

(No Model.)

15 Sheets—Sheet 1.

E. WOODWARD.

MACHINE FOR SEWING ON BUTTONS.

No. 390,148.

Patented Sept. 25, 1888.

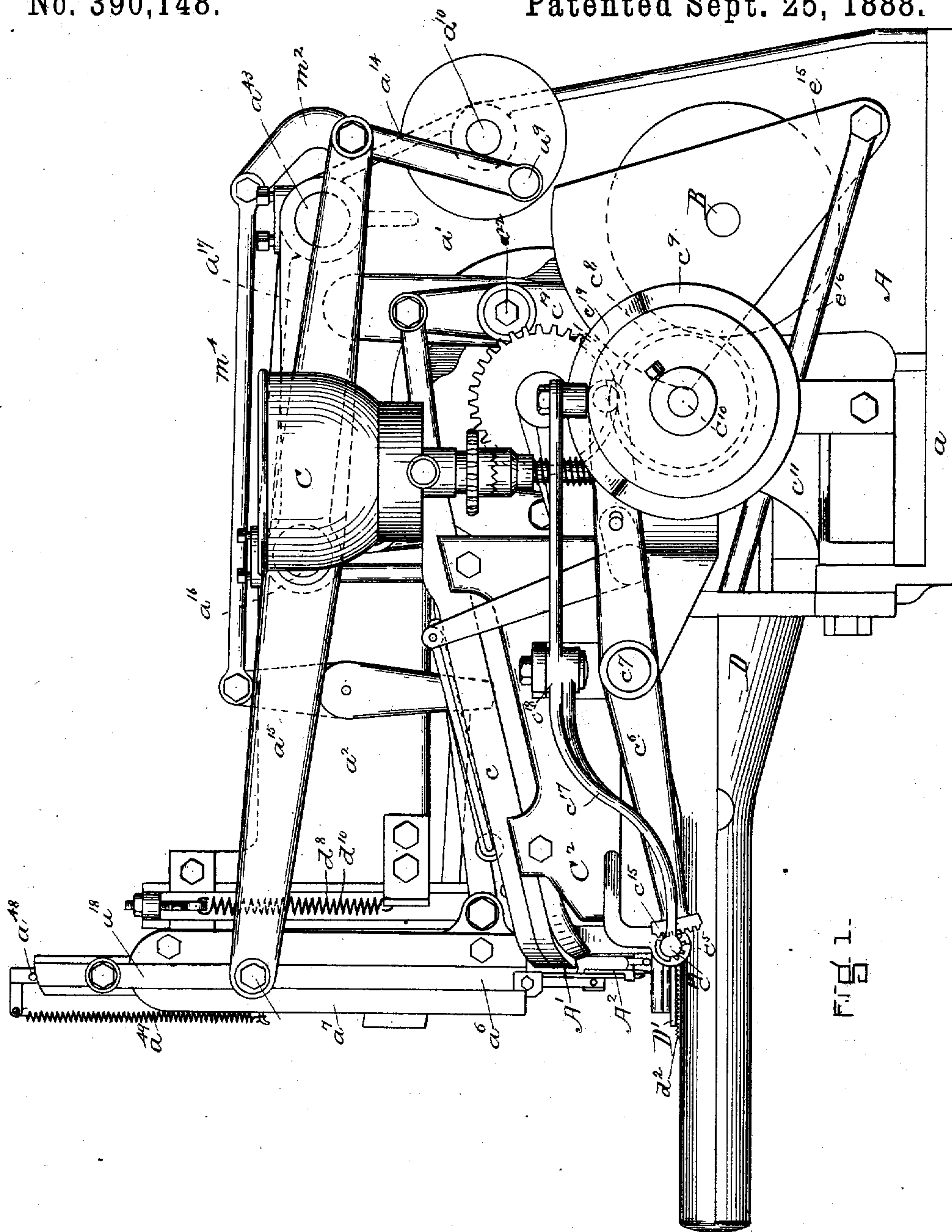


FIG. 1.

WITNESSES.

J. M. Dolan
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Emile Woodward
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Clarke & Raymond

(No Model.)

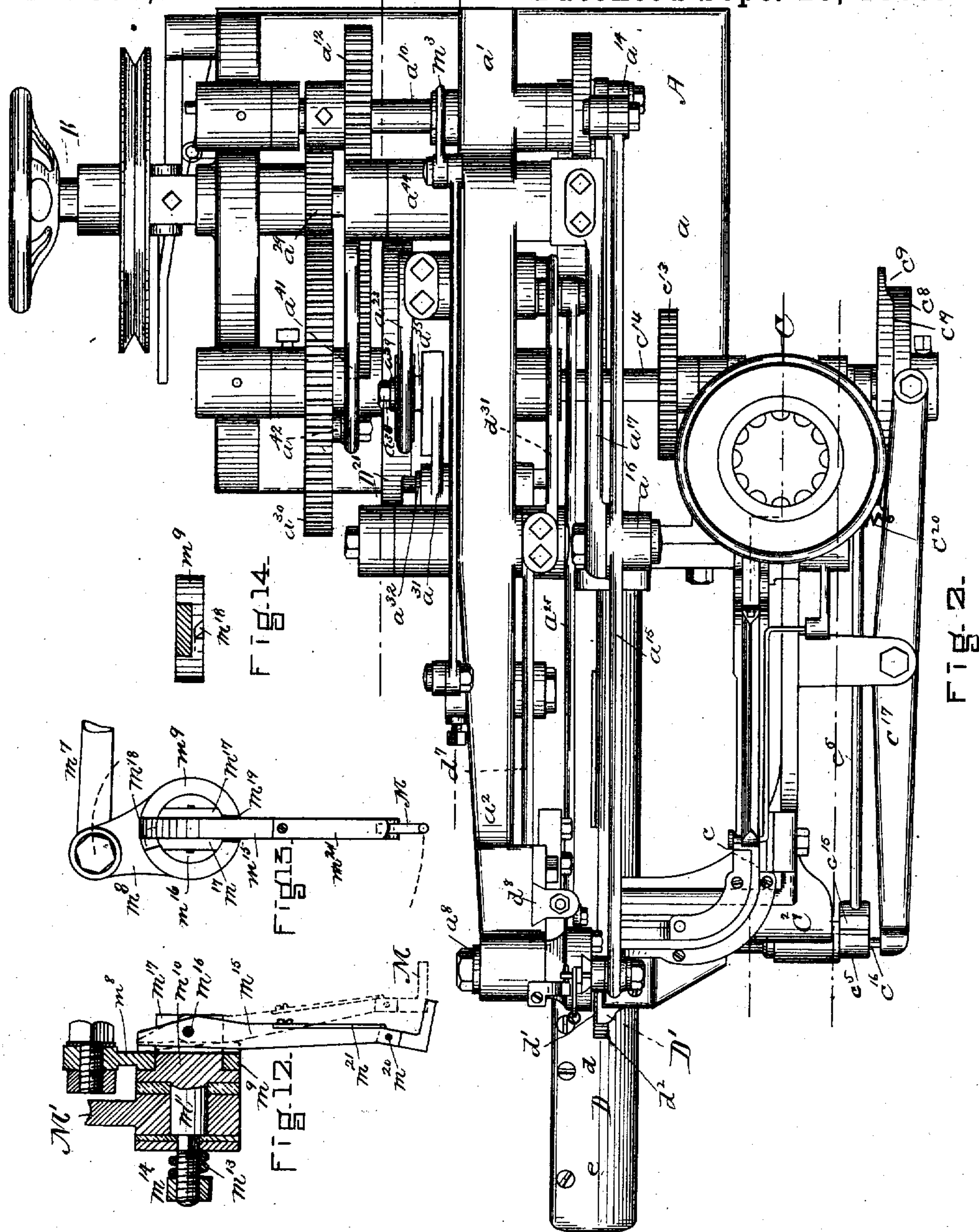
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WITNESSES.

L. M. Dolan
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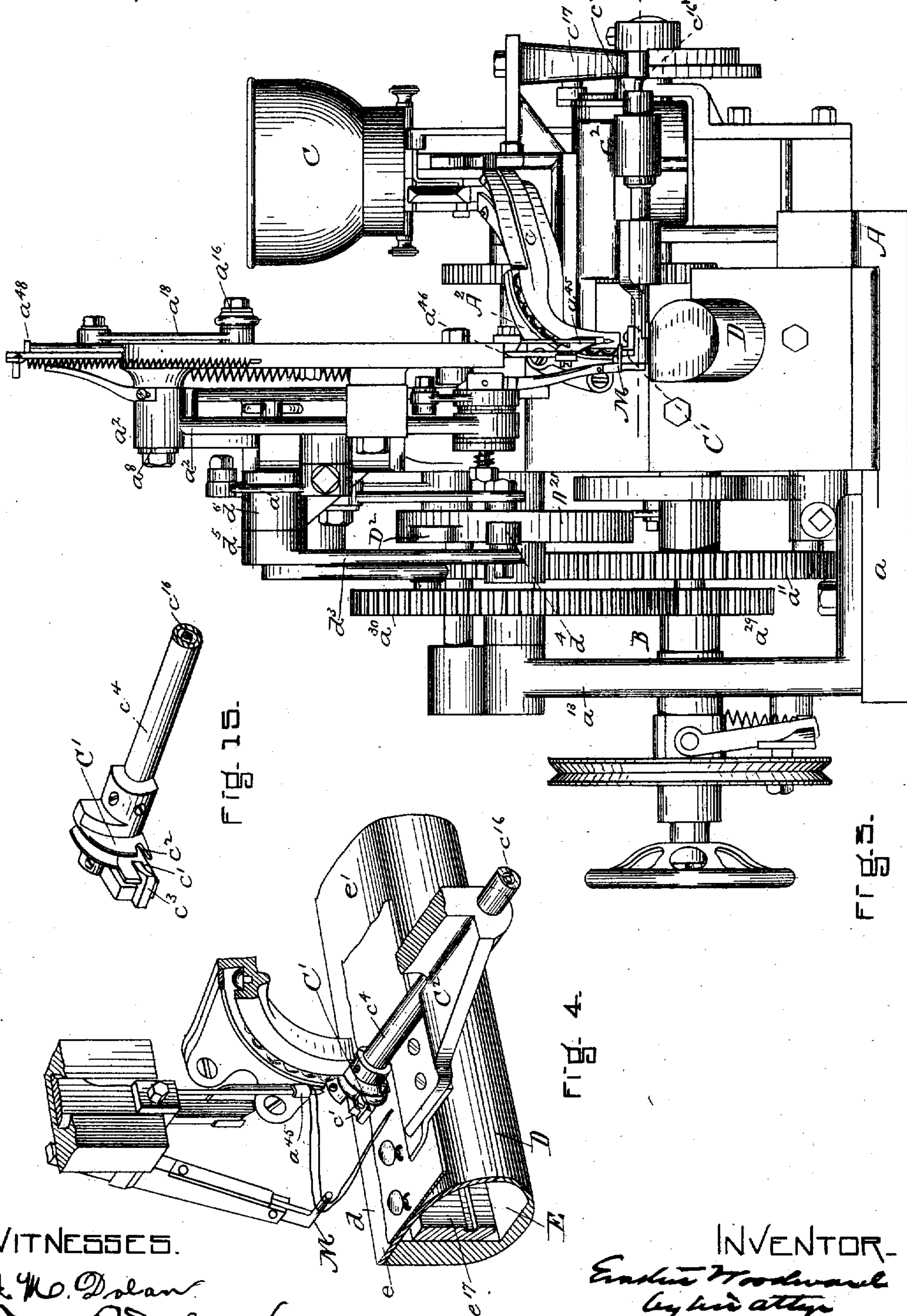
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WITNESSES.

