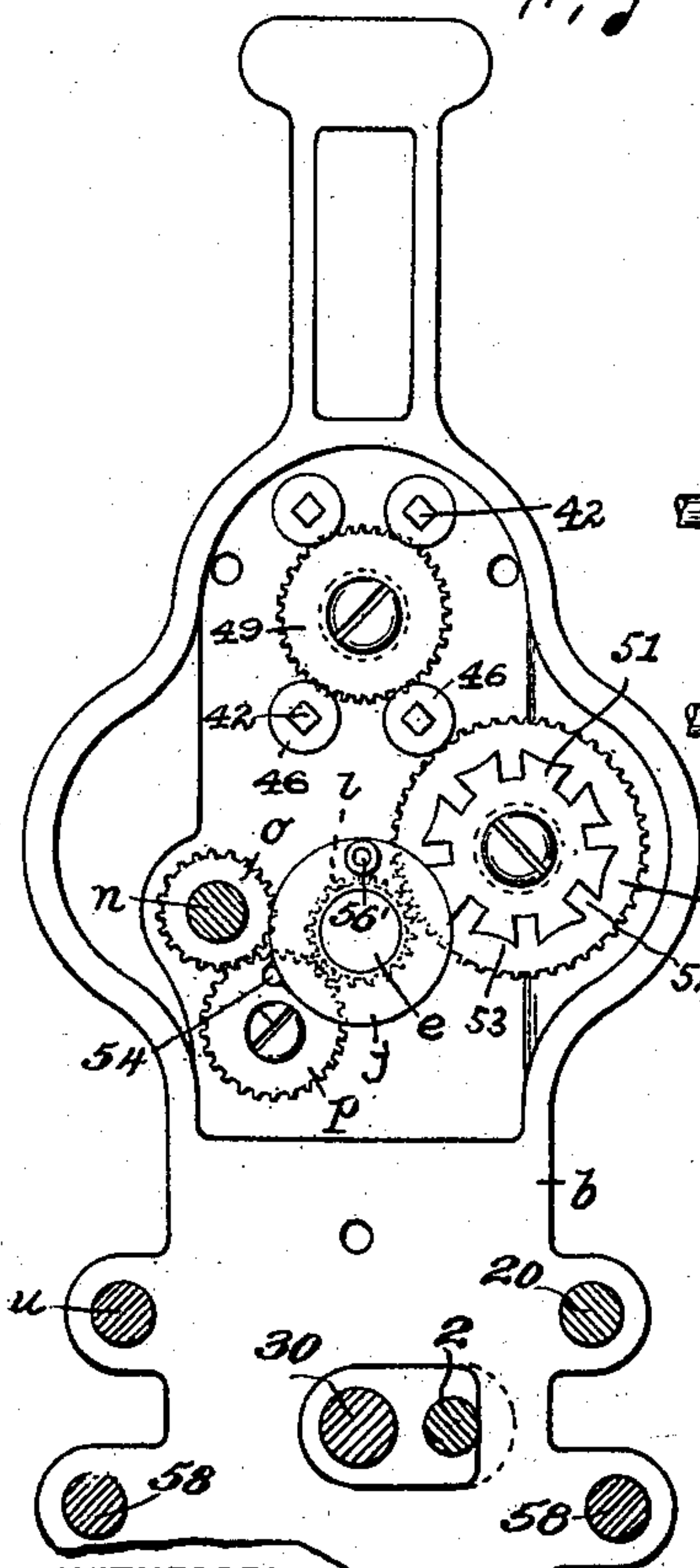
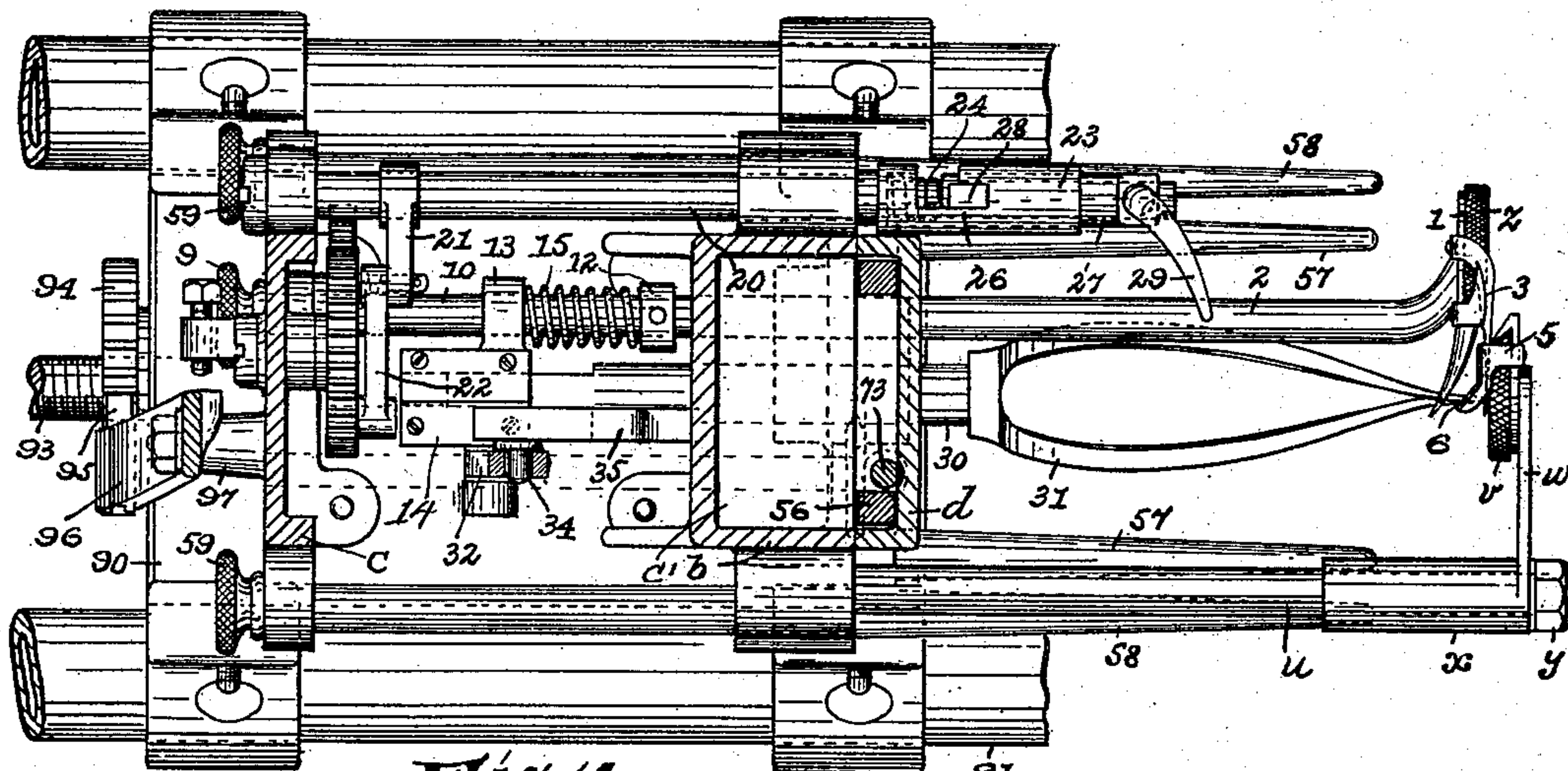
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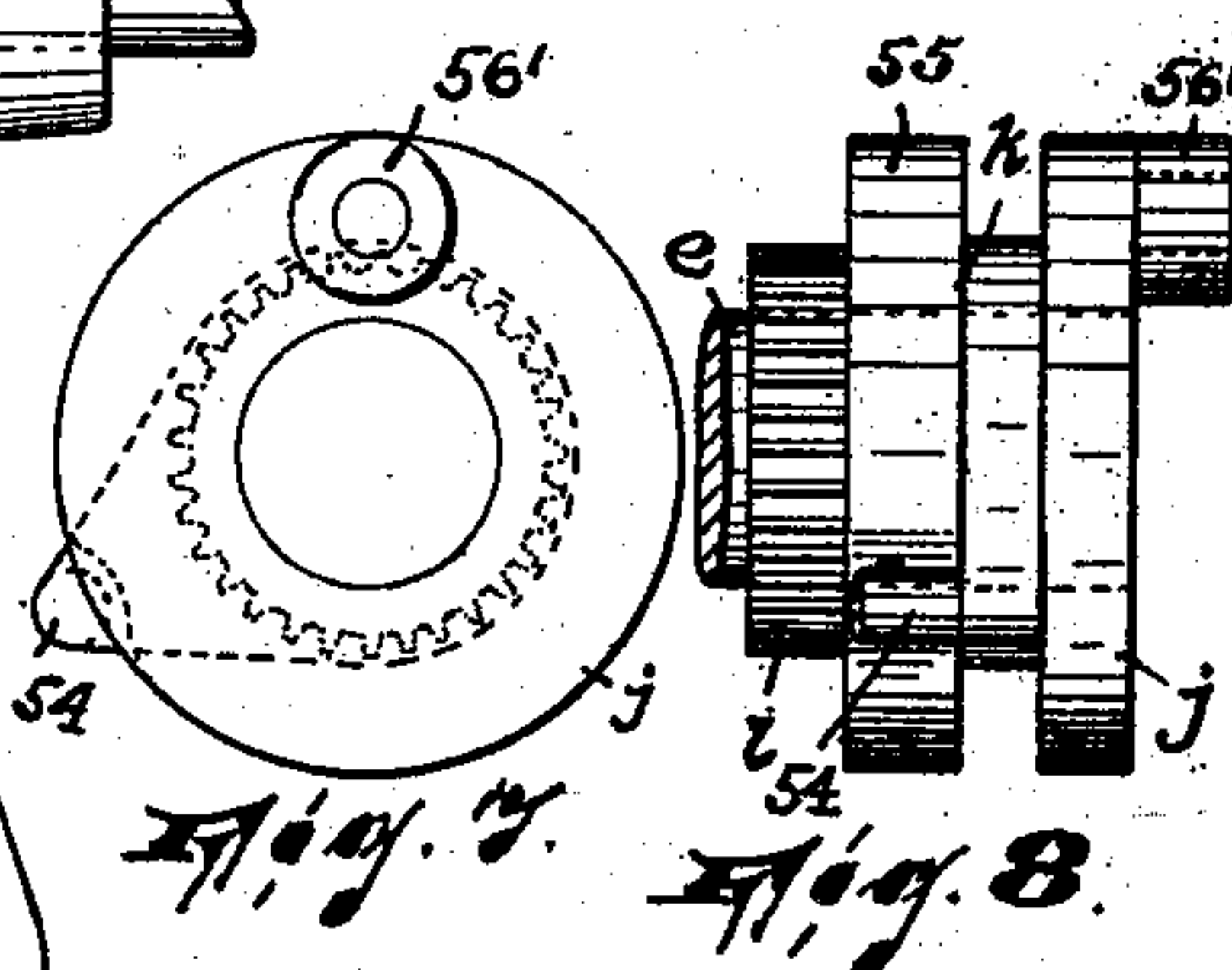
