

No. 686,724.

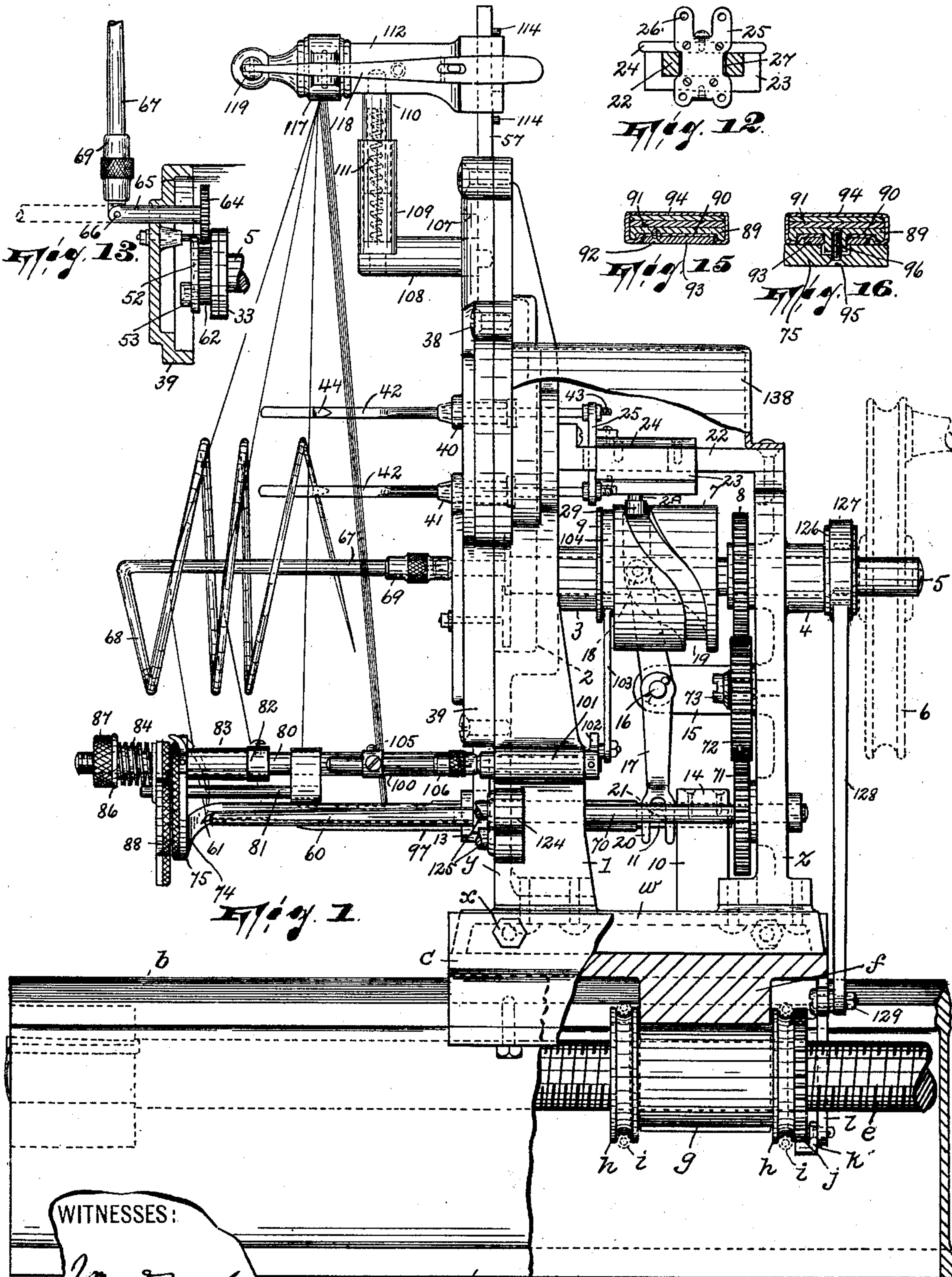
Patented Nov. 19, 1901.

A. GOSS.  
TWISTING MACHINE.

(Application filed June 30, 1900.)

(No Model.)

5 Sheets—Sheet 1.



WITNESSES:

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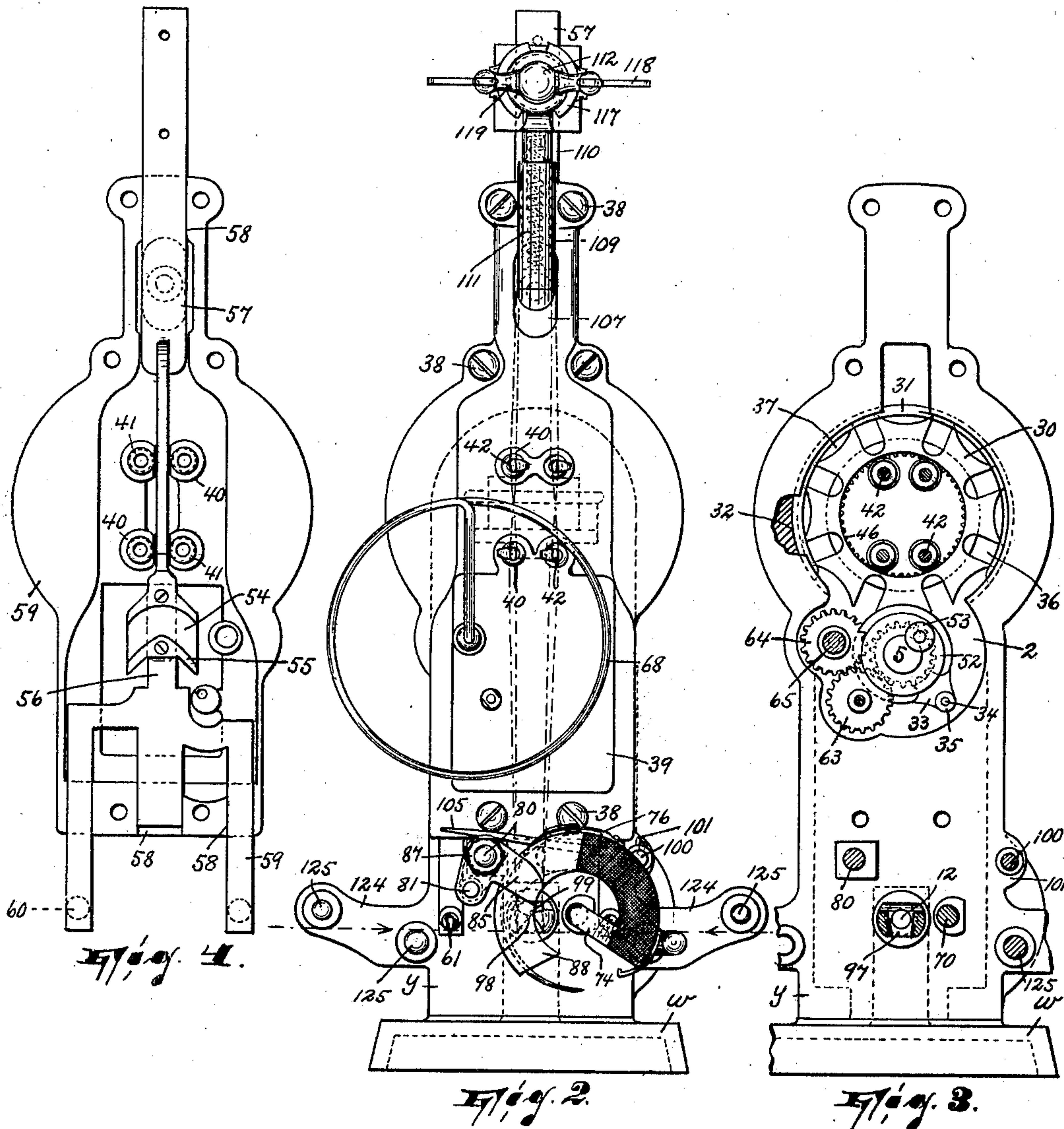
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5 Sheets—Sheet 2.