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(No Model.)

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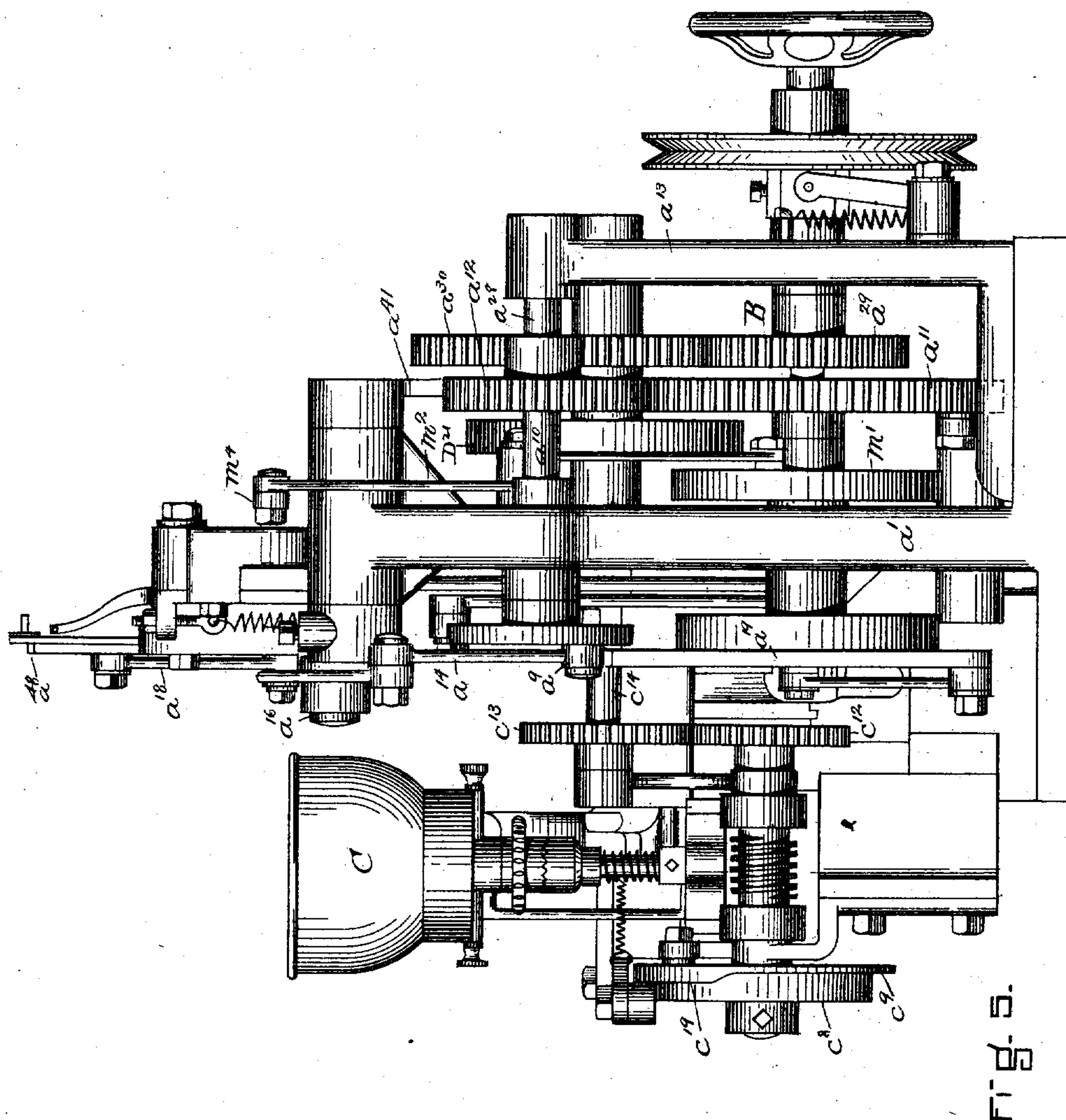


FIG. 5.

WITNESSES.

J. M. Dolan
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(No Model.)

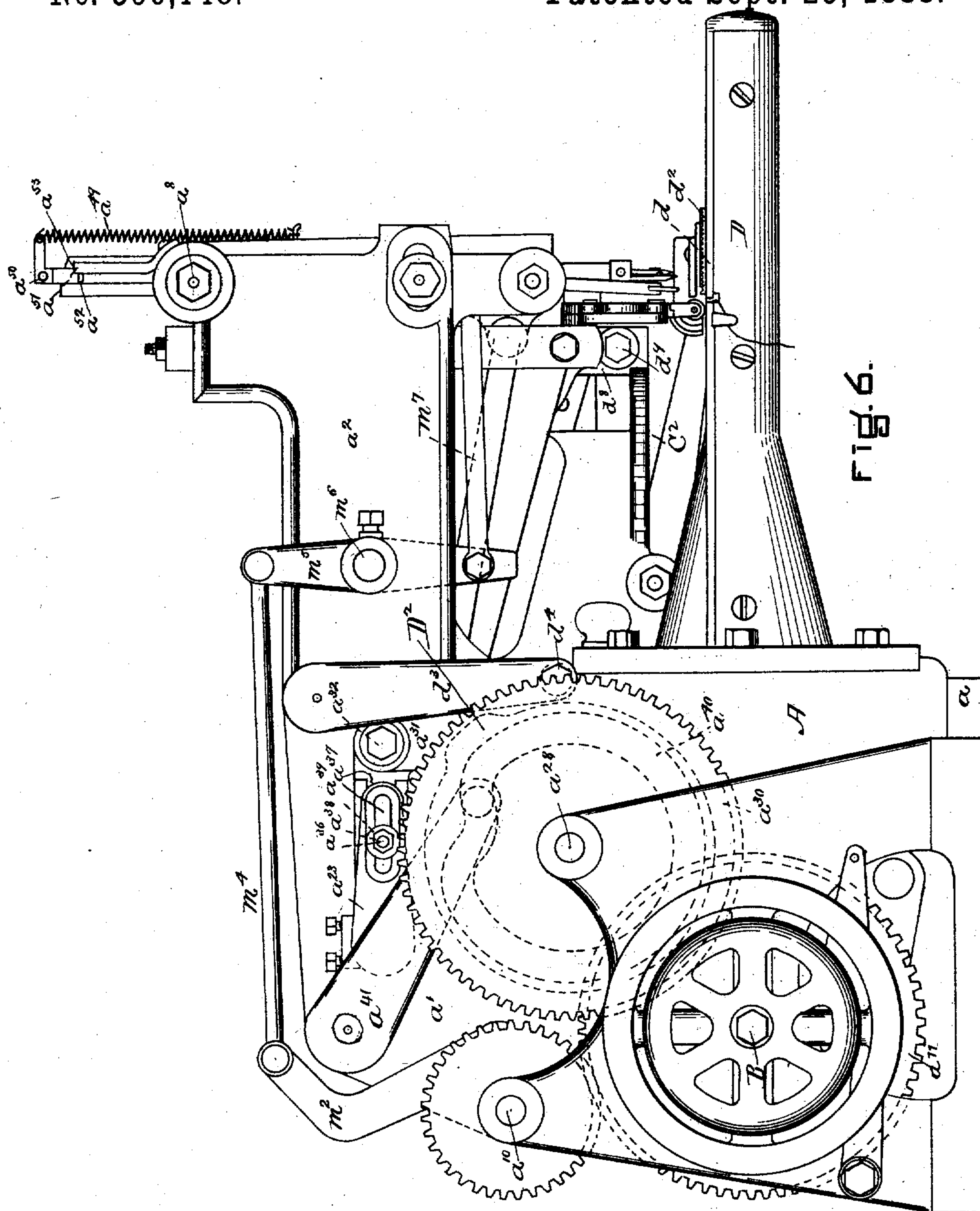
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WITNESSES.

J. M. Dolan
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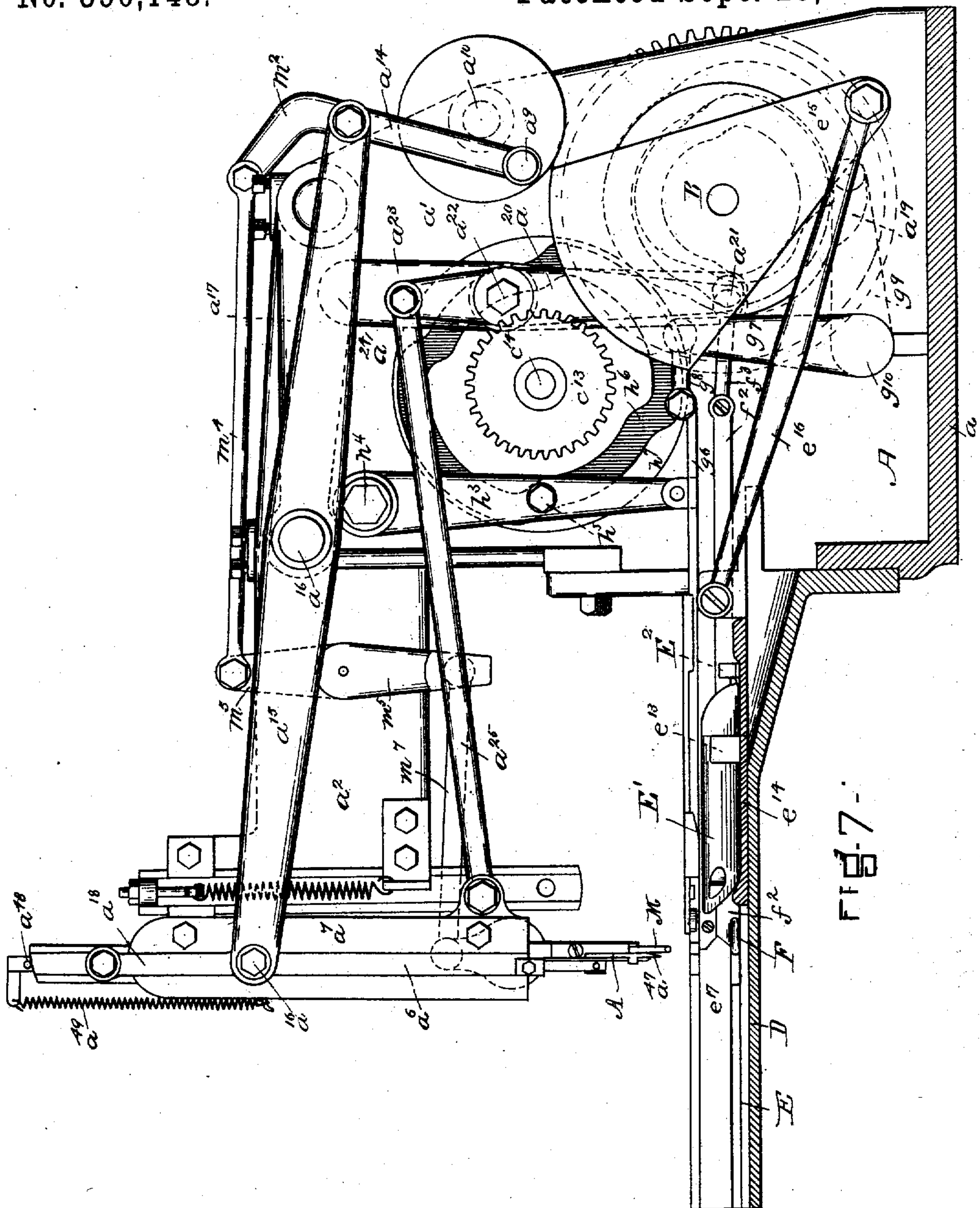
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WITNESSES.