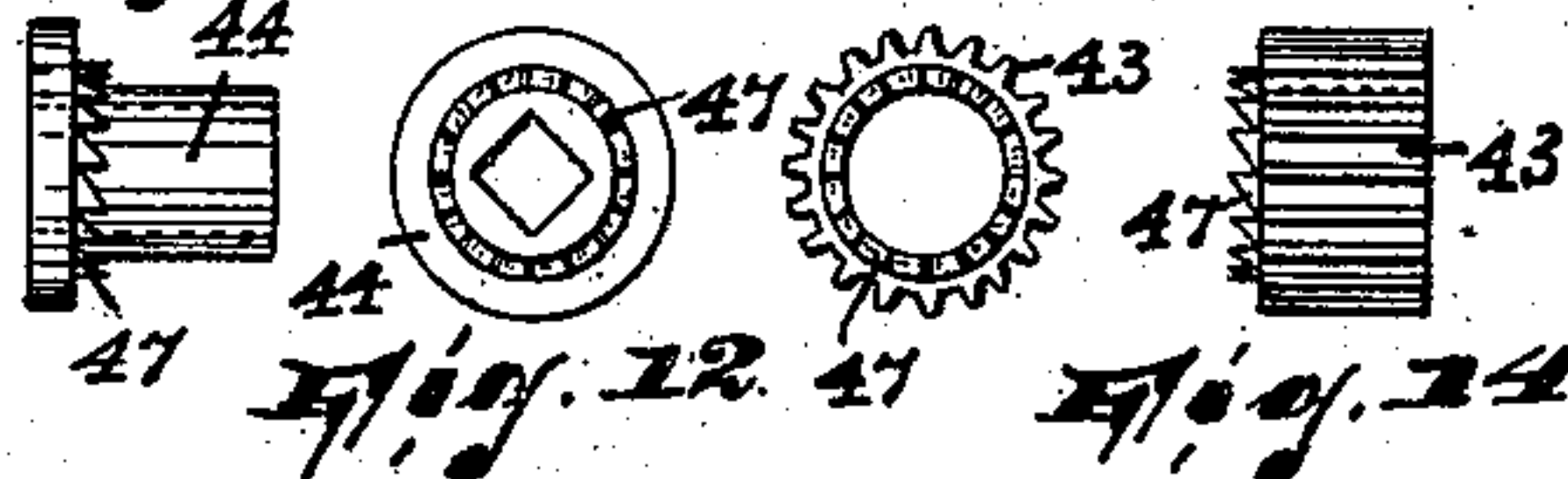
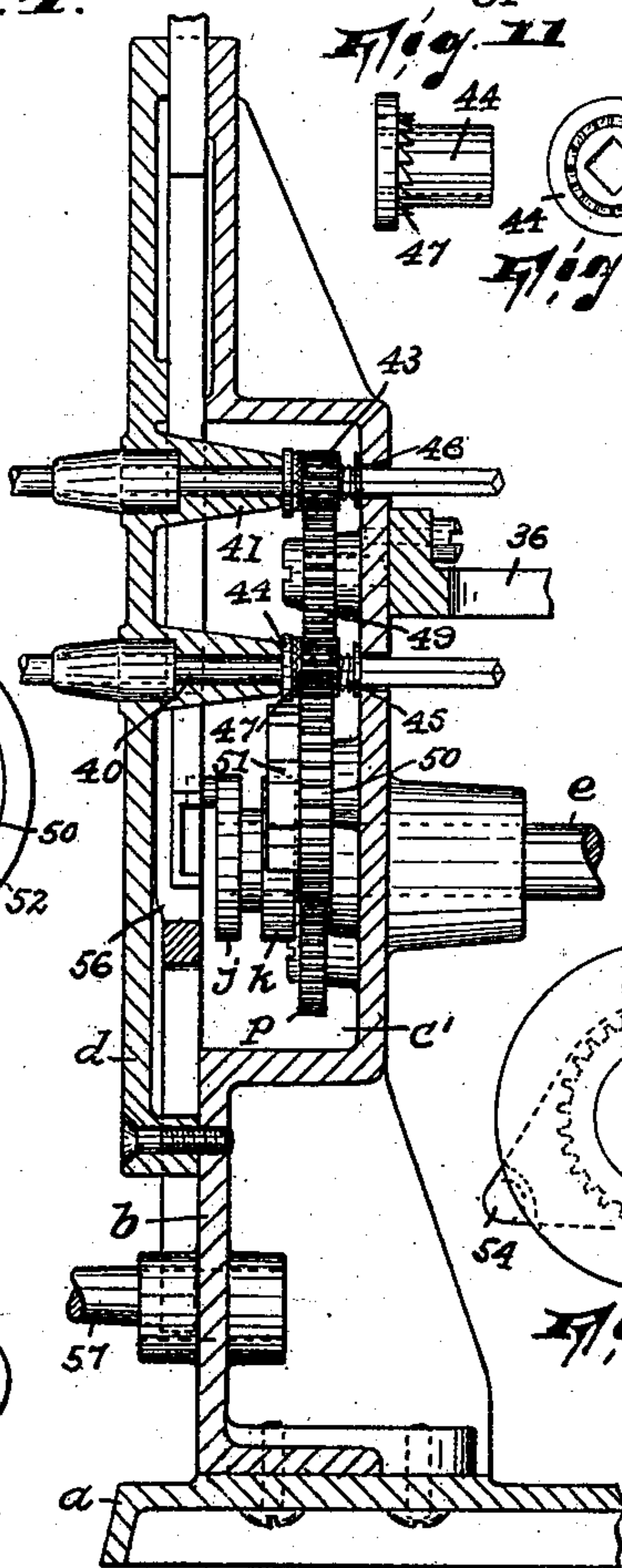
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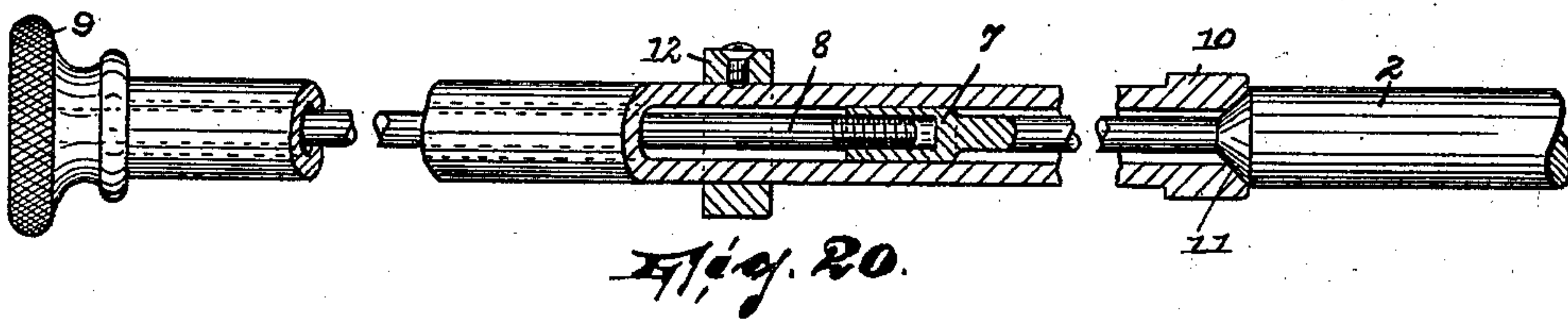