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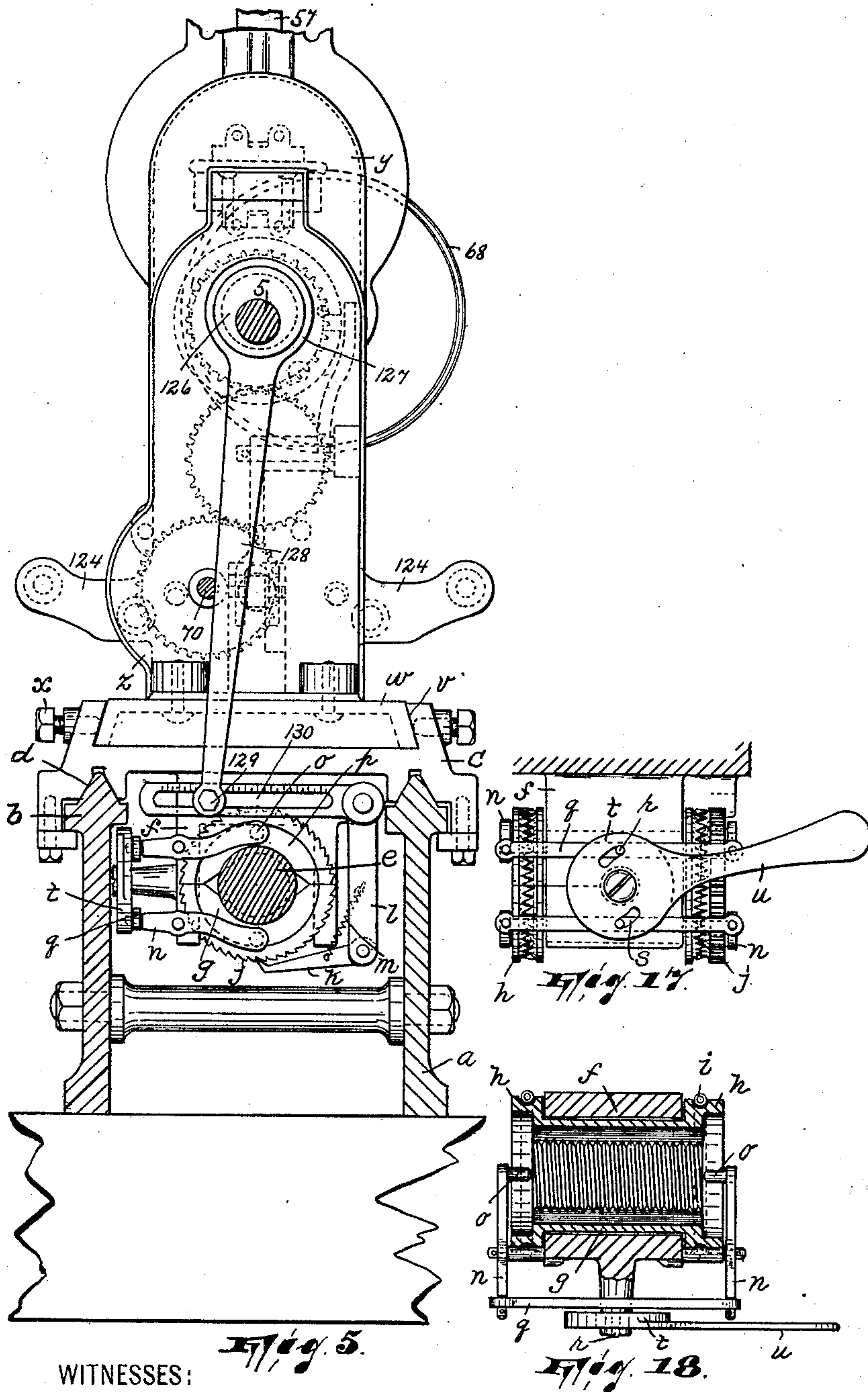
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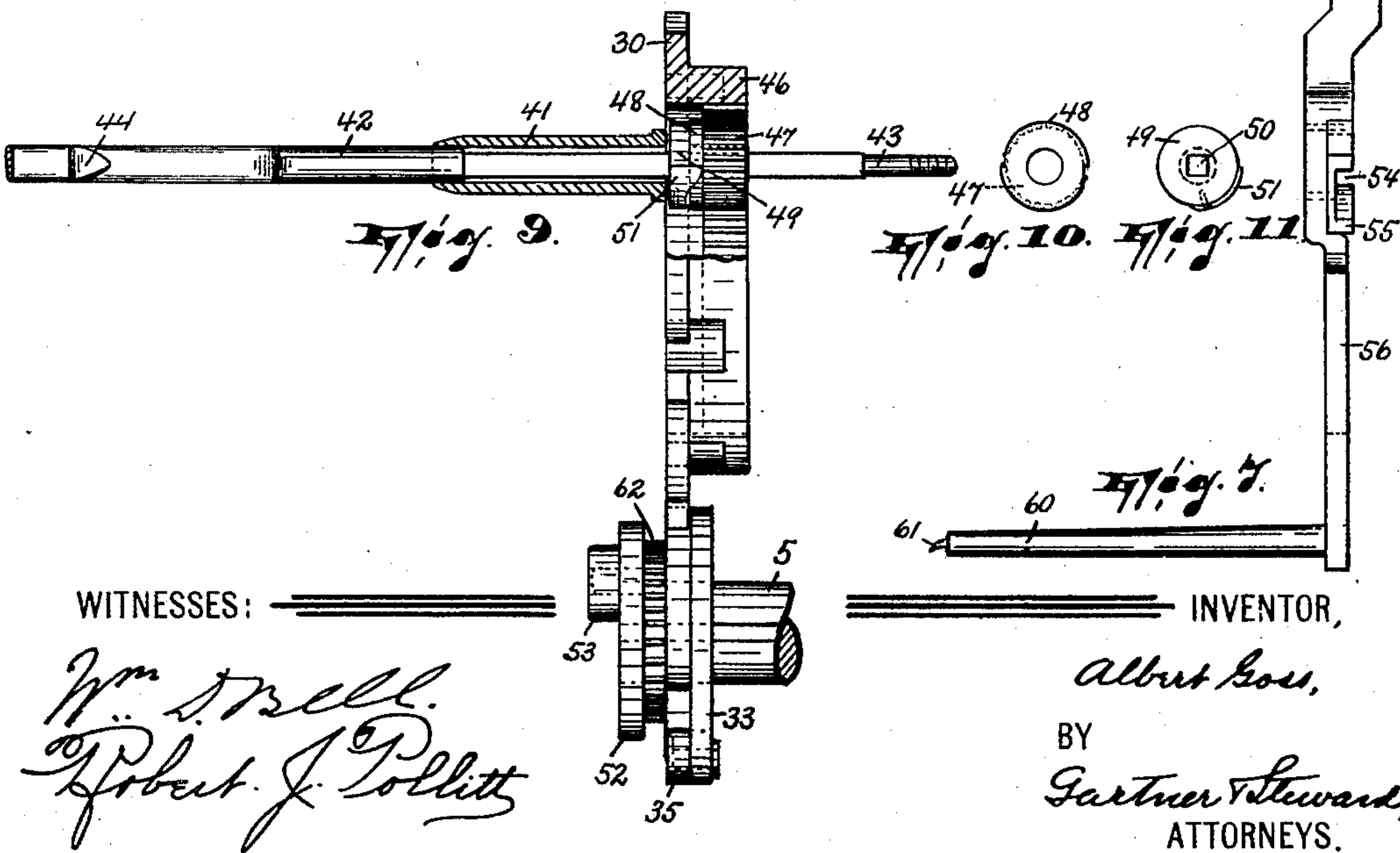