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(No Model.)

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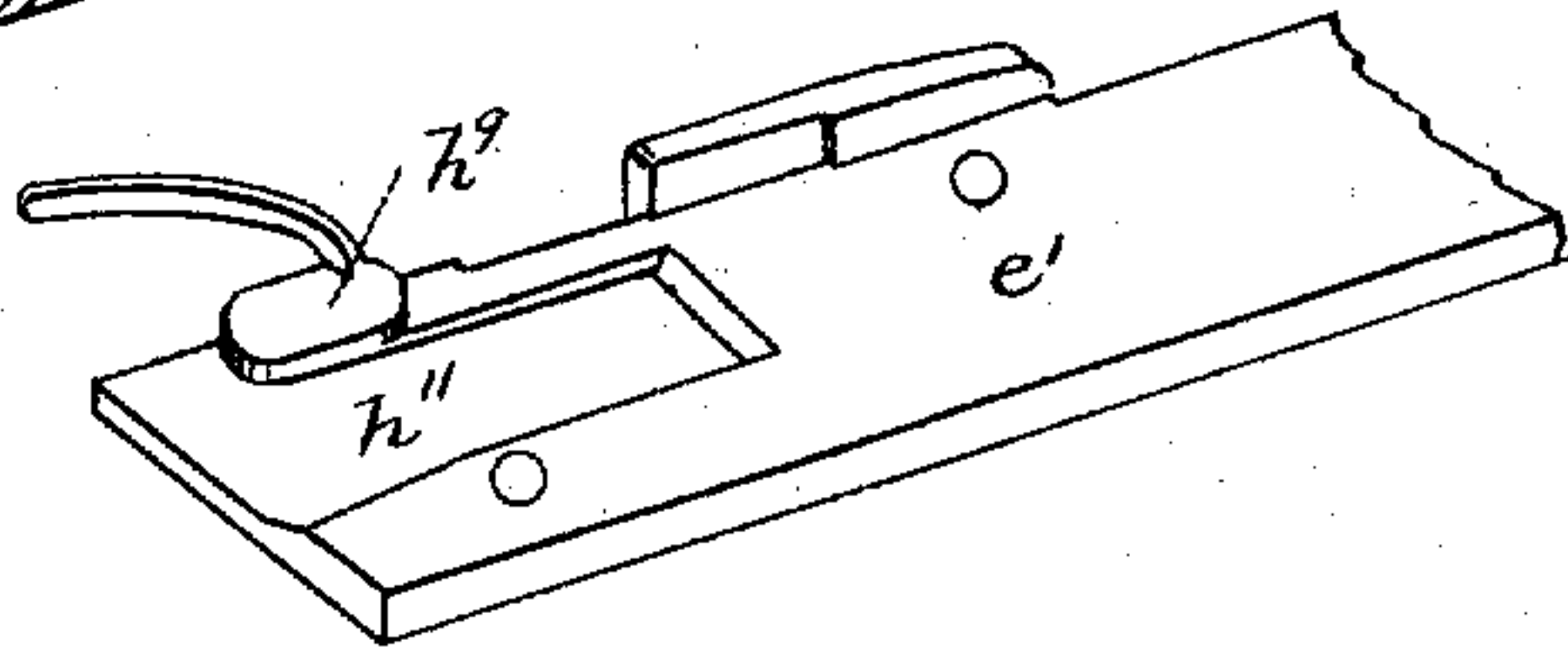
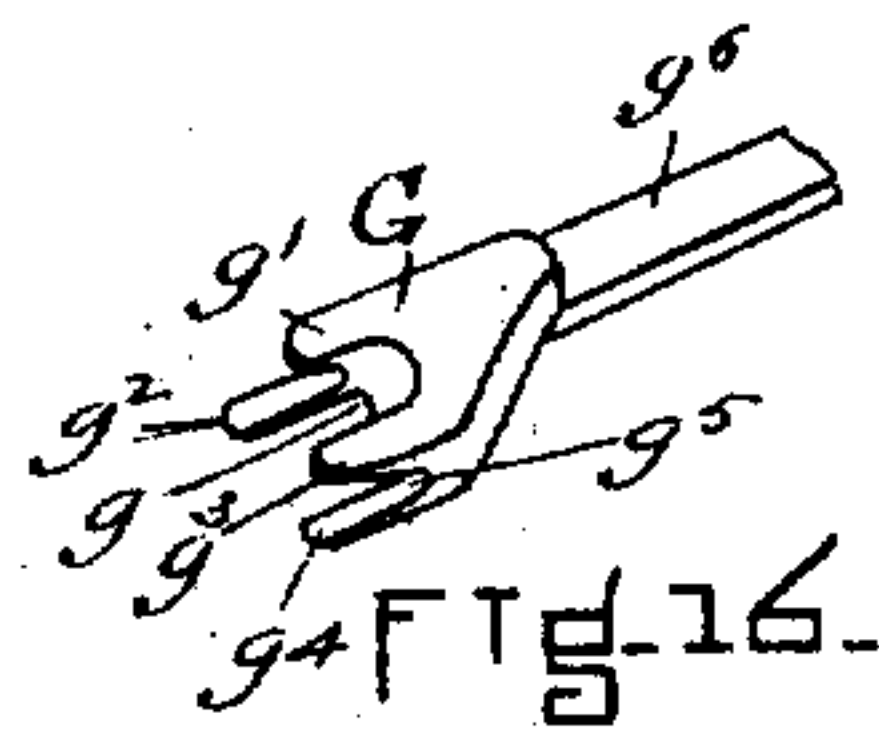
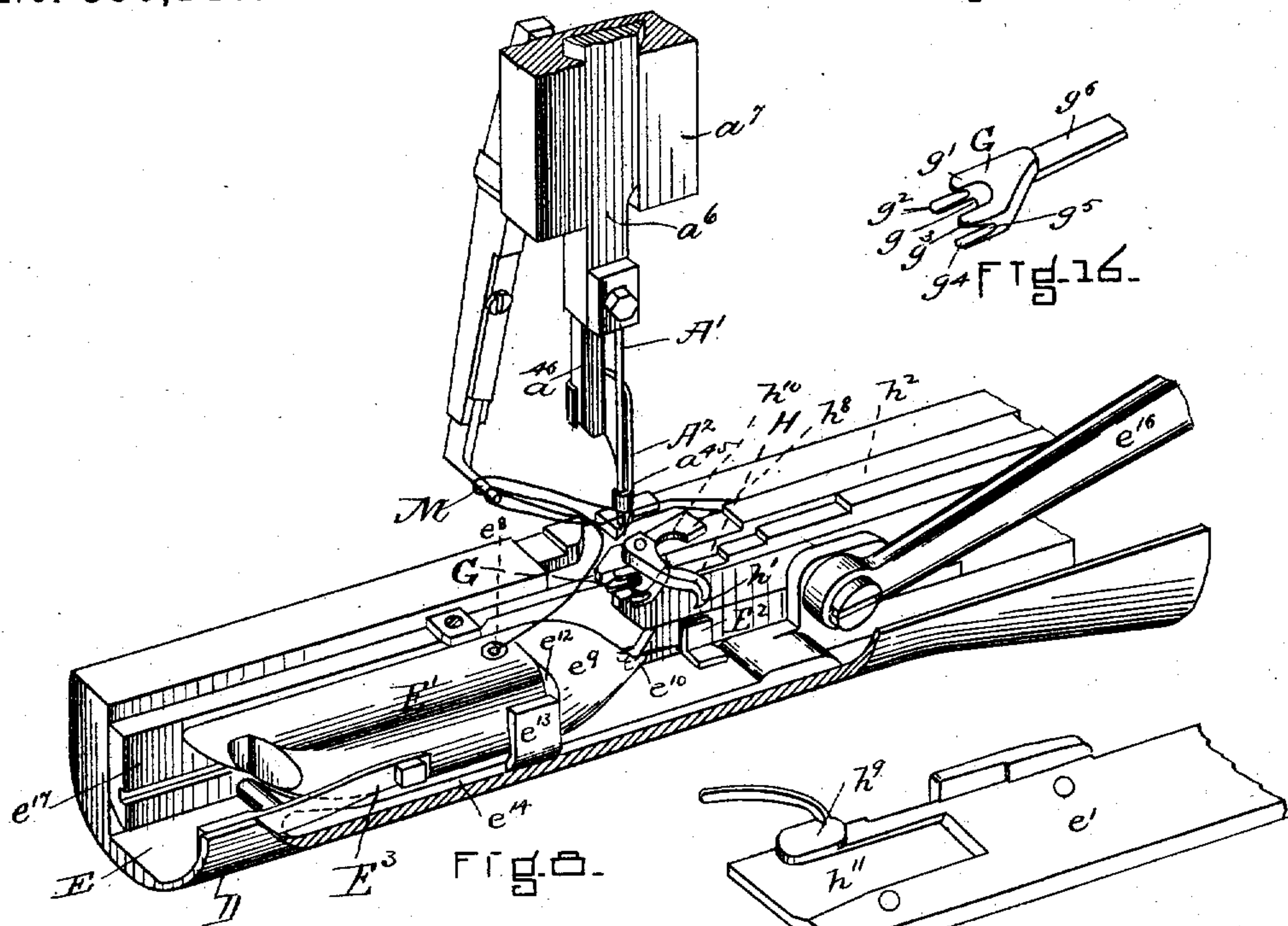


FIG-11.