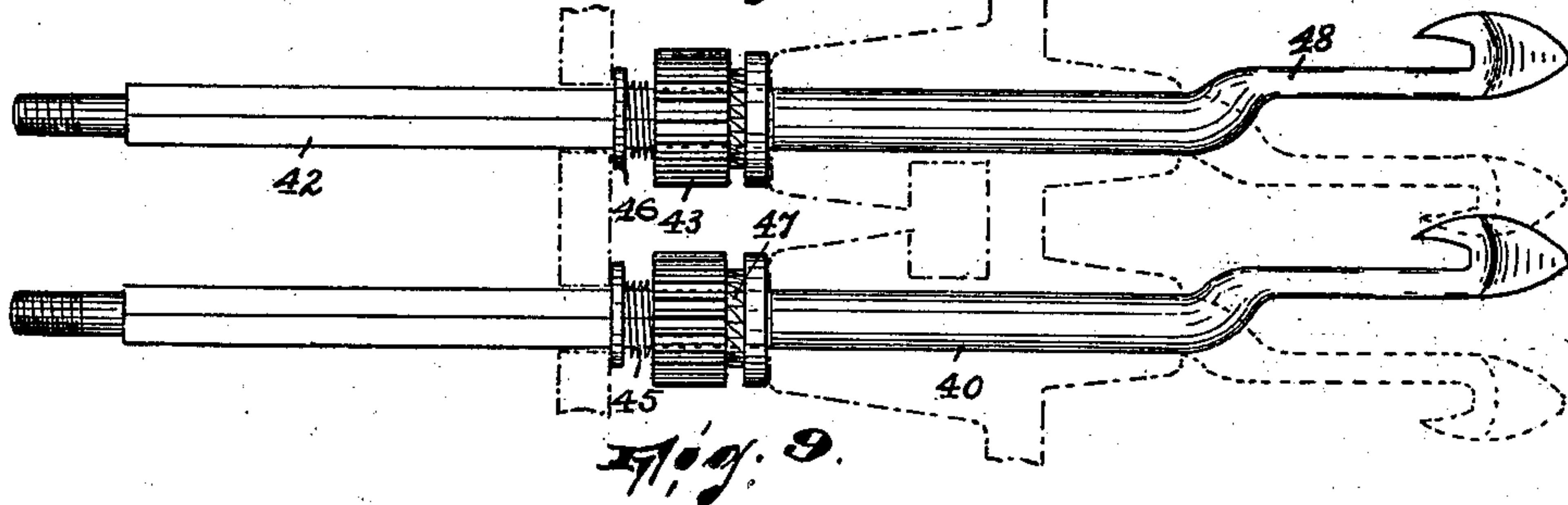
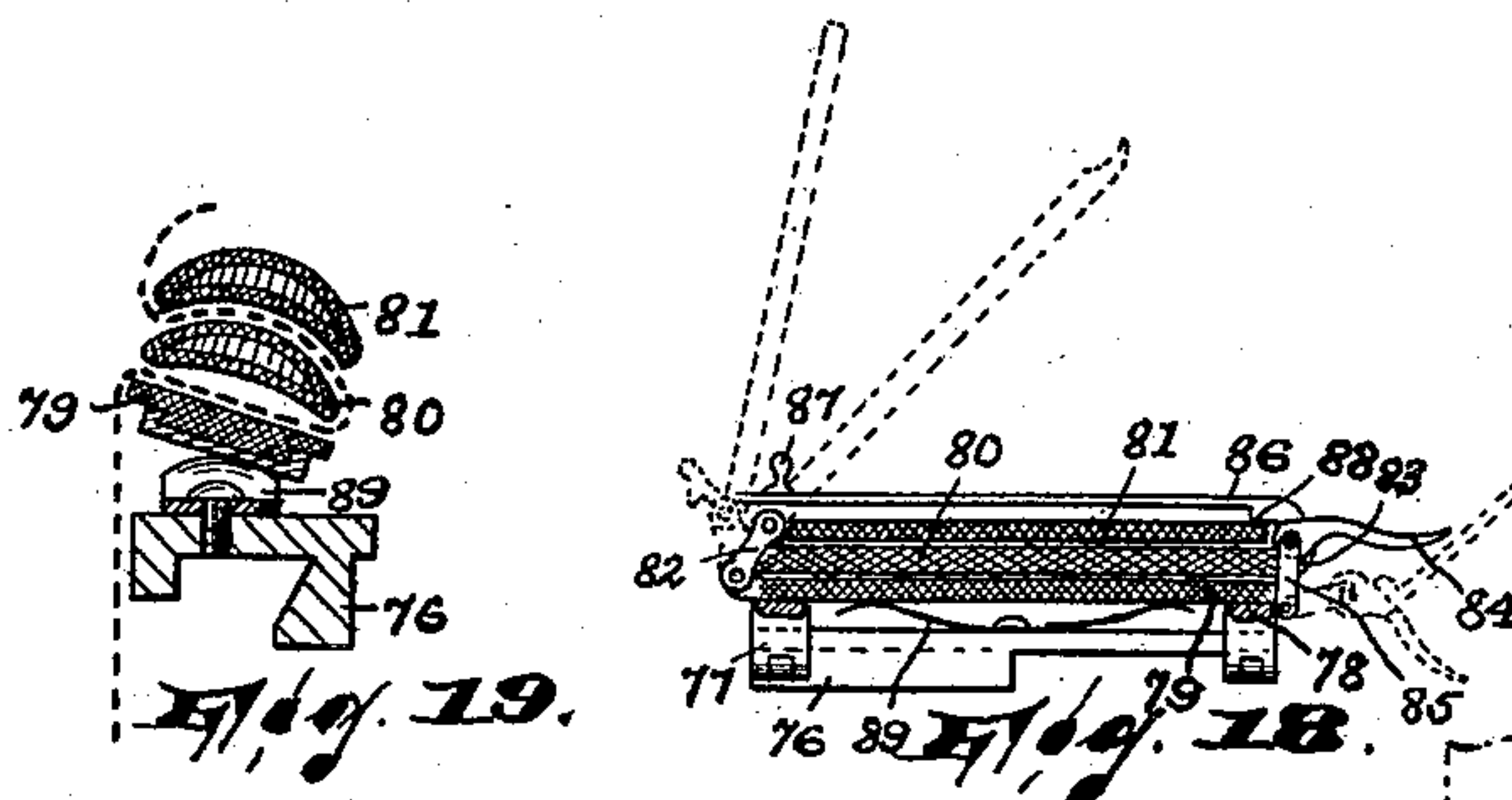
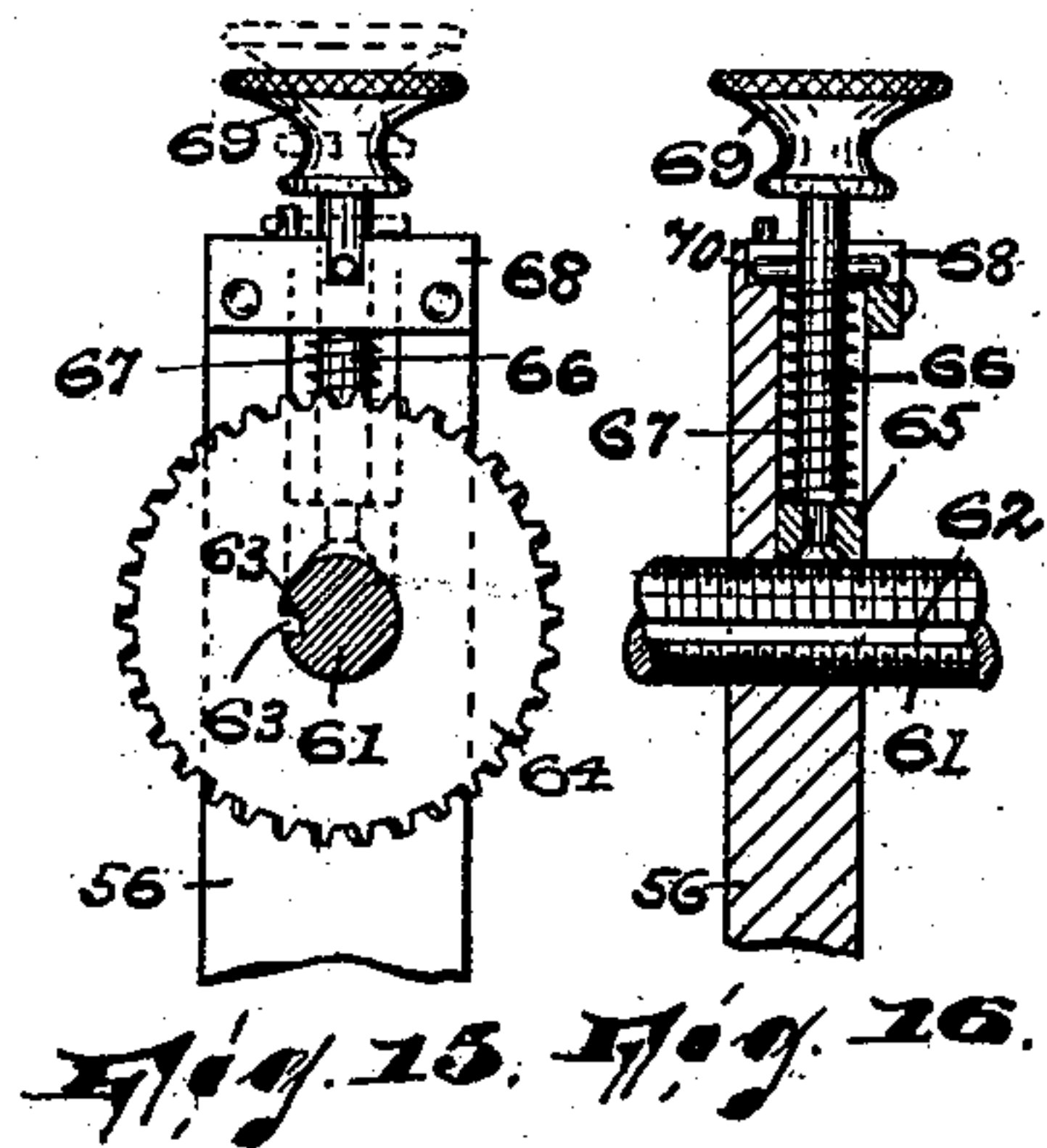
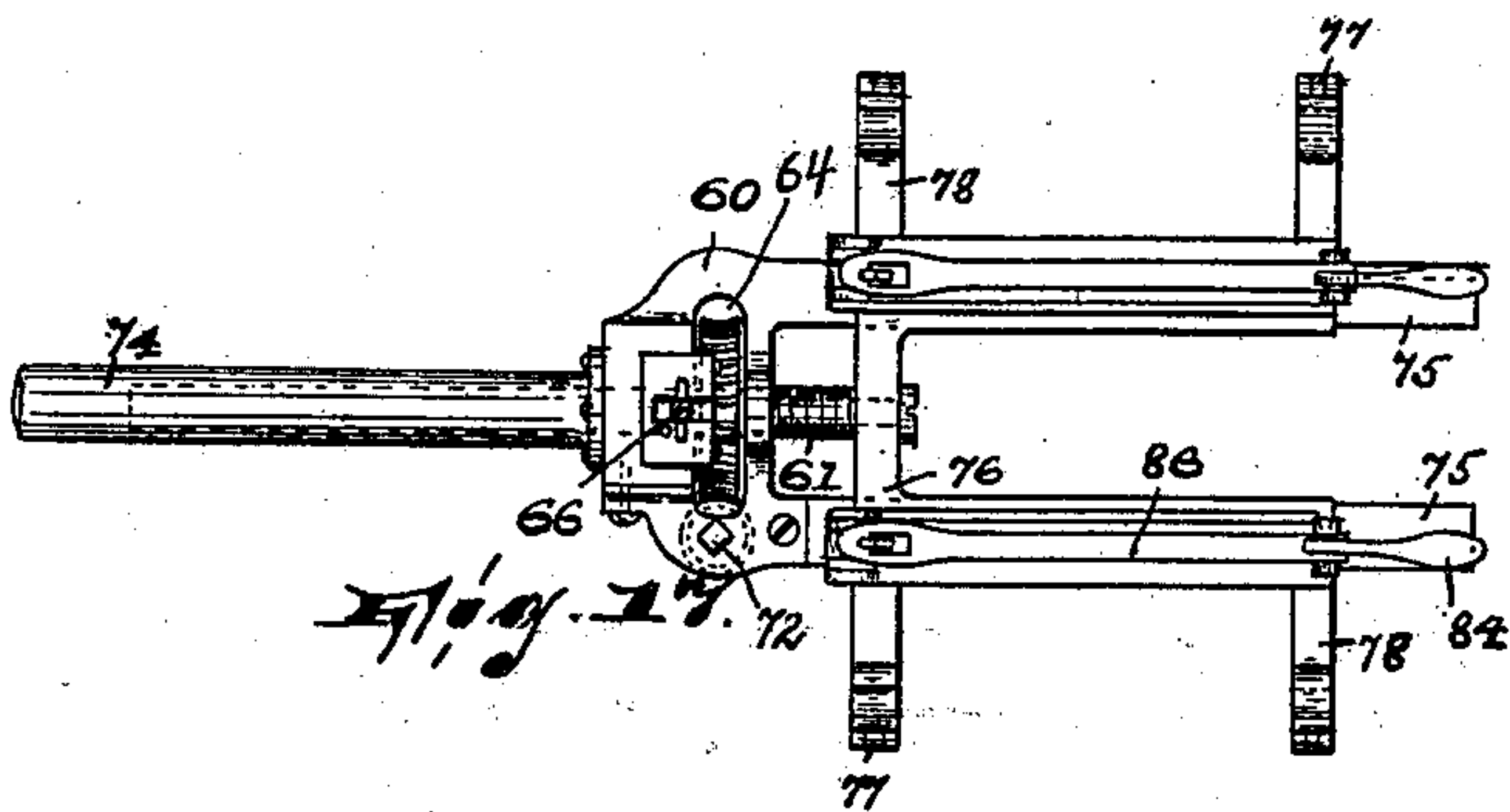
Patented Mar. 18, 1902.