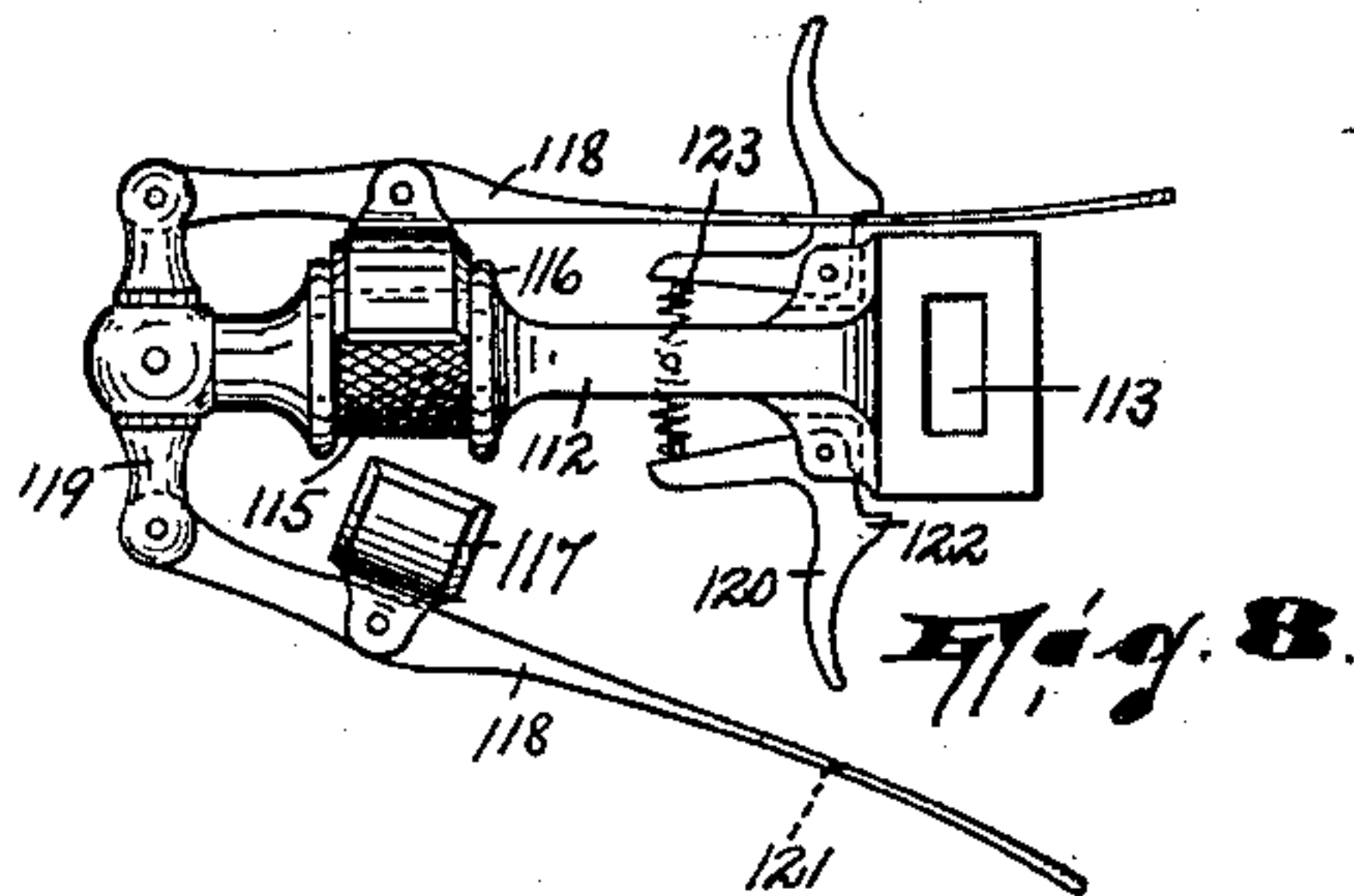
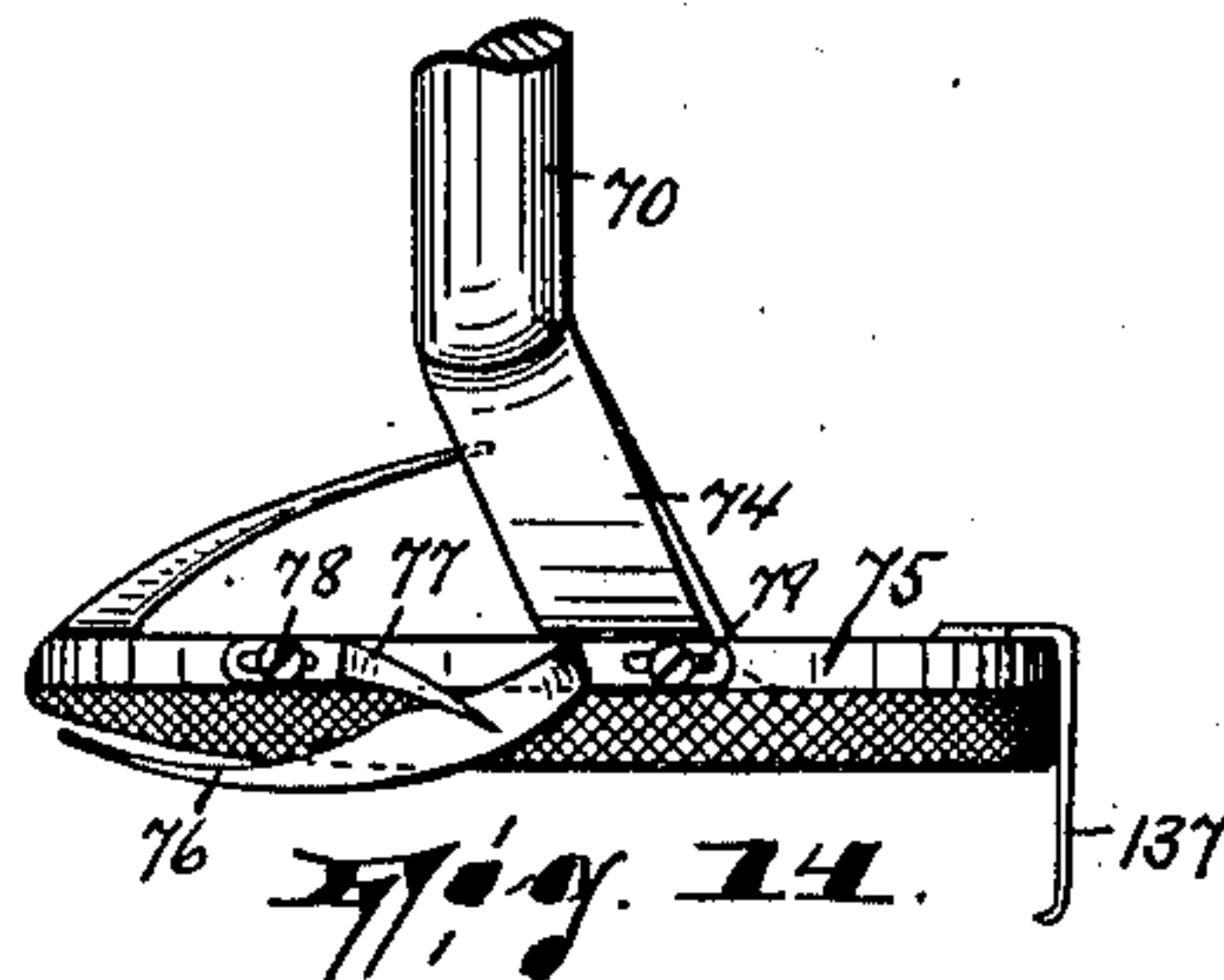
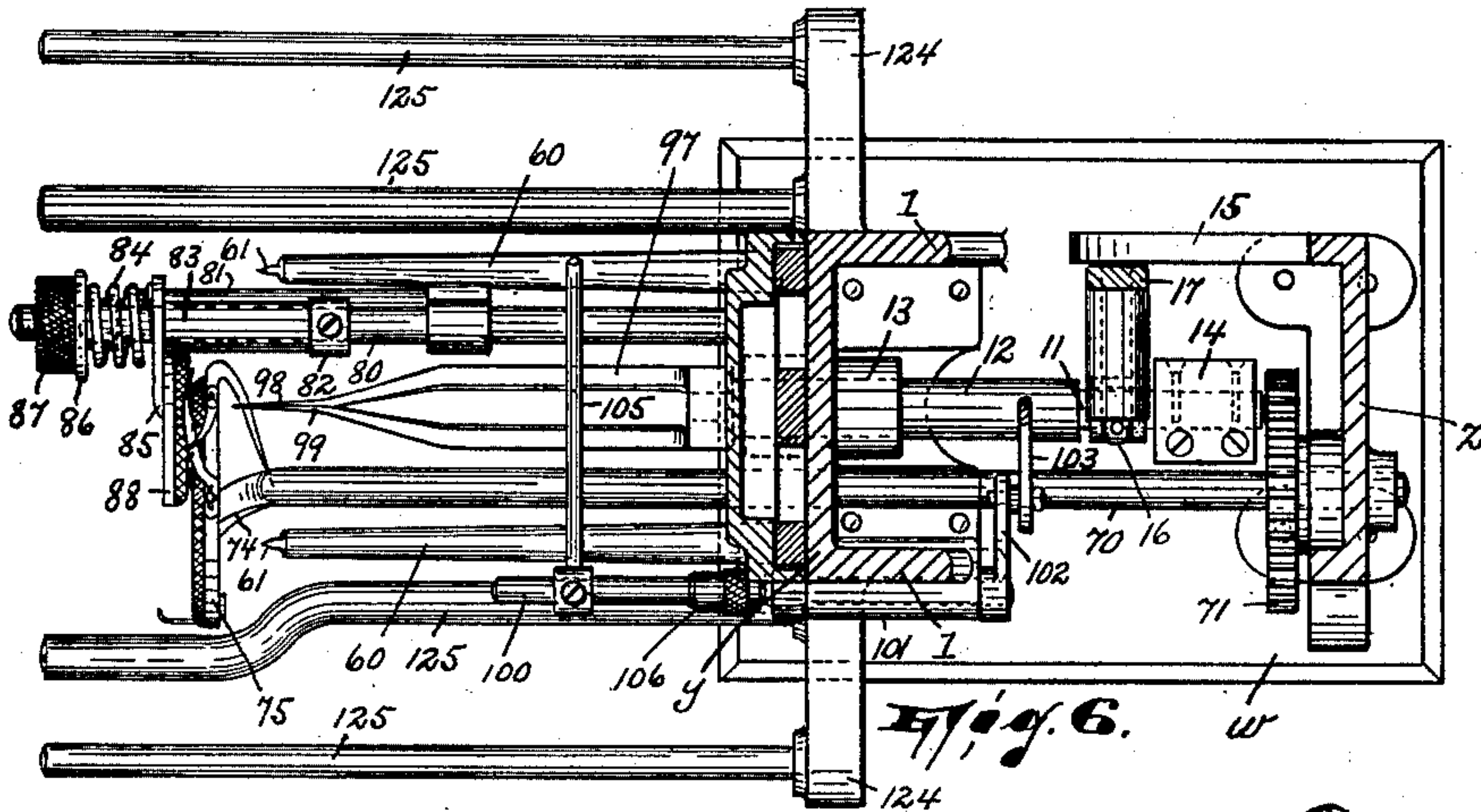
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5 Sheets—Sheet 4.