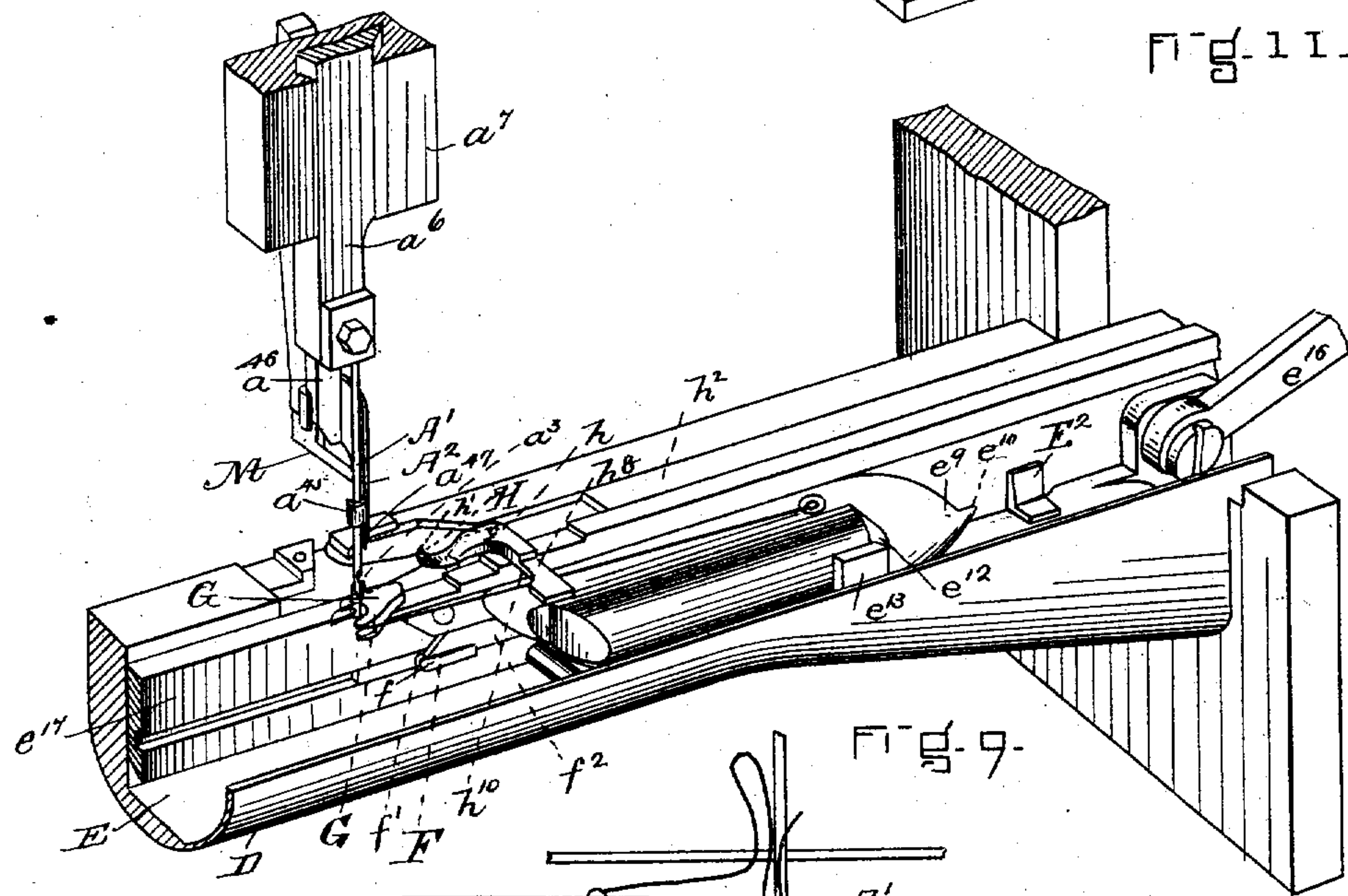


FIG-9.

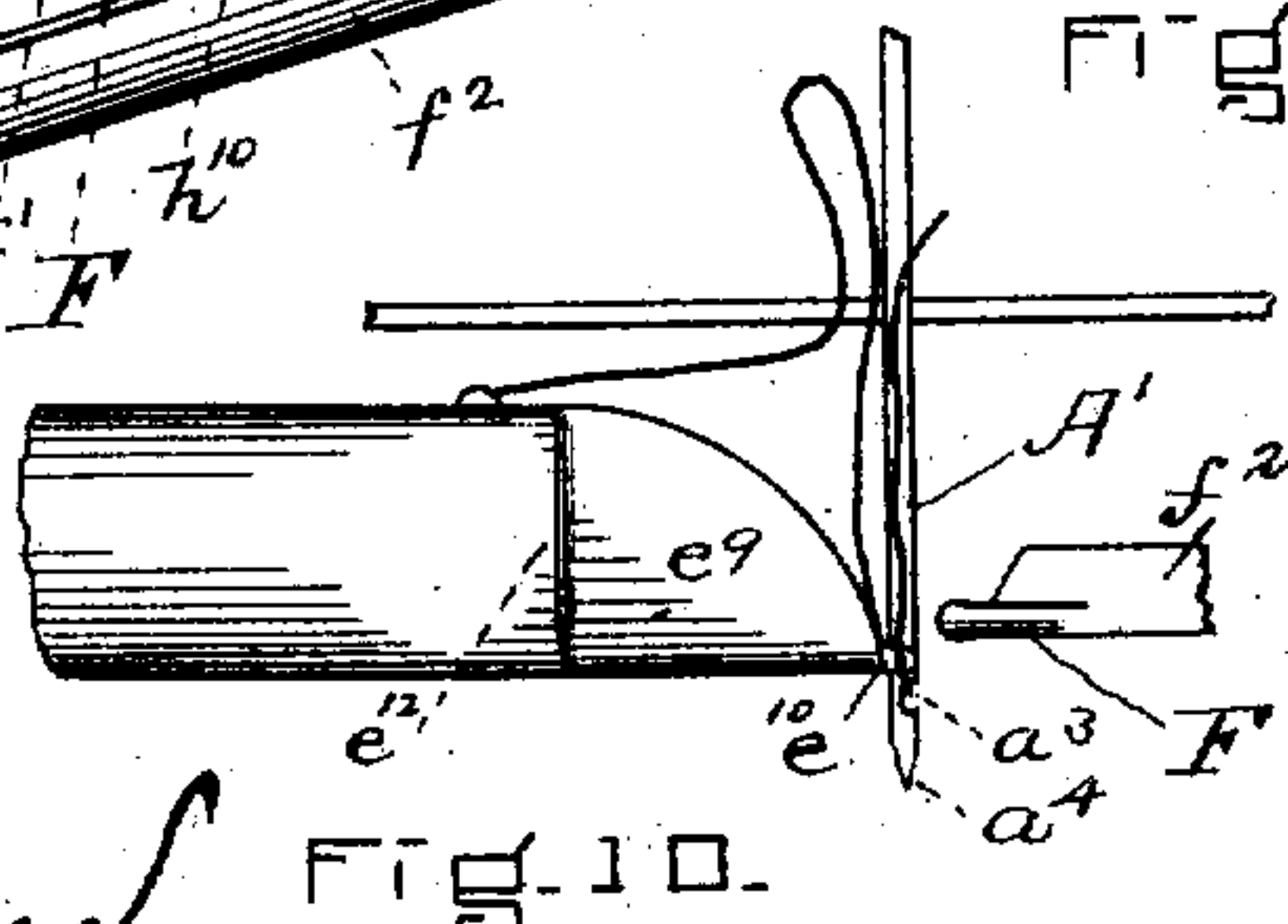


FIG-10.

WITNESSES.

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(No Model.)