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(Application filed Apr. 16, 1901.)

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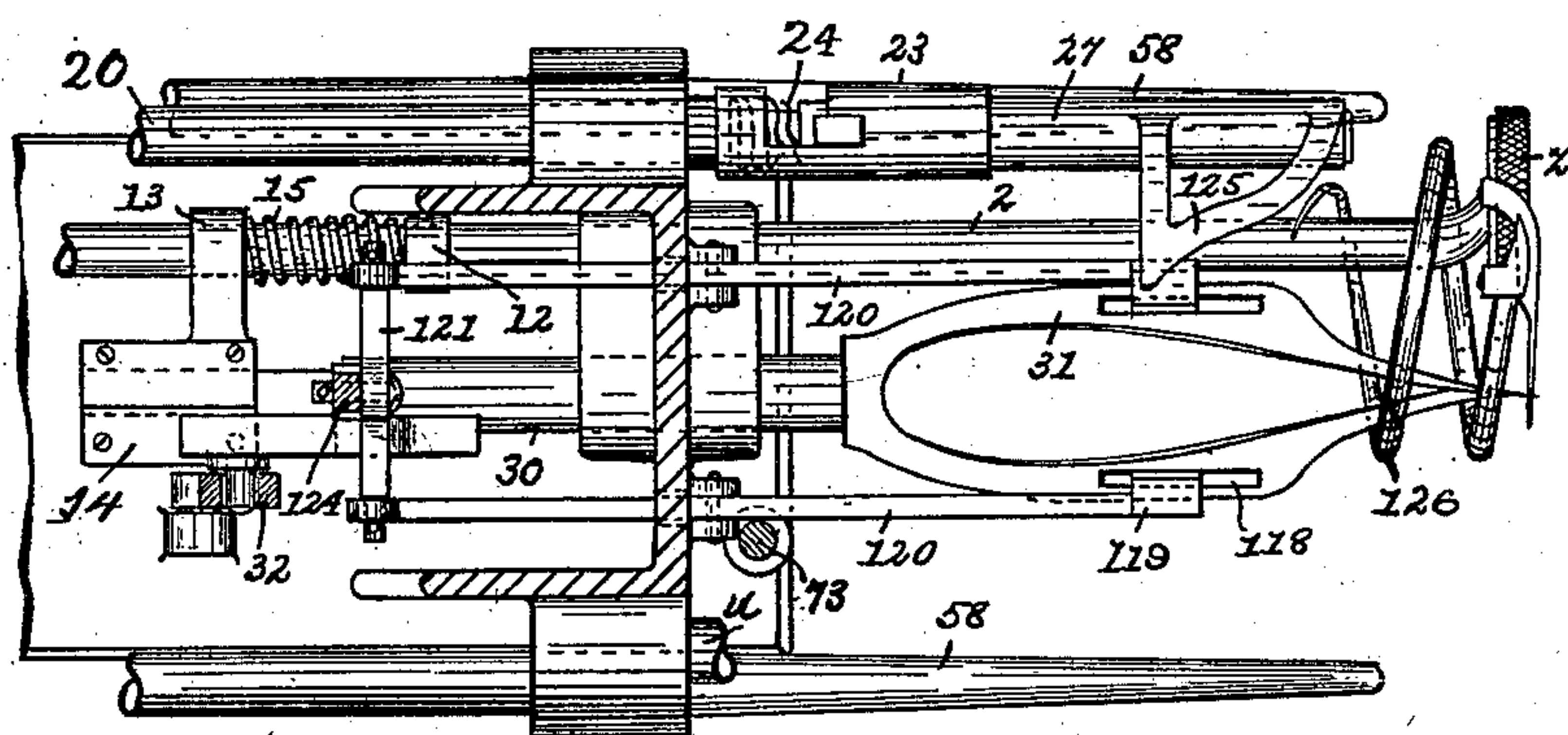
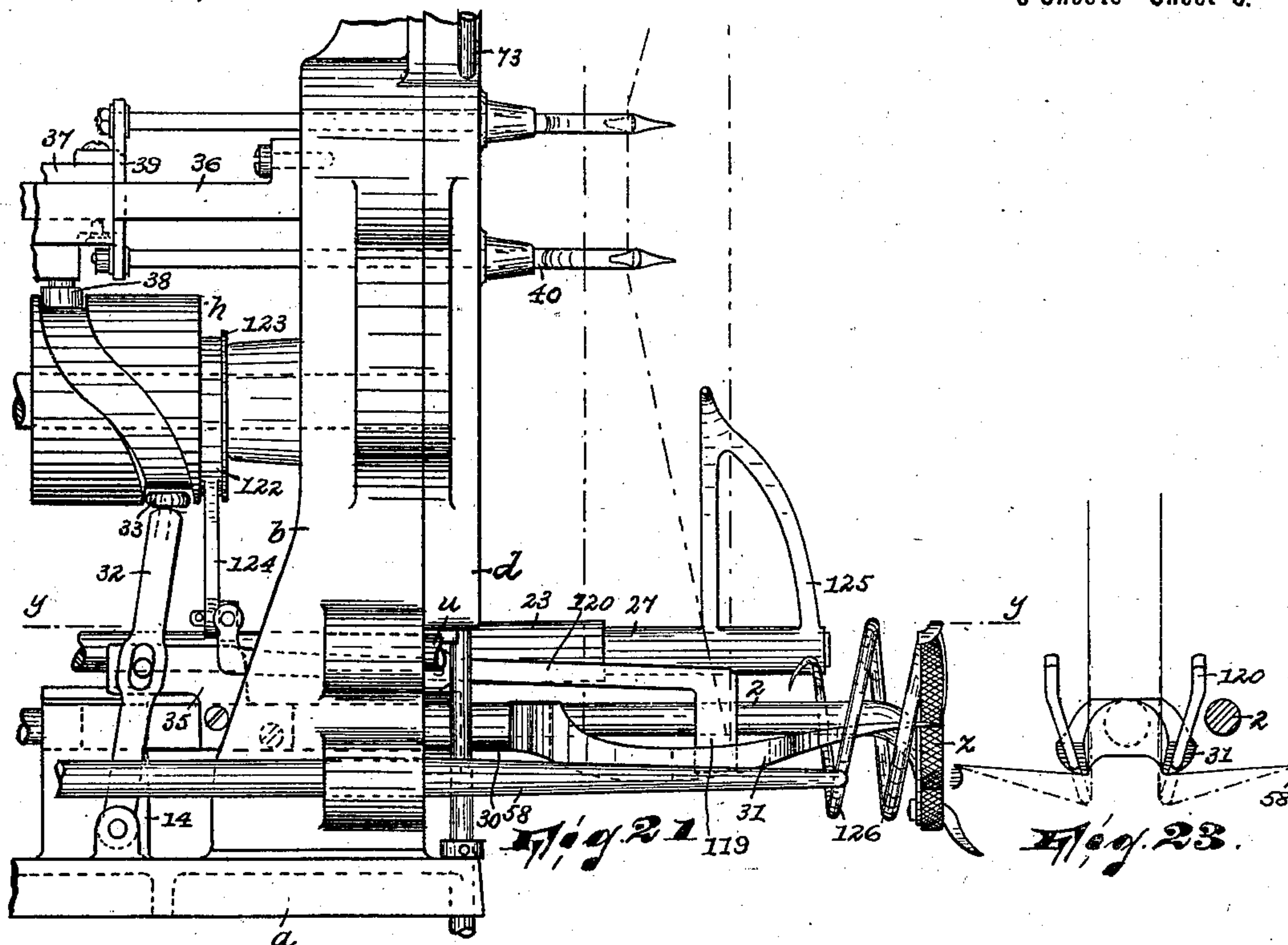