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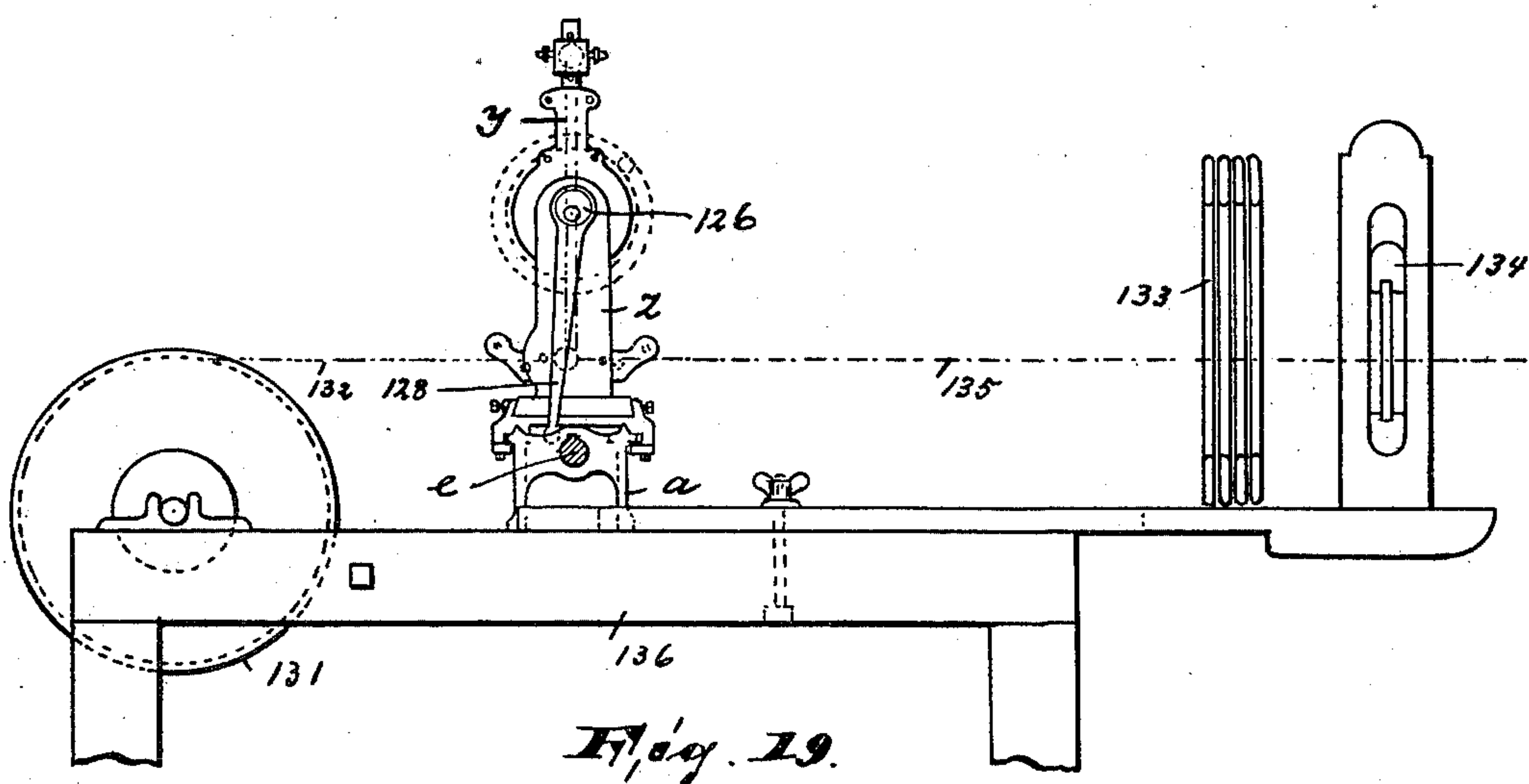
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5 Sheets—Sheet 5.