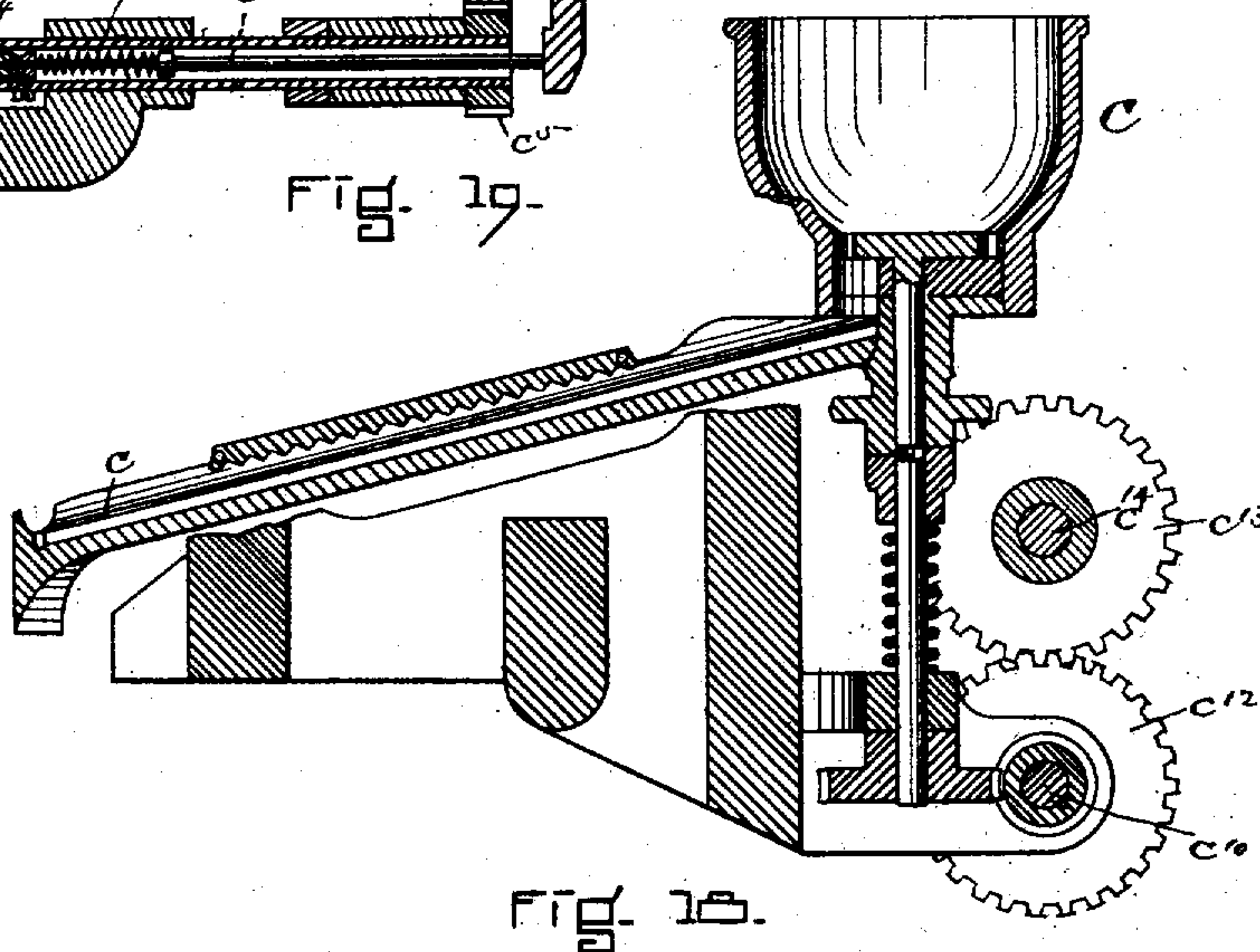
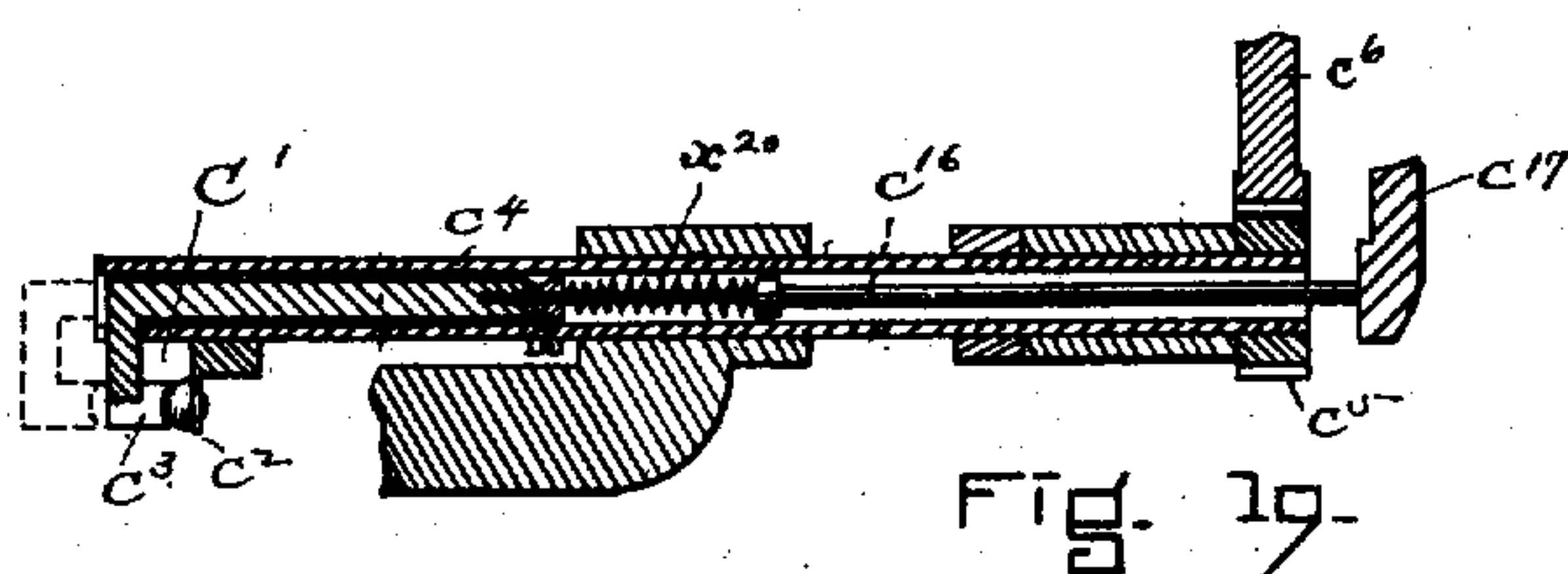
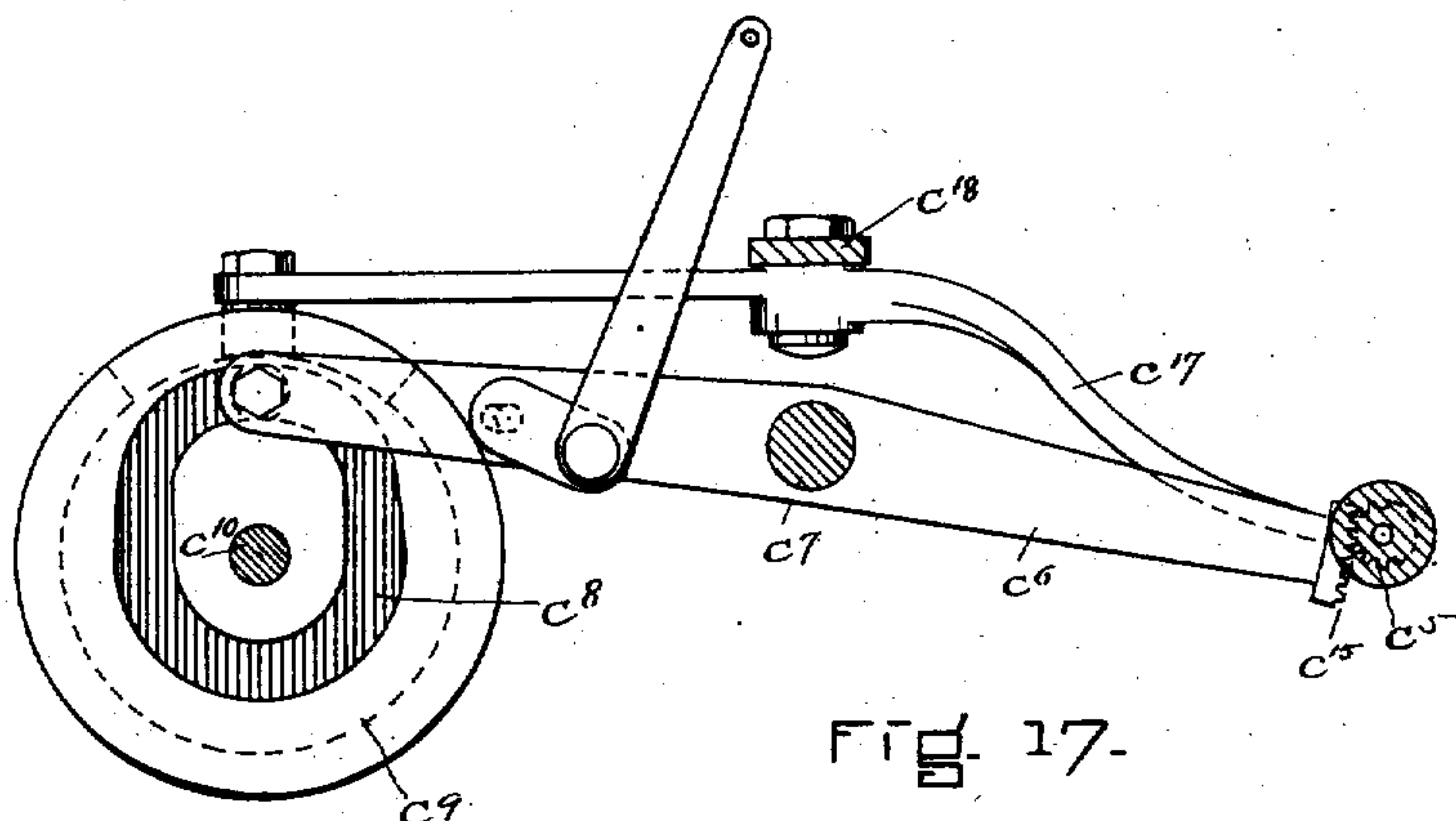
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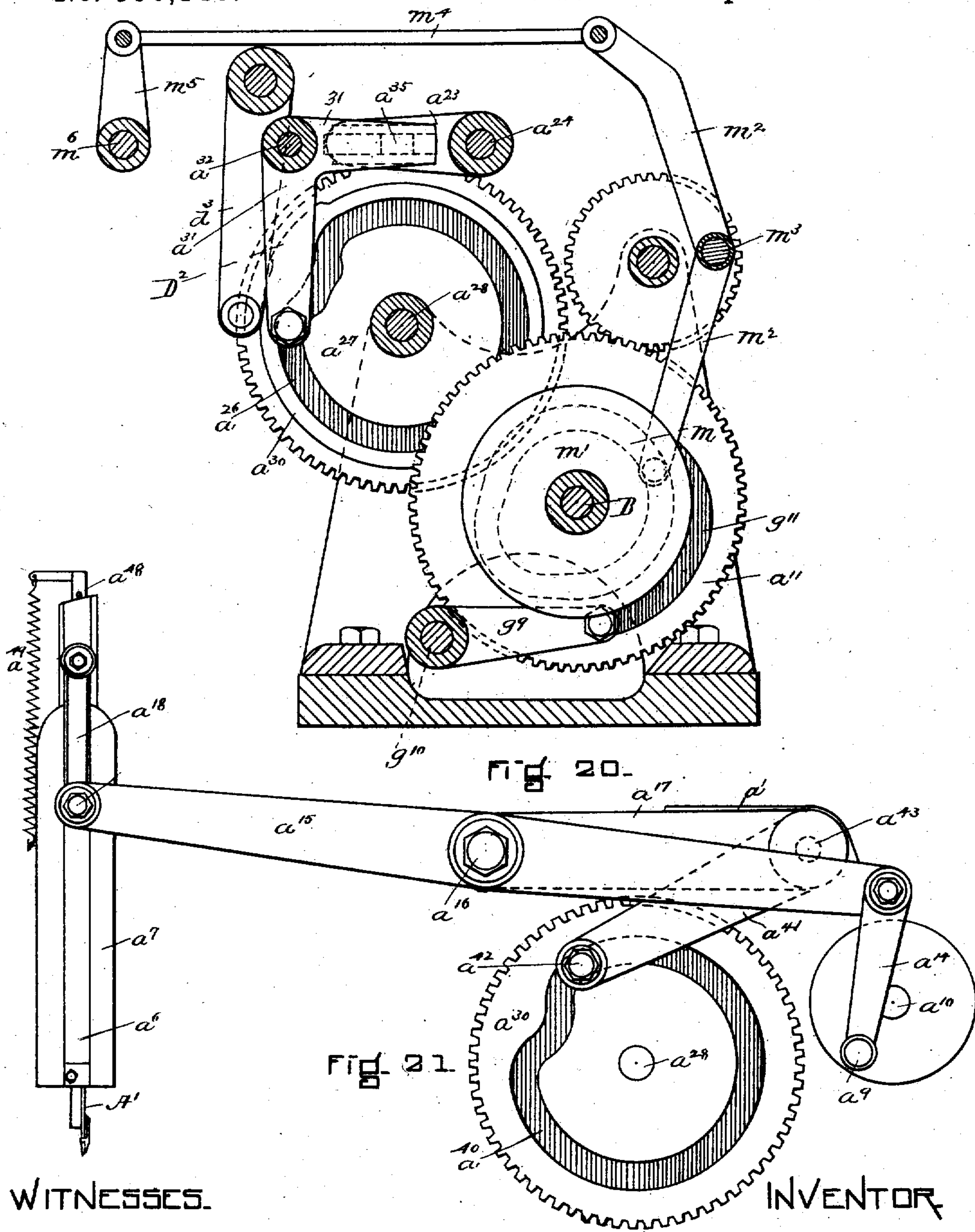
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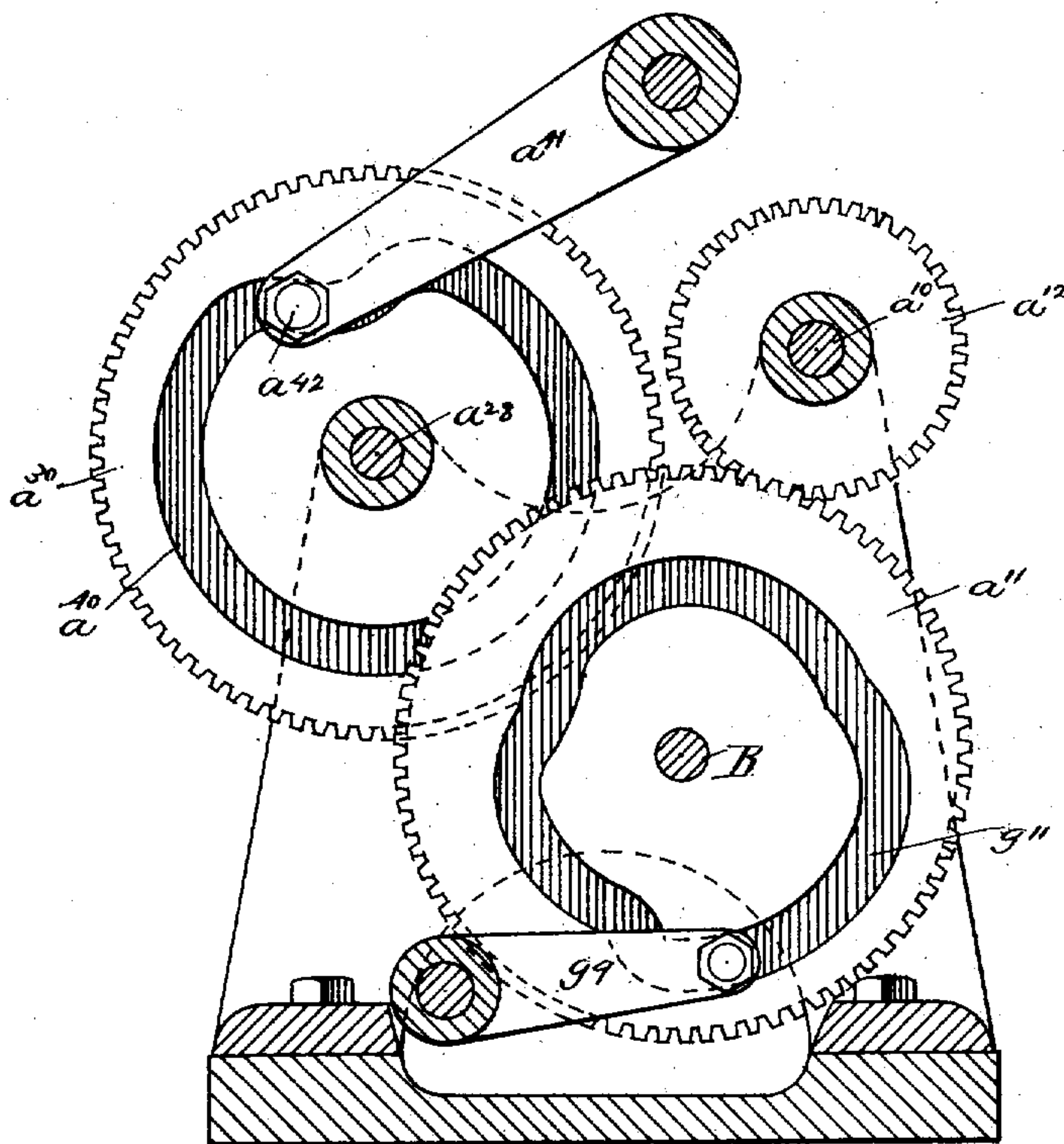