Fig. 22.

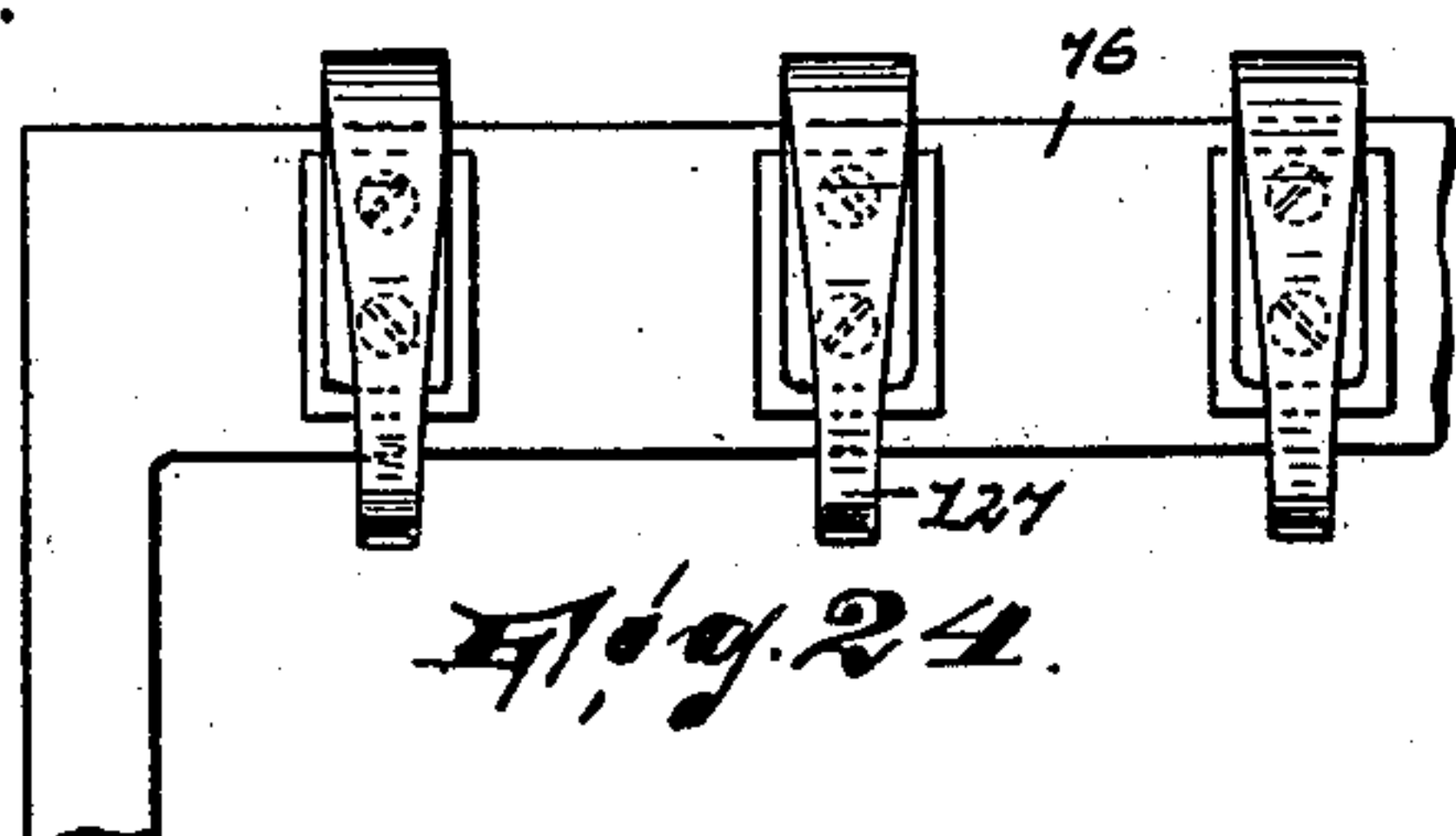


Fig. 24.

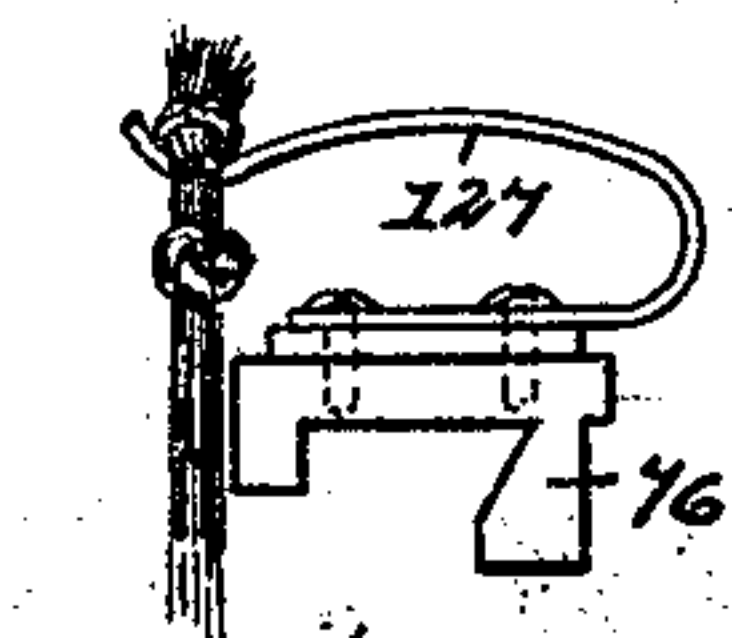


Fig. 25.