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# UNITED STATES PATENT OFFICE.

ALBERT GOSS, OF PATERSON, NEW JERSEY, ASSIGNOR TO AUTOMATIC TWISTING-IN MACHINE COMPANY, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## TWISTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 686,724, dated November 19, 1901.

Application filed June 30, 1900. Serial No. 22,141. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT GOSS, a citizen of the United States, residing in Paterson, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Twisting-Machines; and I 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 me May 1, 1900.

The object of this my present invention is to improve upon the machine above referred to, simplifying the construction of the same and rendering it more durable, more accurate and efficient in operation, and easier of manipulation.

I have fully illustrated my invention in the accompanying drawings, wherein corresponding characters of reference indicate like parts, and wherein—

Figure 1 is a view in side elevation of my improved twisting-machine and a carriage adapted to support it in operative position, certain parts being illustrated as partially broken away. Fig. 2 is a view in front elevation of the twisting-machine detached from the said carriage. Fig. 3 is a view substantially like Fig. 2, certain parts, however, being removed. Fig. 4 is a rear face view of some of the parts that are removed from the machine, as shown in Fig. 3. Fig. 5 is a rear view of substantially what is shown in Fig. 1. Fig. 6 is a horizontal sectional view on the line  $x$  in Fig. 1. Fig. 7 is a view in side elevation of a certain movable member designed to impart longitudinal movement to the threads to be united, so as to facilitate their separation. Fig. 8 is a top plan view of a device for sustaining the threads. Fig. 9 is an enlarged view in side elevation, partly

in section, of a portion of a mechanism designed to effect the successive separation of the threads from the main body thereof. Figs. 10 and 11 are detail views of a portion of the mechanism shown in Fig. 9. Fig. 12 is a sectional view on the line  $y y$  in Fig. 1, showing another portion of the mechanism for effecting the successive separation of the threads from the main body thereof. Fig. 13 is a detail view showing the manner of mounting and also the actuating mechanism for a certain spiral hook, whereby the threads to be united are successively deflected from the main body of threads to the twisting mechanism. Fig. 14 is a side view of the movable member of the twisting mechanism. Figs. 15 and 16 are detail views in section, showing the construction of the members of the twisting mechanism. Figs. 17 and 18 are respectively a side view and a view in elevation, partly in section, of the means for actuating the carriage supporting the machine; and Fig. 19 is a view in side elevation of an apparatus known as a "twisting-in" frame, showing my machine operatively supported by its carriage on said 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 upon the loom by any suitable bracket. However, I prefer to mount it upon an automatically-movable carriage, such as is shown in the drawings, such carriage being mounted upon guides arranged in the loom or in a twisting-in frame, such as is shown in Fig. 19, 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 an elongated rectangular frame, the top edges of whose longer sides form guides  $b$ , upon which slides a carriage  $c$ , said carriage having grooves  $d$  in its under side, which receive the guides. In the end walls of the frame is secured a stationary screw  $e$ , which extends from one end



to the other of the frame, being inclosed thereby. The carriage is provided with a downwardly-extending integral yoke *f*, which straddles the screw *e*.

5 *g* designates a two-part cylindrical block which is internally threaded and receives the screw *e*, its threading being adapted to engage the threading of the screw when its members are closed. Said block is provided with  
10 two grooved heads *h*, which take against the opposite faces of the yoke which receives said block. In order to keep the members of the block closed or clamped together, the grooved heads are surrounded by endless spiral  
15 springs or elastic bands *i*. One of the heads *h* is formed with an integral ratchet *j*, with which engages a pawl *k*, that is carried by one arm of a bell-crank lever *l*, which is fulcrumed in the carriage *c*, said pawl being controlled  
20 by a spiral spring *m*, connecting it with the lever. The other arm of the bell-crank lever is the arm whereby power is transmitted to said lever to vibrate it.

It will be understood, in view of the above  
25 description, that the vibration of the bell-crank lever is adapted to effect the advance of the carriage as the pawl *k* is actuated by said lever to turn the block *g* on the screw. In order that the carriage may be released  
30 from the screw and manually moved, I provide pairs of levers *n*, which are fulcrumed in the yoke and are provided at their inner ends with pins *o*, which engage annular grooves *p*, formed in the ends of said block,  
35 the corresponding members of the pairs of levers being connected by rods *q*, carrying pins *r*, which work in eccentric slots *s* in a disk *t*, journaled on the yoke and having an operating-handle *u*. It will be observed that  
40 by simply turning the disk *t* the free ends of the pairs of levers will be spread, thus opening the two-part block and releasing it from the screw.

It will be understood that the frame *a* is  
45 arranged on the loom or the twisting-in frame at right angles to the warp, so that the twisting-machine may be moved by its carriage from one side to the other of the warp.

The carriage *c* is provided with a dove-  
50 tailed groove *v*, formed in its upper surface, said groove being adapted to receive the correspondingly-shaped base *w* of the twisting-machine, which base may be adjustably secured in position by set-screws *x*. Upon said  
55 base are secured two uprights *y* and *z*, the upright *y* being somewhat higher than the upright *z* and having side webs or flanges 1, as seen in Figs. 1 and 6. Said upright is also  
60 provided with a cavity 2 in its front face, formed by coring out the material of which it is composed. In aligned bosses 3 and 4, formed on said upright, is journaled a horizontal shaft 5, which shaft may carry a driving-wheel 6. (Shown in dotted outline in  
65 Fig. 1.) Upon said shaft, between the uprights, is a cam 7, which is jammed fast on the shaft. Also upon said shaft, between the cam

7 and the upright *z*, is keyed fast a gear 8, and projecting from the end of the cam which is adjacent to the upright *y* is an in- 70  
tegral eccentric 9.

10 designates an integral post projecting upwardly from the base between the uprights, said post sustaining the reduced squared end 11 of a reciprocating shaft 12, 75  
which projects through and is guided in a boss 13 in the upright *y*. The squared end of this shaft is held in place upon the post by a cap 14, surmounting said post.

15 is an integral arm which projects for- 80  
wardly from the upright *z*, and on a pin 16, projecting from said arm, is fulcrumed a lever 17, the upper end of said lever carrying a roller 18, which engages the camway 19 of the cam 7. The lower end of the lever is bifur- 85  
cated, receiving the squared end of the shaft 12, each of its bifurcated portions in turn constituting a fork 20, which receives the end of a pin 21, that protrudes through said shaft.

22 designates a squared arm, which is se- 90  
cured to the upright *y* above the shaft 5, extending rearwardly from said upright parallel to the shaft. Upon this arm is adapted to slide the carriage shown in Fig. 12. This carriage consists of a longitudinally-recessed 95  
block 23, covered by a plate 24, which is secured upon the same over the recess therein, said recess being adapted to receive the arm 22. To the front end of the carriage is se- 100  
cured a plate 25, with preferably four apertures 26, said plate penetrating a longitudinal slot 27 in the arm. The carriage is reciprocated by the cam 7, said carriage having a downwardly-extending pin 28, upon  
105 which is a roller 29, that works in the camway of said cam. In the recess or cavity 2, formed in the upright *y*, is disposed a star-wheel 30, said star-wheel approximately fitting the upper portion of said cavity, which is substantially circular, and being held there- 110  
in by an elastic split ring 31, fitting in a groove 32 in said cavity. Keyed on the shaft 5 is a pin-wheel 33, carrying on its pin 34 a roller 35. The star-wheel is provided with alternating notches and shallow recesses 36 115  
and 37, respectively. The relative disposition of the star-wheel and pin-wheel is such that in every revolution of the pin-wheel its roller engages one of the notches of the star-wheel to advance the latter, said star-wheel 120  
being held stationary by the pin-wheel, between the actuations thereof, by virtue of the fact that the periphery of the pin-wheel engages the recesses of the star-wheel, approximately fitting the same. 125

Upon the front face of the upright *y* is secured over the recess therein and by screws 38 a plate or cover 39. Into hollow bosses 40 of this plate, the same being aligned with the apertures 26 of the plate 25 on the slid- 130  
ing carriage, are driven thimbles 41. Through these thimbles project hook-bars 42, said hook-bars having their rear end portions 43 reduced and journaled in the apertures of



said plate 25. Said hook-bars are provided near their outer ends with bent spurs or hooks 44. It should be remarked that there are two pairs of these hook-bars, the one being disposed beside the other, with the corresponding hooks or spurs in the two pairs projecting in the same direction—that is to say, from corresponding points on the hook-bars—while the hooks in each pair project in relatively opposite directions. A portion 45 of each hook-bar that works in the corresponding thimble is made round, so as to afford a good bearing for the hook-bar, while its free end is made flat and its rear end squared. The star-wheel is annular in shape, and on its rear face is integrally formed an internally-toothed spur-wheel 46. It will be seen that the hook-bars are surrounded by the combined spur-wheel and star-wheel. Each hook-bar carries within the spur-wheel and meshing therewith a pinion 47, which is revoluble thereon and which is formed with an integral ratchet 48. Each hook-bar also carries a disk 49, having a squared orifice 50, which fits the squared portion of the hook-bar. On the periphery of said disk is secured a spring-pawl 51, normally bearing against the periphery of the ratchet and adapted to engage its notches. It will be thus seen that the rotation of the spur-wheel in the proper direction will effect the rotation of each hook-bar, though the latter is also capable of movement in the same direction independently of the spur-wheel, this being for the purpose set forth in my above-mentioned patent.