FIG. 23.

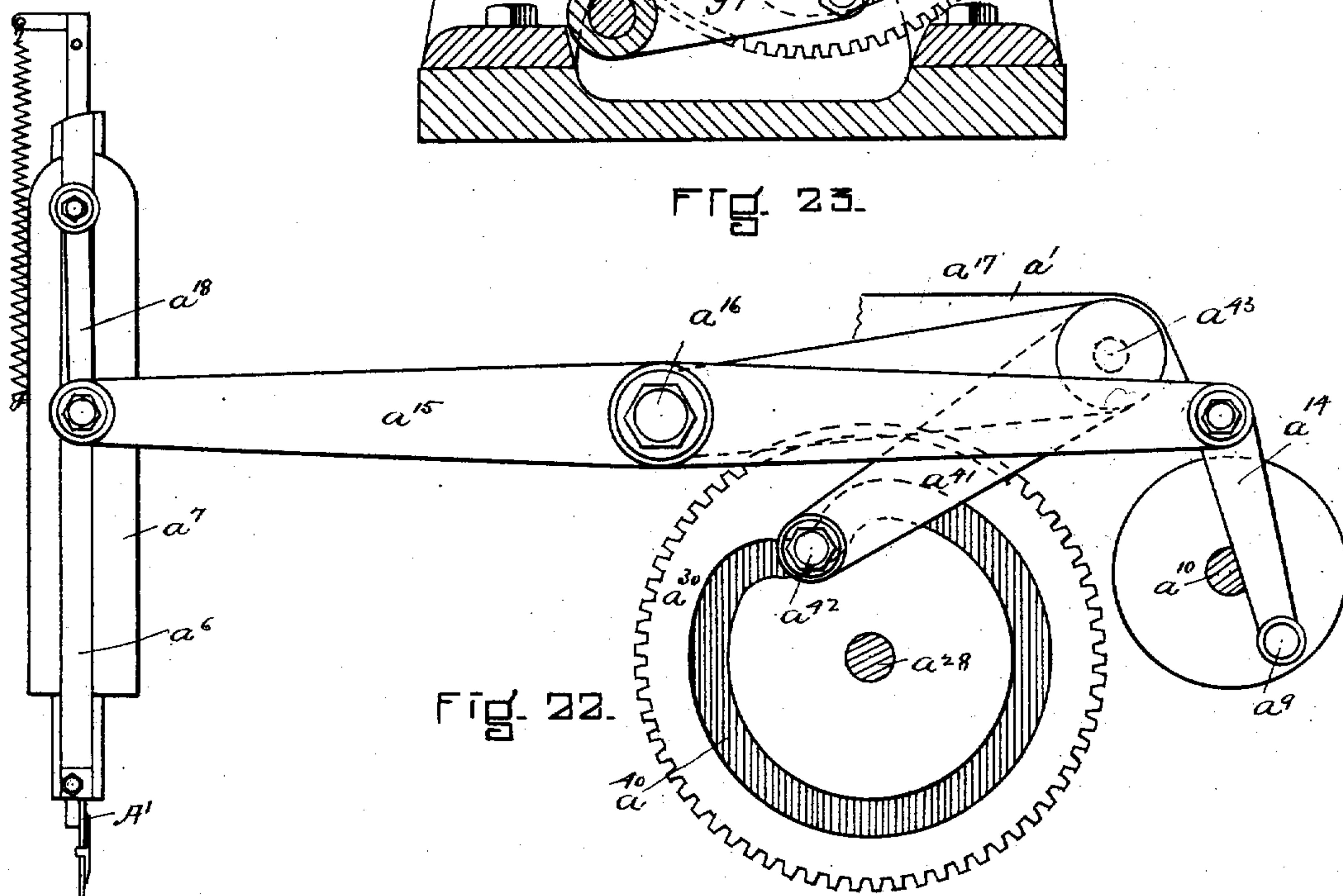


FIG. 22.

WITNESSES.

J. W. Dolan.
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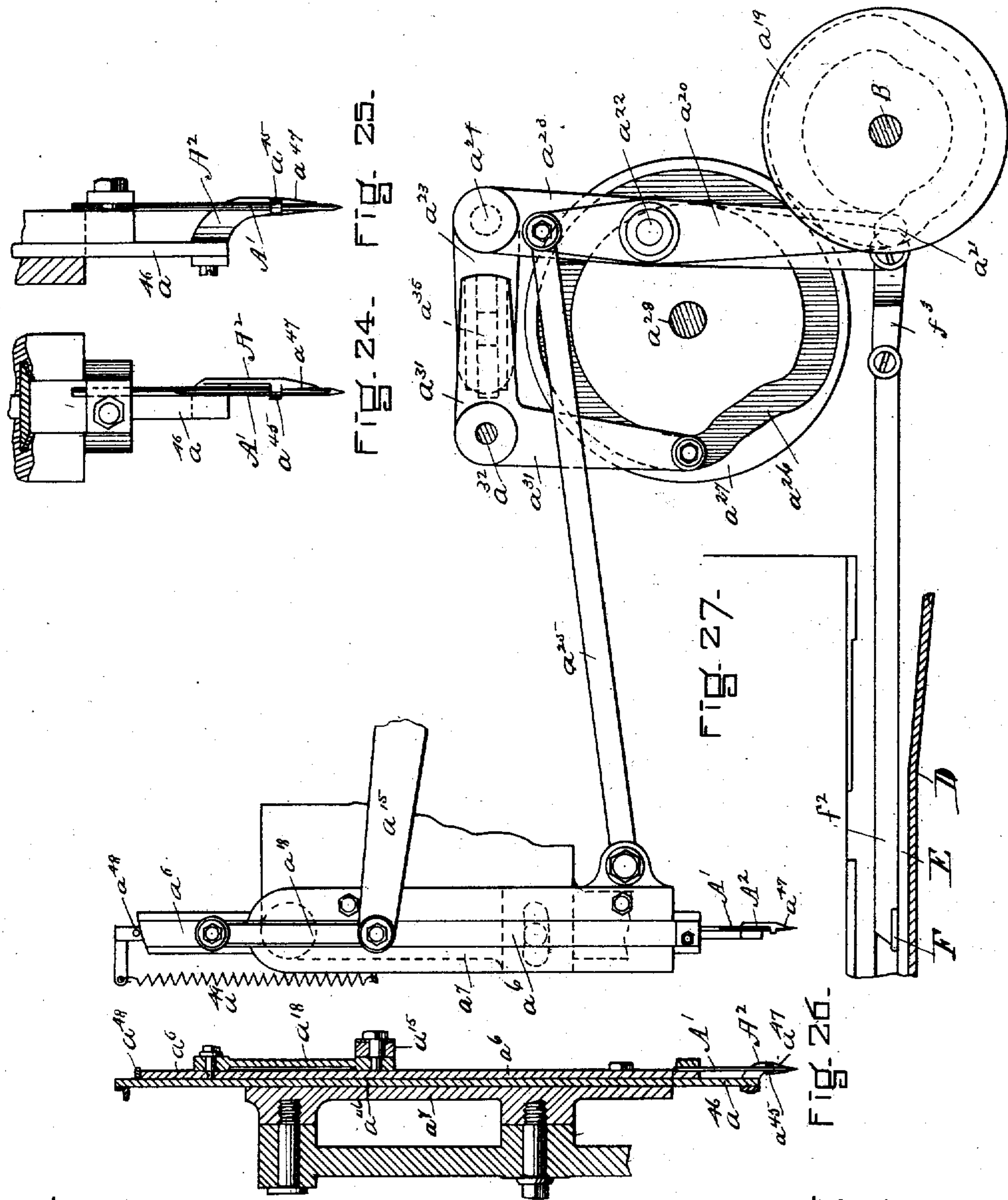
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MACHINE FOR SEWING ON BUTTONS.

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Patented Sept. 25, 1888.



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(No Model.)

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E. WOODWARD.