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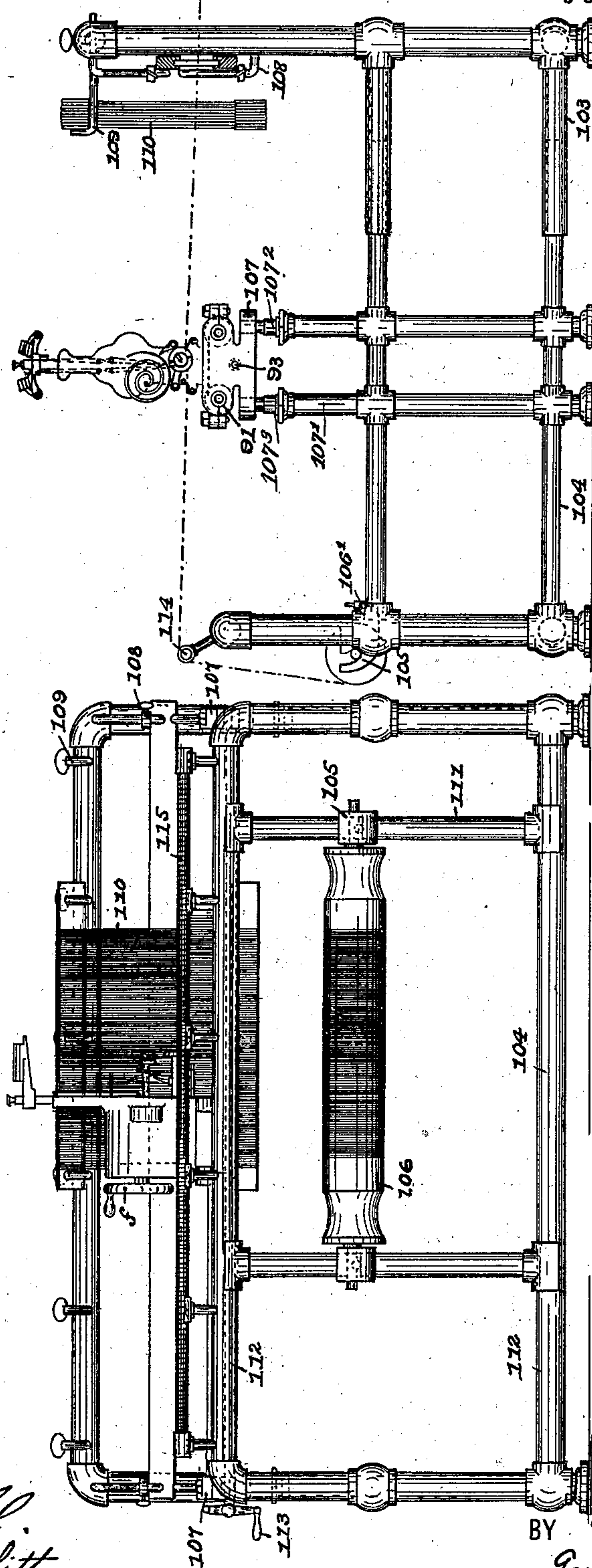
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(Application filed Apr. 18, 1901.)

(No Model.)

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UNITED STATES PATENT OFFICE.

WILLIAM E. KREY, OF NEW YORK, N. Y., AND ANTON DUPPLER, OF JERSEY CITY, NEW JERSEY, ASSIGNORS TO THE AUTOMATIC TWISTING-IN MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

WARP-TWISTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 695,566, dated March 18, 1902.

Application filed April 16, 1901. Serial No. 56,065. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM E. KREY, residing in New York, in the county and State of New York, and ANTON DUPPLER, residing in Jersey City, in the county of Hudson and State of New Jersey, citizens of the United States, have invented certain new and useful Improvements in Warp-Twisting Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to twisting-machines; and it has reference particularly to the machine of this nature set forth in United States Letters Patent No. 648,738, issued to Albert Goss May 1, 1900, the general objects of the invention being to effect improvements looking toward increased durability of the machine and its greater efficiency and accuracy in operation.

The invention is fully illustrated in the accompanying drawings, wherein corresponding letters of reference indicate like parts, and wherein—

Figure 1 is a view in side elevation of the machine in operative position on a specially-constructed frame. Figs. 2 and 3 are respectively views in front and rear elevation of the machine. Fig. 4 is a horizontal sectional view taken on the line xx in Fig. 1. Fig. 5 is a vertical sectional view of the front portion of the frame, taken in the plane of the right-hand pair of hook-bars. Fig. 6 is a front view of what is shown in Fig. 5, a certain cover-plate being removed. Figs. 7 and 8 are respectively front and side views of a part of the mechanism whereby power is transmitted from the main shaft to other parts of the machine. Fig. 9 is a plan view of one of the pairs of hook-bars and a part of their driving mechanism. Fig. 10 is a front view of said hook-bars, showing the arrangement of the threads. Figs. 11, 12, 13, and 14 are detail views illustrating the hook-bar-driving mechanism. Figs. 15 and 16 are respectively a

front view and a vertical sectional view of the upper portion of a vertically-reciprocating frame, showing the feeding mechanism for a certain automatically-movable thread-sustaining means or clamp which said frame carries. Fig. 17 is a top plan view of said frame and the thread-sustaining means or clamp which it carries. Fig. 18 is a view in side elevation of a portion of said thread-sustaining means or clamp. Fig. 19 is an enlarged vertical sectional view of a part of one of said clamps proper. Fig. 20 is an enlarged detail view, partly in section, of the mounting for the revoluble member of the twisting mechanism. Figs. 21 and 22 are respectively a view in side elevation and a view in horizontal section on the line yy in Fig. 21 of a modified form of the machine. Fig. 23 is a view in front elevation of a portion of what is shown in Fig. 21. Figs. 24 and 25 are detail views illustrating a modified form of thread-sustaining means; and Figs. 26 and 27 are front and side views, respectively, of a special form of twisting-in frame.

The machine is designed especially with the idea of applying it to the operation of twisting in new warps in the process of weaving, thus employing it to supersede the usual hand operation. For this purpose it may be supported in an operative position on the loom by any suitable brackets. However, we prefer to mount it upon an automatically-movable carriage, such as is shown in the drawings, said carriage being mounted upon guides arranged in the loom or in a twisting-in frame, such as is shown in Figs. 26 and 27 and usually employed where it is expedient to remove the old warp, together with its harness and reed, from the loom in order to perform the twisting-in operation.

In said drawings, a designates the base of the machine, and b and c denote two uprights, the former of which is considerably higher than the other and is formed with a cavity c' , covered by a plate d , which is secured to the front face of said upright in any suitable manner. In said uprights is journaled the main shaft e of the machine, the rear end of which carries a hand-wheel f , secured thereon by a milled nut g . Between the uprights and

mounted on said shaft is arranged a cam *h*, having a peripheral camway *i*. In the cavity *c'* and mounted on the front end of the shaft *e* are a roller-carrying disk *j*, a pin-wheel *k*, and a gear *l*, they being disposed in the order named, with the disk adjacent the end of the shaft.

In the projection *m* of the upright *b* and in the plate *d* is journaled at one side of the shaft *e* another shaft *n*, which carries a pinion *o*, which is driven by the gear *l* through an intermediate pinion *p*. The front end of the shaft *n* has pivotally connected to it the rear end of an extension-shaft *q*, which terminates in a spiral *r* in substantially the shape best shown in Fig. 1 and having its free end disposed adjacent the upright. With the spiral *r* and branching off from the same at *s'* is formed an auxiliary spiral *s*, the outer end of which is free, as seen in Fig. 1. Being jointed with the main portion of the shaft *n* in the manner above indicated, the shaft *q* may be folded around, so as to turn the spirals out of the way. In order to keep the shafts alined, a sleeve *t*, arranged to slide on them and cover their joint, is provided.

u designates a stationary shaft projecting forwardly from the upright *b* and carrying at its front end the stationary member of the twisting mechanism. Said member consists of an arc-shaped pad *v*, secured to a suitable bracket *w*, carried by a sleeve *x*, which is secured on the shaft *u* by a nut *y* or in any other desired manner.

The revoluble member of the twisting mechanism consists of a pad *z*, which is carried by an arc-shaped arm *1*, forming the free end of a spindle *2*, which projects through the plate *d*. At the free end of this and on the periphery thereof is arranged a pair of thread-cutting knives *3*. At the other end is arranged a deflector *4*, adapted to take against the united threads and to force them away from the face of the pad *z* should they tend to adhere thereto.

5 is a guide which is formed with an oblique portion *6* and which is mounted on the bracket *w* for the stationary member of the twisting mechanism, said guide being adapted to coact with the knives in facilitating the cutting of the threads. The rear end of the spindle *2* is reduced and provided with an internally-threaded socket *7*, into which is screwed a stem *8*, having a milled nut *9* at its free end. A sleeve *10*, which incloses the reduced portion of the spindle and the stem, is clamped by the milled nut between the latter and the shoulder formed at *11* on the spindle. The sleeve is journaled in the uprights *b* and *c*. On said sleeve is adjustably secured a collar *12*, between which and a projection *13* of a post *14* on the base *a* between the uprights *b* and *c* is compressed a spring *15*, coiled about the shaft. The tendency of the spring is to normally press the rotary shaft *2* longitudinally and the member of the twisting mechanism outwardly. The spindle *2* is mounted in the

manner above described so as to be removable for repairs or for replacing with a new one. This may be done without altering the predetermined tension which the spring exercises on said mechanism by simply unscrewing the threaded stem *8*, removing the spindle *2*, replacing a new one, and screwing up the stem again.

The sleeve *10* carries a gear *16*, which is connected with another gear *17* on the shaft *e* by an intermediate gear *18*, being journaled on a stud *19*, projecting from the upright *c*.

20 is a shaft which is journaled in the two uprights and carries a crank *21*, connected with an eccentric point *21'* on the intermediate gear *18* by a link *22*. The forward end of this shaft carries a sleeve *23*, which incloses a spring *24* and which is provided with a slot *25*, (see Fig. 2,) which extends inwardly from the free end thereof and which at its rear end connects with an angular notch *26* in said sleeve. The sleeve thus forms one member of a bayonet-joint, of which the other member is a short shaft *27*, having a lug *28*, adapted to be received by the notch, and a curved finger *29*. By pressing the shaft inwardly and then turning it till its lug is alined with the slot said shaft may be removed so as to get the finger out of the way when desired.