Upon the shaft 5 is also secured a disk 52, carrying a roller 53. This roller is movable in a curved slot 54 of a block 55, that is secured to a reciprocating frame 56. Said frame consists of a bar 57, which is disposed and movable vertically, said frame having its lower end bifurcated and being movable between the upright  $y$  and the plate 39 in grooves or guideways 58, formed in the latter. The extremities 59, formed by bifurcating the lower end of the frame, carry horizontal and parallel rods 60, constituting thread-guides, the same projecting forwardly. The end of each of these arms is provided with a spur 61. Also upon the shaft 5, between the disks and the pin-wheel, is secured a pinion 62, which constitutes one of a train of intermeshing pinions, of which the other two are the pinions 63 and 64, which are journaled on suitable stub-shafts in the cavity 2. The shaft 65 for the pinion 64 is journaled in the plate 39, protruding through the same, its free or outer end having a hinged connection 66 with the axis or shaft 67 of a helical hook 68. The shaft of the hook carries a sliding sleeve 69, which when the two shafts are alined may be slipped along to inclose their joint and maintain them in alinement. The object of providing the above-described connection between the two shafts is to afford means whereby the helical hook may be turned back out of the way when the warps

are being preliminarily adjusted in the machine.

In the uprights  $y$  and  $z$  is journaled a horizontal shaft 70, which carries a pinion 71, in mesh with another pinion 72, which in turn meshes with the gear 8, said pinion 72 being mounted upon a stub-shaft 73, projecting inwardly from the upright  $z$ . The forward end of the shaft 70 is turned off to form a radial arm 74, which carries an integral curved and tapering plate 75, forming a hook, the point of said hook being deflected inwardly toward the upright  $y$ , as best shown in Fig. 14. Upon the periphery of the plate 75 is disposed a cutting mechanism, the same consisting of two knives 76 77, which are adjustably secured upon the plate by screws 78, penetrating slots 79 in the shank of each knife. The knives are arranged so that their cutting edges intersect each other, the knife 76 being in the form of a curved spur. This knife has the peculiar form referred to and shown for a reason hereinafter mentioned. Projecting forwardly from the upright  $y$  is a rod 80, which carries another and rigidly-mounted rod 81, disposed parallel to said first-named rod. On the rod 80 is secured a collar 82, against which a sleeve 83 on the rod is held by the action of a spiral spring 84, coiled about the rod between the plate 85, which said sleeve carries, and the washer 86, which abuts against a nut 87 on the threaded free end of said rod. The plate is penetrated by both of the rods, and it comprises an arc-shaped portion 88, so disposed that when the plate 75 revolves said last-named plate is brought into opposition to it.

Referring to Figs. 15 and 16, 89 designates a curved plate which has a longitudinal groove 90 in its back face and against the front face of which is disposed a flexible pad consisting of two or more layers 91, preferably of rubber. In the groove 90 of said plate is secured by a screw 92 another plate 93, said last-named plate serving to clamp tightly in place a layer 94, of kid or other material, which is arranged to inclose the plates and the layers of rubber material and has its edges interposed between the two plates.

The device just described is employed as a shoe to be carried by each of the plates 75 and 88, as shown in Fig. 16, one of said shoes being adapted to wipe against the other for the purpose of twisting the threads, as clearly described in my patent referred to. The face of the pad which is carried by the stationary member of the twisting mechanism should preferably be provided with a transverse depression (not shown) adapted for the purpose set forth in my above-mentioned patent. Each shoe may be secured in place on the plate 75 or 88 by a screw 95, penetrating a coacting lug- and -recess engagement 96 between said plate and the plate 89 of the shoe.

97 is a fork which constitutes a longitudinally-reciprocating thread-guiding member and is secured to the forward end of the re-



reciprocating shaft 12, its free end portions 98 99 approaching into approximate contact with each other and the latter being disposed slightly above the former, as best shown in Fig. 2.

100 is a rock-shaft which is journaled in an enlargement 101 of one of the webs 1 of the upright *y*, said rock-shaft carrying on its rear end an arm 102, to which is pivotally connected an eccentric-rod 103, forming an integral part of an eccentric-strap 104, which the eccentric 9 carries. Upon the forward end of said rock-shaft is adjustably secured an arm or finger 105, the same being disposed approximately in the vertical planes of the hooks on the hook-bars when in their rearmost positions. It should be remarked that the rock-shaft comprises hinged members, which are adapted to be held in alinement with each other by a sliding sleeve 106, adapted to inclose their joint. As with a corresponding construction already described, said sleeve may be slipped upon the outer member, so that the same may be turned aside out of the way when the warps are preliminarily adjusted.

Through a slot 107, formed in the cover or plate 39 near the upper end thereof, projects forwardly from the frame 56 a stud 108, which carries a vertical cylinder 109, in which works a closely-fitting piston 110. The piston, as well as the cylinder, is hollow, and in said piston and cylinder is arranged a spiral spring 111, which normally tends to raise the piston. The piston carries a bracket 112, whose rear end is provided with a slot 113, which is adapted to receive the bar 57, the latter thus serving to support said bracket, which is movable thereon between two pins 114, which the bar carries, the upper one being removable and the lower one being adapted to enter a vertical slot formed in the bracket. Said bracket is provided with an enlargement 115, having spaced flanges 116, between which are adapted to seat clips 117, that are carried by thin spring-steel levers 118, which are fulcrumed in a cross-head 119 of said bracket. Upon the sides of the bracket are pivoted latches 120, one arm of each of which is adapted to penetrate an opening 121 in the corresponding lever 118 and when so disposed to maintain the clip carried thereby against the enlargement 115 by means of a lug or projection 122 on said arm. The other arm of each latch is engaged by a spiral spring 123, disposed between it and the bracket.

The mechanism just described constitutes a clamp for sustaining the free ends of the threads to be twisted, the elasticity of the levers permitting a considerable amount of thread to be held between each clip and the enlargement on the bracket.

124 designates integral arms which project laterally from the upright *z*, each arm carrying a pair of rods 125, said pairs of rods serving as guides over which the old and new warps are adapted to extend.

On the shaft 5 is secured an eccentric 126, surrounded by an eccentric-strap 127, which forms an integral part of a rod 128, which is pivotally connected to a wrist-pin 129, adjustably secured in a slot 130 of the lever *v*.

The operation of the machine will now be described. The shaft 5 being revolved by means of the operating-wheel 6, the eccentric-rod 128 will be actuated, vibrating the bell-crank lever *l*, so as to turn the two-part block *g* on the screw *e* in the manner already described, and thus move the carriage on its guides. It should be stated that 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 it is seen in Fig. 19, where it is shown, together with the beam 131 for the new warp 132, the harness 133, and reed 134 of the old warp 135, as mounted upon the frame 136 of a twisting-in frame, it moves toward the observer. Before the machine is put into operation, however, the warps are so disposed that each extends under one of the rods 125, then over the other of the rods 125, then under the vertically-movable rods 60, and then under the adjoining member of the fork 97, whence it extends upwardly to the clamp, being secured upon opposite sides of its enlargement by the clips thereof. 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—said hook-bars extending between the two sets above and below the crossing therein, as clearly described in my patent referred to and as shown in Fig. 2 of the drawings hereof. It will be understood, of course, that a tension should constantly be maintained upon the threads. This is partly effected by the spring-actuated sustaining-clamp. The threads being arranged as above described, as the shaft 5 rotates in each revolution thereof an intermittent semirevolution will be imparted to the hook-bars through the medium of the pin-wheel 33, the star-wheel 30, and the interconnected ratchets 48 and disks 49, and alternately with their semirevolutions said hook-bars will be made to reciprocate, so that the desired separating of the threads in each warp one by one, which is dependent upon the above-described crossed arrangement of the corresponding threads in the two sets and the fact that the hook-bars hold back out of the straight course all but the outermost thread in each set of threads, leaving this one free and extended straight, will be effected. It is to be understood that the hook-bars perform their semirevolutions when they are in their outermost positions. The cam 7 of course effects the reciprocation of the hook-bars, as already described. It will be observed that owing to the course which the camway 19 in the cam 7 takes for a portion of its length the carriage 23, and consequently