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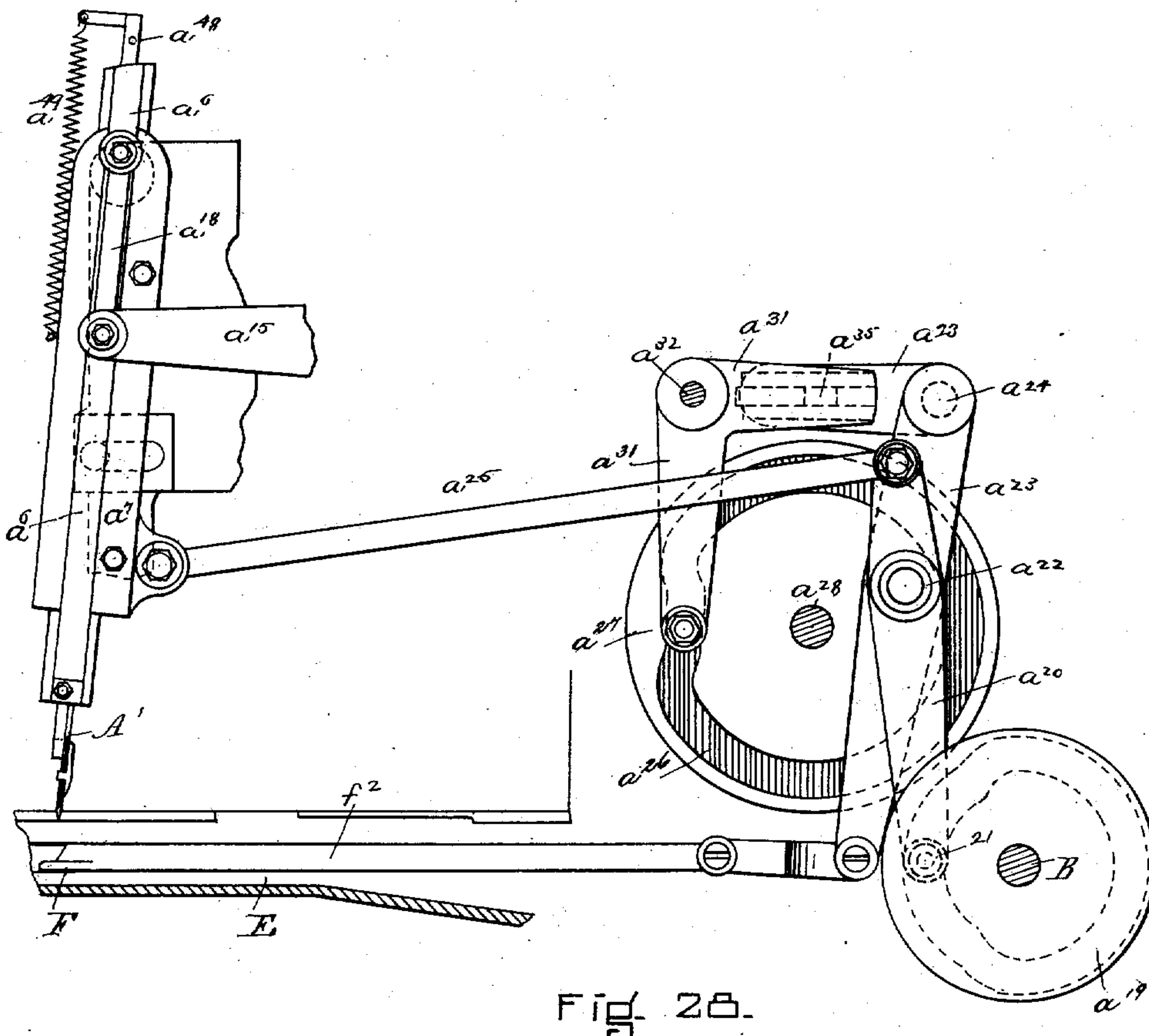


Fig. 2B.

WITNESSES.

J. W. Dolan
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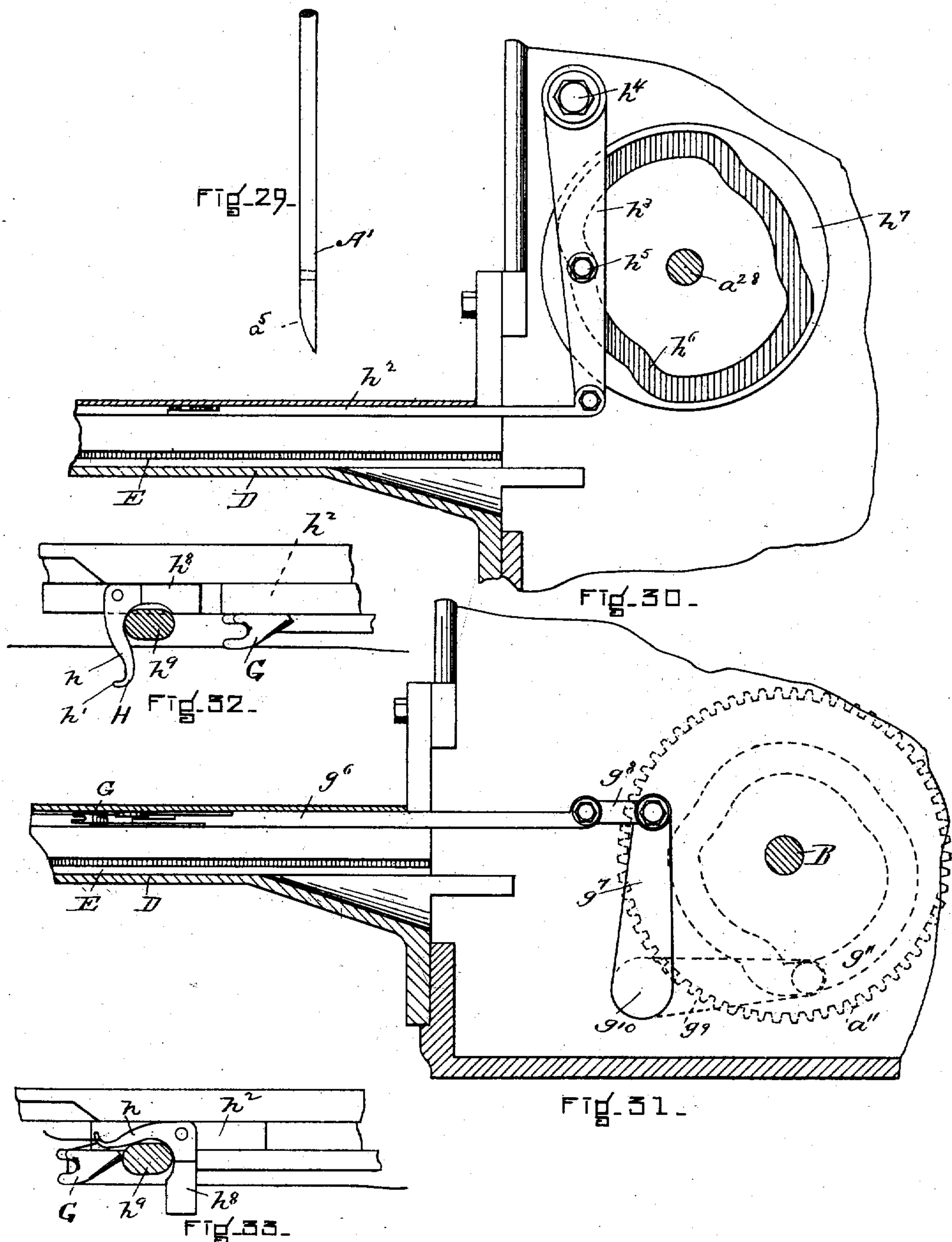
Erastus Woodward
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WITNESSES.

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15 Sheets—Sheet 14.

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MACHINE FOR SEWING ON BUTTONS.

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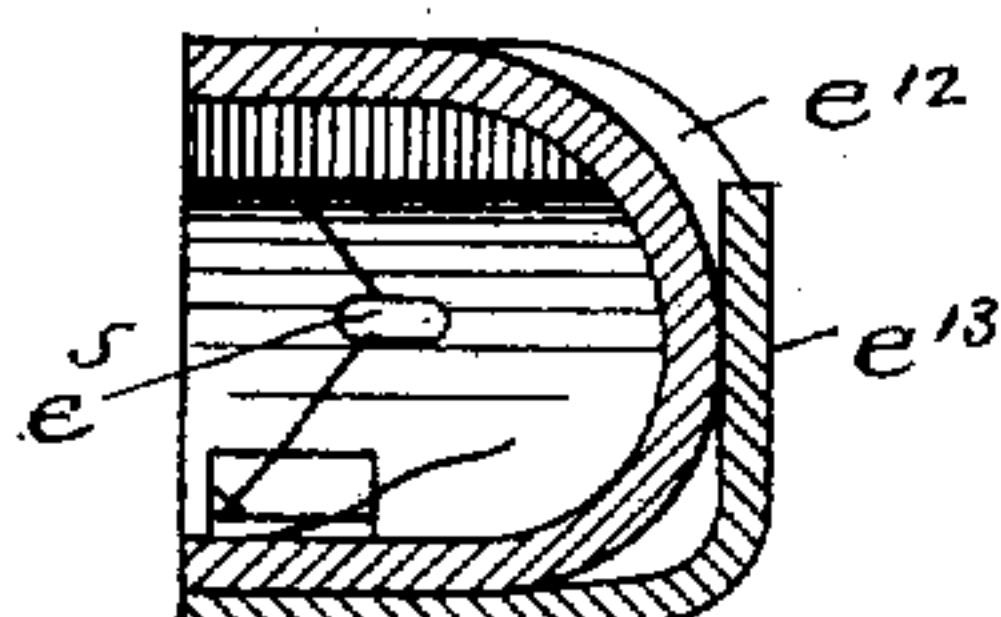
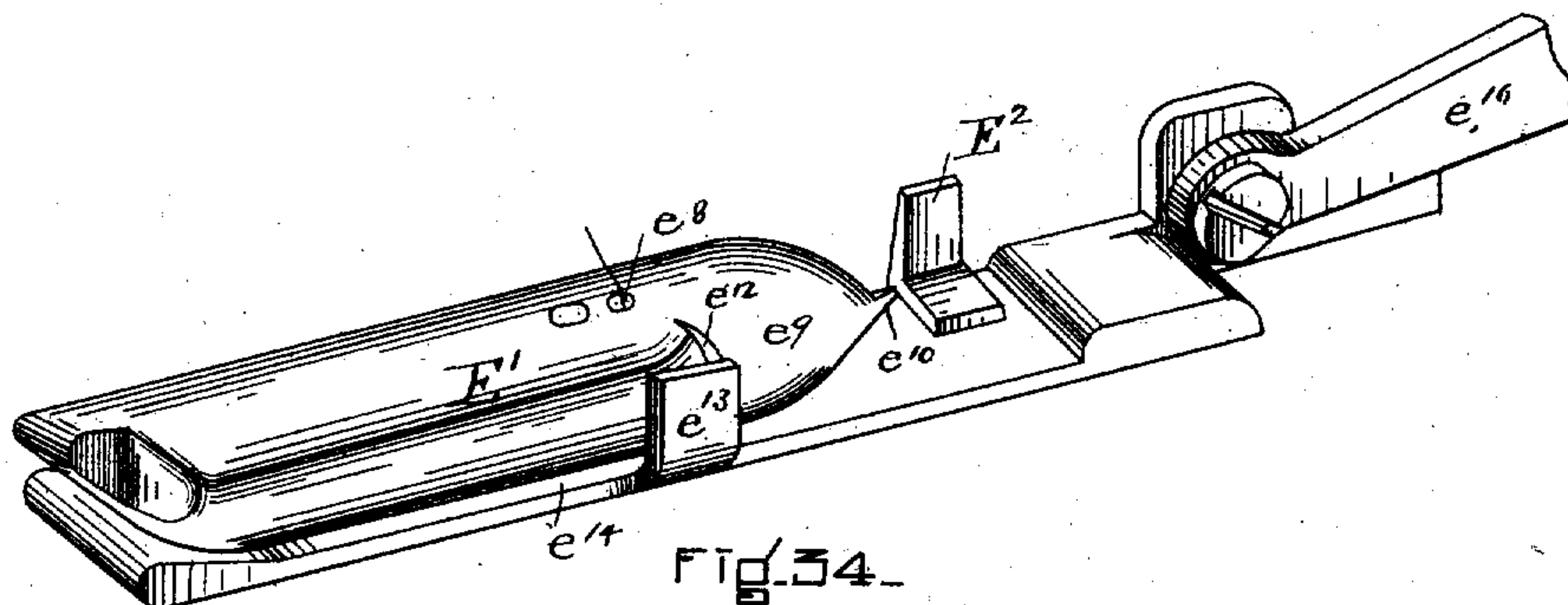


Fig. 38.