30 denotes a longitudinally-reciprocating shaft which works in the upright *b* and has its rear end squared and guided in the post *14*. The forward end of the shaft carries a fork *31*, whose members have their inner faces first curved outwardly and then inwardly toward each other, their ends terminating the one slightly above the other. The fork is reciprocated by means of a lever *32*, which is fulcrumed in the base *a* at its lower end and which engages the camway *i* of the cam *h* through the medium of an anti-friction device *33*, if desired. This lever has a slot-and-pin connection *34* with an arm *35*, carried by the shaft of the fork.

36 designates an arm which projects rearwardly from the upright *b* and on which reciprocates a carriage *37*, having an anti-friction device *38*, which works in the camway *i* of the cam *h*. In a plate *39*, forming a part of the carriage, are swiveled the rear ends of hook-bars *40*. Said hook-bars are journaled in integral thimbles *41*, forming a part of the plate *d*. The rear portion of each hook-bar is squared, as at *42*, and said squared portion carries a pinion *43*, which is free to turn on a flanged sleeve *44*, having a squared opening which fits the squared portion of the hook-bar and against the flange of which said pinion is pressed by a spiral spring *45*, interposed between the pinion and a washer *46*, taking against the rear wall of the cavity *c'*. The adjacent faces of the pinion and disk are provided with ratchet-teeth *47*, the nature of which is such that the pinion may be employed to rotate the hook-bar through the ratchet, while, if desired, the hook-bar may be man-

ually turned in the same direction independently of the pinion. The forward end of each hook-bar is formed with an offset hook portion 48, which is preferably flattened and pointed. These hook-bars are arranged in two pairs, the one beside the other, as seen in Fig. 2, their several pinions being grouped about and engaging a gear 49. With one of the pinions 43 engages another gear 50, which is journaled in the cavity *c'* and with which is formed a star-wheel 51, having alternating notches 52 and recesses 53, adapted to respectively and alternately receive the pin 54 of the pin-wheel *k* and the periphery of the body portion 55 of said pin-wheel. By this motion (the ordinary Geneva stop-motion) the hook-bars are adapted to be intermittently rotated each time a half-revolution.

56 denotes a vertically-reciprocatory frame, which is guided for movement between the upright *b* and its plate *d*, the lower end of said frame being bifurcated and carrying a pair of parallel and horizontal rods 57, constituting thread-guides. These rods are movable up and down with the frame between other parallel and horizontal rods or thread-guides 58, which are extended through the two uprights and secured by milled nuts 59, the idea being to arrange them removably, so that they may be taken out and straightened. The upper part of the frame 56 is of rectangular rod-like form; and on it is mounted the thread-sustaining means. It is actuated by a roller 56' on the disk *j*, which works in a curved slot 57' in said frame.

60 denotes a bifurcated support, (see Figs. 1 and 17,) which is penetrated by the rod-like portion of the frame 56 and which is sustained thereon by a horizontal screw 61, penetrating said support and the frame 56 and arranged to turn freely in them. In the support and mounted on the screw with the key 62 of which its feather 63 engages is a worm-gear 64. The screw 61 is adapted to be engaged, for the purpose of advancing it in the support, by a block 65, which has threading engaging the threading of the screw and which is carried at the lower end of a spindle 66, which is normally pressed downwardly by a spring 67, compressed between the block and a slotted plate 68, surmounting the frame 56. By grasping a knob 69 which the spindle carries and raising and then turning it through ninety degrees the cross-piece 70, which the spindle carries, may be made to rest on the top of the plate 68 transversely of its slot to sustain the block out of engagement with the screw. The worm-gear 64 is engaged by a worm 71, loosely arranged on the upper squared portion 72 of a vertical rotary rod 73, which extends down through the upright *b* and through the base of the machine.

74 is simply a tubular guard for the screw 61. The parts 75 of the bifurcated portion of the support 60 serve as guides for a carriage 76, having outwardly-extending parallel arms

77. In these arms are fulcrumed pairs of levers 78, each pair carrying one of the two clamps for the warp ends. Each clamp consists of three members—a bottom member 79, which rigidly connects the ends of the levers, an intermediate member 80, and a top member 81. The member 80 carries at one end a head 82, the ends of which afford pivotal connections between the three members. The free end of the intermediate member is formed with a hook 83, with which engages a clip 84, carried by links 85, which are pivoted in the bottom member, said clip being thus adapted to lock the intermediate member down. The clip carries a plate 86, which is adapted to extend over the top member and at its free end to be clamped down by a latch 87, its pivoted end bearing, as at 88, on the free end of the top member. It is preferable that the contacting faces of the intermediate and top members be concavo-convex and that the bottom and top faces of said members, respectively, be concave and convex, for the warp is adapted to extend relatively to the parts of the clamp, as shown in Fig. 19. The clamp being pivotally mounted on the carriage 76 in the manner above indicated rests on a curved spring-plate 89 on said carriage, so as to offer resiliency when the warp is drawn up taut.

The end of the screw 61 is swiveled to the carriage 76, being thus adapted to advance the same as it itself advances. The object of this is to cause the threads to successively occupy a given position relatively to the hook-bars and the other parts as they are successively engaged thereby—in other words, to arrange them so that they will all be engaged at approximately the same position and as much under the same condition of tension as possible.

90 denotes a carriage in which the base *a* of the machine is clamped and which is arranged to slide on guide-rods 91. In order to advance the carriage, and with it the machine, as the work proceeds, an internally-threaded tubular block 92, journaled in the carriage and engaging a screw 93, is provided, said block having a ratchet 94, which is engaged by a pawl 95, carried at the lower end of a lever 96, which is fulcrumed at 97 in the upright *c* and bears against a cam 98 on the shaft *e* of the machine. Thus as the shaft *e* is rotated the resultant intermittent action of the lever is utilized to advance the machine. The block 92 also carries a gear 99, meshing with a pinion 100 on a short shaft 101, which is carried by the carriage 90 and which is connected with the rod 73 by bevel-gearing 102.

It is preferred that the guide-rods and screw 93 be mounted in the specially-constructed frame shown in Figs. 26 and 27. This frame is preferably constructed of tubing, a portion of it, 103, being telescoped with the other portion thereof, 104. 105 denotes bearing-blocks arranged in the portion 104 of the frame and adapted to carry the beam 106 for

the new warp, being rendered vertically adjustable in said frame by thumb-screws 106'. With parallel vertical tubular parts 107' of the portion 104 are telescoped spindles 107² of supports 107, said spindles carrying nuts 107³, having threaded engagement with them and resting on the tops of said tubular parts. Said supports carry the guide-rods 91 and screw 93. The portion 103 is provided with clamps 108 for the reed, and with racks 109 for the harness 110, said harness and reed being that for the old warp and being, with said old warp, removed from the loom. The tubular parts 111 of the frame in which the bearing-blocks 105 are mounted may be arranged to be adjustable laterally by being guided between the horizontal portions 112 of the frame, so as to accommodate various lengths of beam 106. In order to turn the screw 93 so as to manually feed the machine back to its starting-point, a crank 113 may be arranged on one end of said screw. Since the warp extending from the beam 106 has a tendency under the actuation of the machine to work laterally, this may be obviated by providing the bar 114, over which the warp extends from said beam, with a series of corrugations 115, as by being threaded, wrapped with wire, or the like.

The operation of the machine will now be described: The hand-wheel *f* being revolved the block 92 will feed along the screw 93, moving the carriage with it along the guides 91. The machine moves backward as it unites the threads, leaving the joined threads one after another in front of it. In other words, viewing the machine as seen in Fig. 26, it moves from right to left. Before the machine is put into operation a corresponding portion of each warp is so disposed that each extends over one of the rods 58 under the adjacent rod 57 and then under the adjoining member of the fork 31, whence it extends upwardly to the clamp, where it is secured, as shown in Fig. 19. It should be remarked that the threads of each warp are arranged in two sets, the corresponding threads of which cross each other between the members of the corresponding pair of hook-bars—*i. e.*, one upper and one lower hook-bar—as shown in Fig. 10, said hook-bars extending between the two sets above and below the crossing therein, as clearly described in the patent to Goss, referred to, and having their hooks extending in relatively opposite directions. A tension should be maintained on the threads. As the shaft rotates an intermittent semi-revolution is imparted to each pair of hook-bars through the gearing already described, which is inclosed in the cavity *c'*, and intermittently with such semirevolutions said hook-bars are reciprocated by the carriage 37 from the cam *h*, so that the desired separating of the threads in each warp, one by one, will be effected. The ends of the hook-bars being offset, as at 48, the threads released stand absolutely disengaged with the hook-bars or

clear of the same—in other words, extend absolutely free and unengaged from the clamp to the fork. When the hook-bars have moved back, they stand idle for a time, whereupon the roller-carrying disk *j* depresses the frame 56, which causes the vertical portions of the warps to move vertically or transversely of the hook-bars in such manner as to cause the release of the outermost or freed threads should their filaments tend to cling to the main body of threads. The drawing back of the hook-bars effects the drawing back of the body of the threads away from the straight line which the freed threads tend to assume, so that a space is left between the main body of threads and the freed threads. Into this space the point of the spiral *r* is now projected as it is turned from the main shaft through the gearing *l p o*, said spiral taking the two released threads and, with the spiral *s*, deflecting them outwardly until they are brought into the range of the rotary member of the twisting mechanism. Simultaneously the lever 32 is actuated by the cam *h* to force the fork 31 outwardly, which thus coacts with the spirals to properly advance the threads to the twisting mechanism. It being undesirable that the main body of threads should also move forward, the finger 29 oscillates to interpose itself between the separated threads and the main body of threads, so as to hold the latter back. Said finger is actuated through its shaft and the crank 21 and link 22 from the pinion 18, as already indicated. The outermost or freed pair of threads being brought by the spirals and the fork into the plane of movement of the rotary member of the twisting mechanism, the upper or vertical end portions of the threads will first be cut off and then the short ends twisted about the body portion of one of them in the manner sufficiently indicated in the patent referred to. By the deflector 4 the joined threads will be ultimately forced out of range of the mechanism. This operation will continue until all the threads which have been taken up and secured by the clamp are disposed of. Meanwhile the machine is moving bodily backward also through the mechanism which connects the clamp-carrying carriage 76 with the rotating block 92 on the shaft 93, said carriage is moved in the other direction, the effect being to keep the clamp in a practically stationary position relatively to the warps. When so much of the warps have been united, the next succeeding portions are clamped into the machine, whereupon the operation proceeds in the same manner.