the hook-bars, remain idle for a short time while in their rearmost positions. At this time the roller 53 on the cam 52, working in the groove 54 of the frame 56, forces said frame 5 downwardly, which also draws downwardly the upwardly-extending portions of the warps, the spring-actuated sustaining-clamp following. It will be observed that the movement thus effected in the upwardly-extending portions of the threads causes them to wipe against the several hook-bars and also around the members of the fork 97, as well as the rods 125. This action augments the proper separation of the released threads from the main body of threads, any filaments which might interconnect them being broken apart. As the hook-bars move rearwardly, drawing back with them the main body of the threads, the released pair of threads (one from each warp) will of course assume a straight line between the clamp and the fork 97, so that a space is thus formed between the two bodies of threads. It is in a plane parallel to the front face of the upright  $y$  and which lies in this space that the point of the spiral hook 68 rotates, and so in each revolution it engages the threads that have been separated, forcing them outwardly in an obvious manner as they continue to engage its convolutions. The outward movement of the threads is augmented because the rods 125 are tapered from their free ends, as shown in the drawings. The hook is adapted to accommodate, preferably, three pairs of threads, each pair of course including a new and an old warp-thread. As each pair of threads slips off the ends of the rods 60 it is momentarily held by the spurs 61 thereon, which thus act as detents and obviate any possibility of the threads slipping off the rods prematurely. As the cam 7 rotates it imparts in each revolution a reciprocating movement to the fork 97, the shaft carrying which is actuated by said cam through the medium of the lever 17. The tips of the portions 98 99 of this fork are adapted to keep the threads about to be twisted together close to each other until they are brought into the control of the twisting mechanism. Since it is unnecessary, if not undesirable, that the main body of threads, which also engages said fork, should have movement therewith, I provide the finger 105, which at the time when the fork begins its outward movement is interposed between the last pair of separated threads and the main body of threads. The finger is of course brought into the position referred to by the rocking of the shaft 104, which carries it, this rocking being produced by the action of the eccentric 9, operating said shaft through the eccentric-rod 103 and arm 102. The outermost pair of threads being brought by the fork within the plane of movement of the tip of the spur or hook of the plate 75, said pair of threads will be forced by the hook between the members of the twisting mechanism. As the shaft 70 revolves, this action being produced by the

shaft 5 through the medium of the interconnecting gearing, the twisting of the threads will be carried out precisely as described in my patent referred to, for which reason it is unnecessary to here particularly refer to the operation. It is believed that it will be understood that as the movable member of the twisting mechanism rotates the upwardly extending portions of the threads will first be brought between the knife 76 and the face of said member and then be brought to the intersection of the edges of said knives, where they will be cut. It will be observed that the back of the knife 76 is curved and extends beyond the face of the movable member of the twisting mechanism. The object is that the projecting portion of the knife shall impinge against the face of the stationary member just after the upwardly-extending portions of the threads are received between the extremity of said knife and the other knife, so as to bend the former inwardly, and thus insure its passing clear of the horizontal portion of the thread toward which said member revolves and prevent its cutting this also.

As in the case of my patented machine, a deflector 137 is attached to the rear end of the movable member of the twisting mechanism to act as a throw-out for the joined threads.

In order that the threads may have as little contact with the members of the fork 97 as possible, said members are beveled away each to a single edge on its under side, and they have their inner faces disposed to converge downwardly toward each other, as seen in Fig. 3. By having their end portions 98 99 disposed the latter slightly above the former it will be seen upon a view in Fig. 2 that when the cut ends of the threads being united are laid and twisted around the body portion of the left-hand thread the other thread will extend almost straight, not having to be turned out of the straight course by the end portion 98 in order to pass it, as it would if said end portions stood side by side. This construction not only therefore avoids unnecessarily abrading the threads, but permits the production of a twist of the most perfect character. In order, furthermore, to obviate undue vibration in the helical hook, I taper the same somewhat toward its point.

138 is simply a casing, which is provided for inclosing that portion of the mechanism which is between the uprights  $y$  and  $z$ .

I wish to be understood as broadly claiming that structure of which the spurs 61 form a part—that is to say, with reference simply to the idea of providing a thread-guide along which threads are moved laterally with a detent for holding the threads momentarily stationary until some mechanism for manipulating them, whether in uniting or otherwise, gets them perfectly into its control.

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

1. The combination, with a frame and with



thread-sustaining means, of a cam journaled in said frame and having a peripheral camway, a thread-uniting mechanism, a longitudinally-reciprocating thread-guiding member, a longitudinally-reciprocating carriage, thread-separating mechanism carried by said carriage, the planes of movement of said carriage and said guiding member being parallel with the axis of the cam, and a lever operatively connected to said guiding member at one of its ends and engaging said camway at the other of its ends, said carriage having a projection also engaging said camway, substantially as described.

2. The combination, with a frame and with thread-sustaining means, of a cam journaled in said frame and having a peripheral camway, a thread-uniting mechanism comprising a revoluble member, a longitudinally-reciprocating fork, a longitudinally-reciprocating thread-separating mechanism, said fork, said thread-separating mechanism, and the axes of the cam and of said revoluble member of the uniting mechanism being parallel to each other, gearing connecting said cam and said member of the uniting mechanism, said thread-separating mechanism having a projection engaging said camway, and a lever fulcrumed in said frame, engaging said camway, and operatively connected to said fork, substantially as described.

3. The combination, with a frame and with thread-sustaining means, of a cam journaled in said frame and having an eccentric projection, a thread-uniting mechanism comprising a revoluble member, a rotary thread-deflecting device, a finger-carrying rock-shaft, said rock-shaft and the axes of the cam, of the deflecting device, and of said revoluble member of the uniting mechanism being parallel to each other, gearing connecting said cam and said member of the uniting mechanism, a rod connecting said rock-shaft and the projection of said cam, and gearing connecting said cam and the deflecting device, substantially as described.

4. The combination, with a frame and with thread-sustaining means, of a cam journaled in said frame and having a peripheral camway and an eccentric projection, a thread-uniting mechanism comprising a revoluble member, a longitudinally-reciprocating fork, a longitudinally-reciprocating thread-separating mechanism, a rotary thread-deflecting device, a finger-carrying rock-shaft, said fork, said thread-separating mechanism, and the axes of the cam, of the deflecting device, and of the revoluble member of the uniting mechanism being parallel to each other, a rod connecting said rock-shaft and the eccentric projection of said cam, gearing connecting said cam and said member of the uniting mechanism, said thread-separating mechanism having a projection engaging said camway, a lever fulcrumed in said frame, engaging said camway, and operatively connected to said fork,

and gearing connecting said cam and the deflecting device, substantially as described.

5. The combination, with a frame and with thread-sustaining means, of a cam journaled in said frame and having a peripheral camway, a thread-uniting mechanism comprising a revoluble member, a longitudinally-reciprocating fork, a longitudinally-reciprocating thread-separating mechanism, a rotary thread-deflecting device, a finger-carrying rock-shaft, said fork, said thread-separating mechanism, said rock-shaft, and the axes of the cam, the deflecting device, and said revoluble member of the uniting mechanism being parallel to each other, gearing connecting said cam and said member, power-transmitting mechanism operatively connecting said cam and said rock-shaft, said thread-separating mechanism having a projection engaging said camway, a lever fulcrumed in said frame, engaging said camway, and operatively connected to said fork, and gearing connecting said cam and the deflecting device, substantially as described.