It being the tendency of each tense thread to engage each coil of the spiral at the uppermost and consequently the rearmost portion thereof the disadvantage in having the engagement-point of the thread with the spiral so far away from the guides 57 that it will tend to unduly drag on the guides as it is advanced by the spiral and not be delivered to the twisting mechanism with accuracy is over-

come by providing the auxiliary spiral *s*, for then after the thread reaches the spiral *s* it has engagement not only with that spiral at the uppermost part thereof, but also with the spiral *r* at a diametrically opposite point—*i. e.*, a point nearest the thread-guides.

It may be desirable to brush the warps out before they have been clamped into the machine, so as to get them into proper disposition. For this purpose we have provided rotary brushes 116, which are journaled in the levers 78 and have cranks 117 for manually turning them.

Inasmuch as the portion of each warp taken is reduced in width after it enters the machine, it is found advisable to curve the inner faces of the fork 31 in the manner already described, for then the threads will stand relatively at right angles to the portions of said surfaces with which they immediately engage, and so be prevented from a tendency to move laterally in the fork.

In the modified form of the invention shown in Figs. 21-23 the vertically-reciprocating rods 57 are done away with and instead we make use of other reciprocating devices, which, by engaging only a few of the threads at a time to effect the desired up-and-down movement thereof, save the wear upon the threads. Moreover, the spirals *r* and *s* are also done away with, certain other expedients being employed to replace them.

The fork 31 is provided in each of its members with a slot 118, in which oscillates vertically a foot 119 on one of a pair of levers 120, which is fulcrumed in and penetrates the upright *b*. The rear ends of these levers are connected by a link 121, which is in turn connected with an eccentric-strap 122 on an eccentric 123, forming a portion of the cam *h* by a pitman 124. Thus as the eccentric rotates the feet 119 are oscillated, as already indicated, these feet engaging, by pressing down, only a few of the threads at a time.

On the shaft 27 in lieu of the finger 29 we provide a tapering spreader 125, which oscillates as the finger does, combining the actions of the finger and the spirals *r* and *s* by interposing its point between the separated threads and the main body of threads to force the latter outwardly toward the twisting mechanism and hold the former back. If desired, the movable member of the twisting mechanism may carry a spiral 126, adapted to take the threads separated after they have been deflected outwardly as far as the spreader can effect this. This spiral simply constitutes practically an extension of the twisting member in question, which already has a substantially spiral form, as seen, for instance, in Fig. 4. In Figs. 21 and 22 the stationary member of the twisting mechanism is removed.

In the modified form of the thread-sustaining means shown in Figs. 24 and 25 spring hooks or hangers 127 are provided, being secured on the carriage 76 in any desired man-

ner. It is designed that a number of the threads be knotted together, as shown in Fig. 25, or otherwise, to form a loop, and then slipped over each of the hangers, which should be arranged in series of any number on the carriage.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination of a frame, a mechanism, carried by said frame, for successively uniting the threads of a warp, said frame being movable substantially transversely of the warp, and mechanism for holding the ends of the warp arranged to move in the frame in the direction opposite to that of the movement of the frame.

2. The combination of a frame, a mechanism, carried by said frame, for successively uniting the threads of a warp, said frame being movable substantially transversely of the warp, mechanism for holding the ends of the warp movably arranged in said frame, means for moving said frame, and power-transmitting mechanism operatively connecting the thread-holding mechanism and said frame-moving means.

3. The combination of a frame, a mechanism, carried by said frame, for successively uniting the threads of a warp, said frame being movable substantially transversely of the warp, a carriage arranged in said frame for movement in a direction opposite to that of the movement of said frame, warp-holding clamps carried by said carriage, means for moving the frame, and power-transmitting mechanism operatively connecting said carriage and the frame-moving means.

4. In a machine for successively uniting warp-threads, the combination, with the frame, of a uniting mechanism, means for successively advancing the threads to be united to said uniting mechanism, and thread-sustaining means arranged in said frame and movable in the direction of movement of the threads toward said uniting mechanism, substantially as described.

5. In a machine for successively uniting warp-threads, the combination, with the frame, of a uniting mechanism, means for successively advancing the threads to be united to said uniting mechanism, guides arranged in said frame, a carriage movable on said guides, means for moving said carriage, and warp-sustaining clamps mounted on said carriage, substantially as described.

6. In a machine for successively uniting warp-threads, the combination, with the frame, of a uniting mechanism, means for successively advancing the threads to be united to said uniting mechanism, a support arranged in said frame, a carriage guided on said support, a screw swiveled in said carriage and engaging the support, a gear keyed on said screw, a worm engaging said gear, and warp-sustaining clamps mounted on said carriage, substantially as described.

7. In a thread-releasing mechanism for twisting-machines, the combination, with a support, of a pair of reciprocatory and revoluble hook-bars mounted in said support and having their hooks projecting laterally therefrom and in relatively opposite directions, the hook-carrying portion of each hook-bar being offset out of alinement with the other portion of said hook-bar, substantially as described.

8. In a machine for successively uniting warp-threads, the combination, with the frame, of spaced thread-holding means, and a pair of reciprocatory and revoluble hook-bars arranged in said frame between said holding means substantially in the plane in which the threads extend between said holding means and having their hooks projecting laterally therefrom and in relatively opposite directions, the hook-carrying portion of each hook-bar being offset out of said plane, substantially as described.

9. In a thread-releasing mechanism for twisting-machines, the combination, with a support, of hook-bars penetrating said support, sleeves journaled in said support and penetrated by and revoluble with said hook-bars, a pinion loosely arranged on each sleeve and having a ratchet-like engagement there-with, a gear engaging the several pinions, a combined gear and star-wheel, said last-named gear engaging one of the pinions, and a pin-wheel engaging said star-wheel, substantially as described.

10. In a twisting mechanism for twisting-machines, the combination, with a frame, of a stationary member, a revoluble member adapted to wipe against said stationary member, a rotary, longitudinally-yielding and spring-actuated shaft-like support carrying said revoluble member and journaled in said frame, substantially as described.

11. In a twisting mechanism for twisting-machines, the combination, with a frame, of a stationary member, a revoluble member adapted to wipe against said stationary member, a rotary spindle carrying said revoluble member, a sleeve removably arranged on said spindle, a collar arranged on said sleeve, and a spring interposed between said collar and a portion of the frame, substantially as described.

12. The combination, with a frame, of a rotary spiral arranged in said frame, a shaft carrying said spiral, a rock-shaft, a finger carried

by said rock-shaft, a crank on said rock-shaft, a gear, a link connecting said crank with an eccentric point on the gear, and power-transmitting mechanism operatively connecting said gear and the spiral-carrying shaft, substantially as described.

13. The combination, with a frame, of a rock-shaft journaled in said frame, a finger carried by said rock-shaft, a fork arranged to reciprocate substantially parallel with said shaft, a gear journaled in said frame, a crank on said rock-shaft, a link connecting said crank with an eccentric point on the gear, and power-transmitting mechanism operatively connecting said gear and said fork, substantially as described.

14. In a machine for successively uniting warp-threads, a thread-deflecting device comprising two spirals intercoiled with each other about a common axis, substantially as described.

15. In a warp-sustaining clamp, the combination of three coacting members pivotally connected together at one end, a clip adapted to bind together the free ends of two of said members, and means for binding the third member against said first-named members, a part of said means being carried by the clip, substantially as described.

16. In a mechanism for holding one portion of a warp at a narrower width than another portion thereof, a device adapted to be engaged by the threads to maintain a turn therein and having a concave thread-engaging surface on the side thereof away from the wide portion of the warp, substantially as described.

17. In a mechanism for holding one portion of each of two warps at a narrower width than another portion thereof, a bifurcated device adapted to receive and be engaged by the threads to maintain a turn therein, the members of said device having concave thread-engaging surfaces on the sides thereof away from the wide portions of the warps, substantially as described.

In testimony that we claim the foregoing we have hereunto set our hands this 13th day of April, 1901.

WILLIAM E. KREY.
ANTON DUPPLER.

Witnesses:

ALFRED GARTNER,
JOHN W. STEWARD.