6. The combination, with a frame, of a shaft journaled in said frame, a cam carried by said shaft and having a peripheral camway, a longitudinally-movable thread-separating mechanism disposed parallel to said shaft and having a projection engaging said camway, a rotary thread-deflecting device also disposed parallel to said shaft, and gearing connecting said shaft and the deflecting device, substantially as described.

7. The combination, with a frame, of a shaft journaled in said frame, a cam carried by said shaft and having a peripheral camway, a longitudinally-movable thread-separating mechanism disposed parallel to said shaft and having a projection engaging said camway, a rotary thread-deflecting device also disposed parallel to said shaft, said thread-separating mechanism comprising revoluble hook-bars, gearing connecting said shaft and the hook-bars, and gearing also connecting said shaft and the deflecting device, substantially as described.

8. The combination, with a frame, of a shaft journaled in said frame, a cam carried by said shaft and having a peripheral camway, a longitudinally-movable thread-separating mechanism disposed parallel to said shaft and having a projection engaging said camway, a rotary thread-deflecting device also disposed parallel to said shaft, said thread-separating mechanism comprising revoluble hook-bars penetrating a portion of the frame, gearing connecting said shaft and the hook-bars and inclosed in said frame, and gearing connecting said shaft and the deflecting device and also inclosed in said frame, substantially as described.

9. The combination, with a suitable support, of a yielding thread-sustaining means supported thereby, a frame movably arranged in said support, said sustaining means hav-



ing a sliding engagement with said frame, and contiguously-disposed thread-guides, some of said thread-guides being carried by said frame, substantially as described.

5 10. The combination, with a suitable support, of a spring-supported clamp arranged therein, a frame movably arranged in said support, said clamp slidingly engaging a portion of said frame, and contiguously-disposed  
10 thread-guides, some of said thread-guides being carried by said frame, substantially as described.

11. The combination, with a suitable support, of a thread-sustaining clamp, a frame  
15 movably arranged in said support, said clamp having sliding engagement with said frame, a cylinder carried by said support, and a piston arranged in said cylinder and sustaining said clamp, said piston closely fitting said cylinder, substantially as described.

12. The combination, with a suitable support, of a thread-sustaining clamp, a frame movably arranged in said support, said clamp having sliding engagement with said frame,  
25 a cylinder carried by said support, a hollow piston arranged in said cylinder and closely fitting the same, and a spring inclosed in said cylinder and piston, said piston sustaining the clamp, substantially as described.

13. A thread-sustaining clamp consisting of two members, one of said members constituting the body portion of said clamp and the other of said members being movable into appreciably-close proximity to said first-named member and comprising an elastic element pivotally connected at one of its ends to said first-named member and adapted to be locked thereto at the other of its ends, substantially as described.

14. The combination, in a thread-sustaining clamp, of two members, one of which constitutes the body portion of said clamp and the other of which comprises an elastic element pivotally secured at one of its ends to  
45 said first-named member, and a spring-actuated latch carried by said first-named member and adapted to engage the other member at the other of its ends, substantially as described.

15. In a twisting mechanism, a shoe consisting of a plate having a recess in one of its faces, a flexible strip extending over the other of its faces and having its edges projecting into said recess, and another plate secured to  
55 said first-named plate against the recessed side thereof, said last-named plate approximately fitting said recess, substantially as described.

16. In a twisting mechanism, a shoe consisting of a plate having a recess in one of its faces, a flexible strip extending over the other of its faces and having its edges projecting into said recess, another plate secured to said first-named plate against the recessed  
65 side thereof, said last-named plate approximately fitting said recess, and layers of yield-

ing material interposed between said flexible strip and said first-named plate, substantially as described.

17. The combination of a suitable support 70 having a cavity therein, a portion of said cavity being substantially circular, an annular star-wheel arranged in the circular portion of said cavity, of a split ring also disposed in the circular portion of said cavity 75 and securing said star-wheel in place, hook-bars arranged in said support and surrounded by said star-wheel, and operative connection between said star-wheel and said hook-bars, substantially as described. 80

18. The combination of a suitable support having a cavity therein, a portion of said cavity being substantially circular, an annular star-wheel arranged in the circular portion of said cavity, a split ring also disposed 85 in the circular portion of said cavity and securing said star-wheel in place, a plate secured to said support and covering the cavity, thimbles penetrating said plate, hook-bars journaled in said thimbles, and operative connection between said star-wheel and  
90 said hook-bars, substantially as described.

19. The combination of a suitable support having a cavity therein, a portion of said cavity being substantially circular, an annu- 95 lar star-wheel arranged in the circular portion of said cavity, a split ring also disposed in the circular portion of said cavity and securing said star-wheel in place, a plate secured to said support and covering the cavity, 100 thimbles penetrating said plate, hook-bars journaled in said thimbles, operative connection between said star-wheel and said hook-bars, a pin-wheel disposed in said cavity and engaging the star-wheel, a shaft jour- 105 naled in said support and carrying said pin-wheel, a cam carried by said shaft, and means, operatively connected to said hook-bars and controlled by said cam, for reciprocating said hook-bars, substantially as described. 110

20. The combination, with a suitable support, of a slotted guide projecting from said support, longitudinally-movable hook-bars journaled in said support, a carriage penetrated by said guide, and a plate secured to 115 said carriage and penetrating the slot in said guide, said hook-bars being journaled in said plate, substantially as described.

21. The combination, with a suitable support and a screw arranged therein, of a twist- 120 ing or other similar machine movably arranged on said support and having a drive-shaft, a threaded block movable with said machine and penetrated by and engaging said screw, a ratchet carried by said block, a 125 lever also movable with said twisting-machine, a spring-actuated pawl carried by said lever and engaging the ratchet, an eccentric carried by said shaft, and a rod receiving said eccentric at one of its ends and connected 130 to the lever at the other of its ends, substantially as described.



22. The combination, with a suitable support, of a carriage movably arranged on said support, a screw arranged in said support, a threaded split block penetrated by and engaging said screw, means for rotating said block, levers fulcrumed in said carriage, said block having continuous ways adapted to be engaged by said levers and surrounding said screw, and means for rotating said block, substantially as described.

23. The combination, with a suitable frame, of a thread-manipulating mechanism arranged in said frame, a thread-guide projecting from said frame into operative proximity to the manipulating mechanism, means for deflecting the threads along said guide toward the manipulating mechanism, and a thread-detent disposed on said guide adjacent the manipulating mechanism, substantially as described.

24. The combination, with a suitable frame, of a thread-uniting mechanism arranged in said frame and including a movable member having a projection, thread-guides projecting from said frame into operative proximity to said projection, means for deflecting the threads along said guides toward the uniting mechanism, and thread-holding spurs projecting from the free ends of said guides, substantially as described.

25. In a twisting-machine, a rotary thread-controlling device interposable between the threads being acted upon and having a shaft affording support therefor, said shaft having a flexible joint, substantially as described.

26. In a twisting-machine, the combination of a rotary thread-controlling device interposable between the threads being acted upon and having a shaft affording support therefor, said shaft having a flexible joint, and means, adapted to engage the joint portion

of said shaft, to maintain said shaft inflexible, substantially as described.

27. In a machine for twisting together and thus uniting, threads or other filaments, the combination, with a frame, of substantially parallel guides arranged in said frame in proximity to each other, the two sets of threads to be united being adapted to extend from substantially opposite directions to and in engagement with said guides and from thence between the same and in substantially the same direction, and means, disposed adjacent the end portions of said guides, for twisting that portion of one of each pair of threads to be united which extends from one guide with that portion of the other thread which extends to the other guide, the end portion of said first-named guide being disposed approximately over the end portion of the other guide, substantially as described.

28. In a machine for twisting together and thus uniting, threads or other filaments, the combination of two substantially parallel guides arranged in proximity to each other, the two sets of threads to be united being adapted to extend from substantially opposite directions to and in engagement with said guides and from thence between the same and in substantially the same direction, the faces of each guide being disposed at acute angles with each other and the end portion of one guide being extended over the end portion of the other, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand this 20th day of April, 1900.

ALBERT GOSS.

Witnesses:

ALFRED GARTNER,  
ROBERT J. POLLITT.