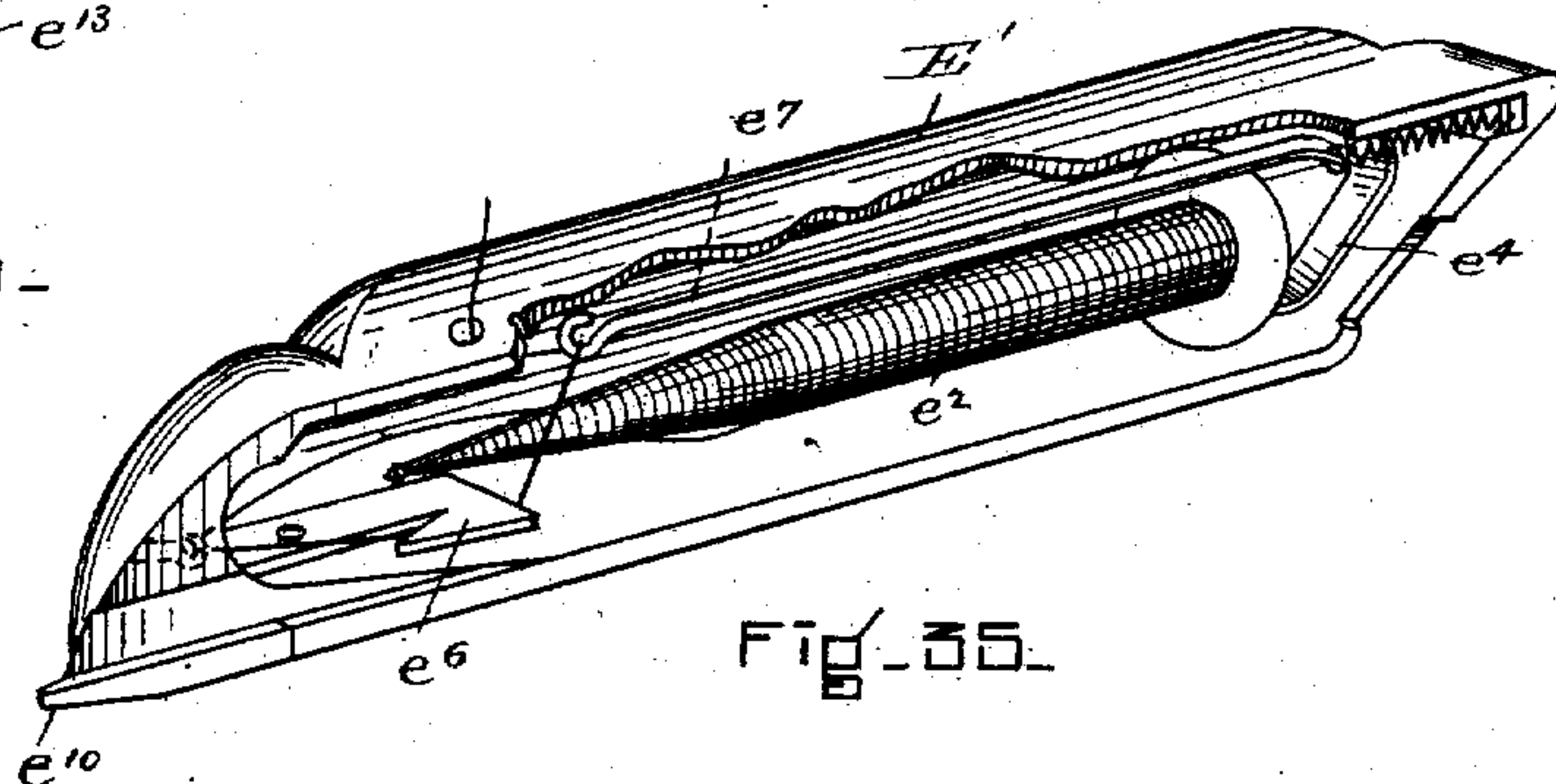


Fig. 35.

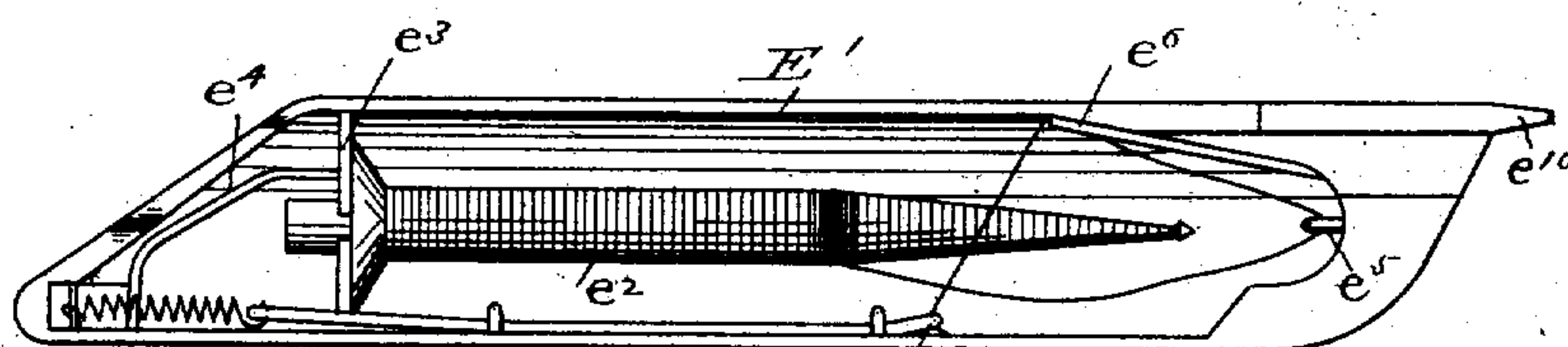


Fig. 36.

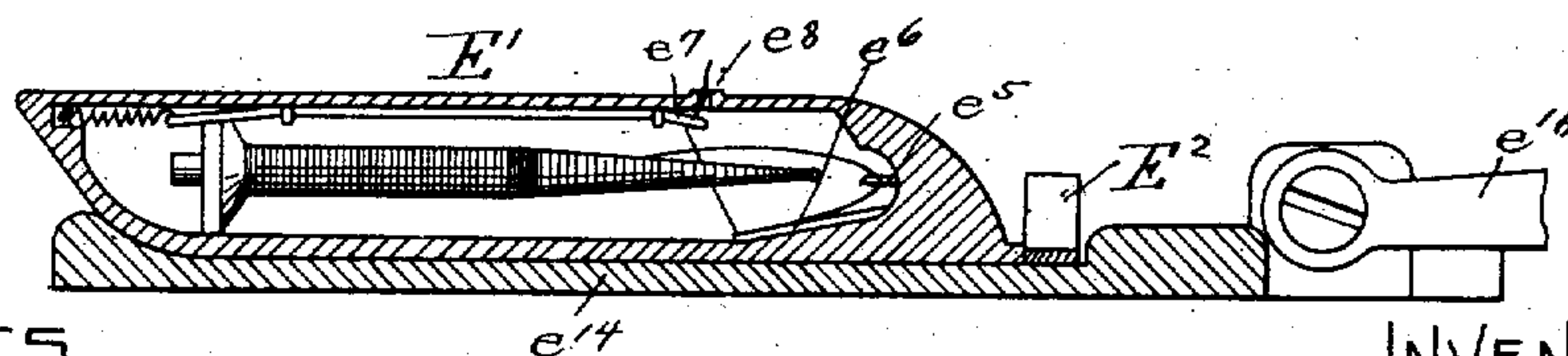


Fig. 37.

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(No Model.)

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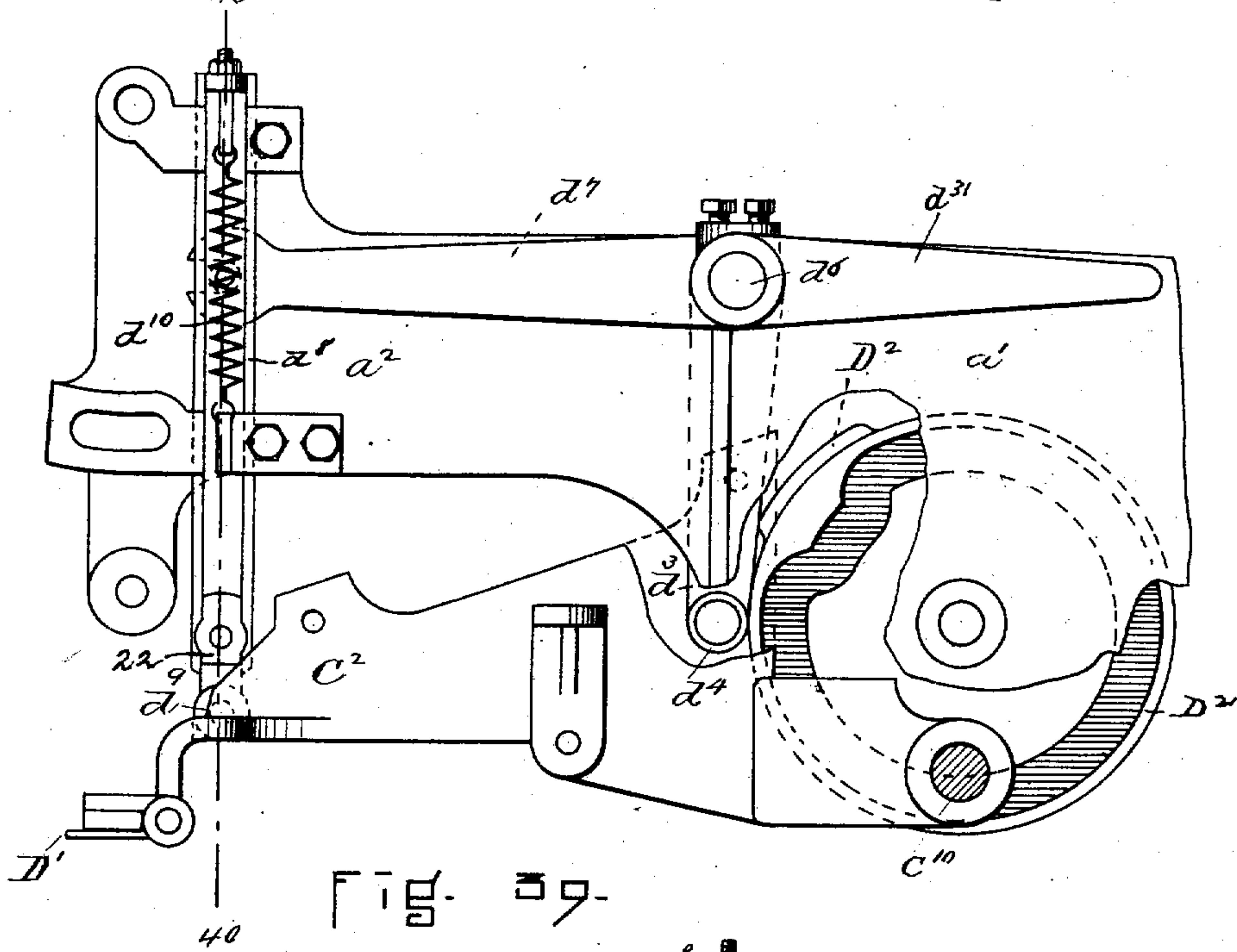


Fig. 39.

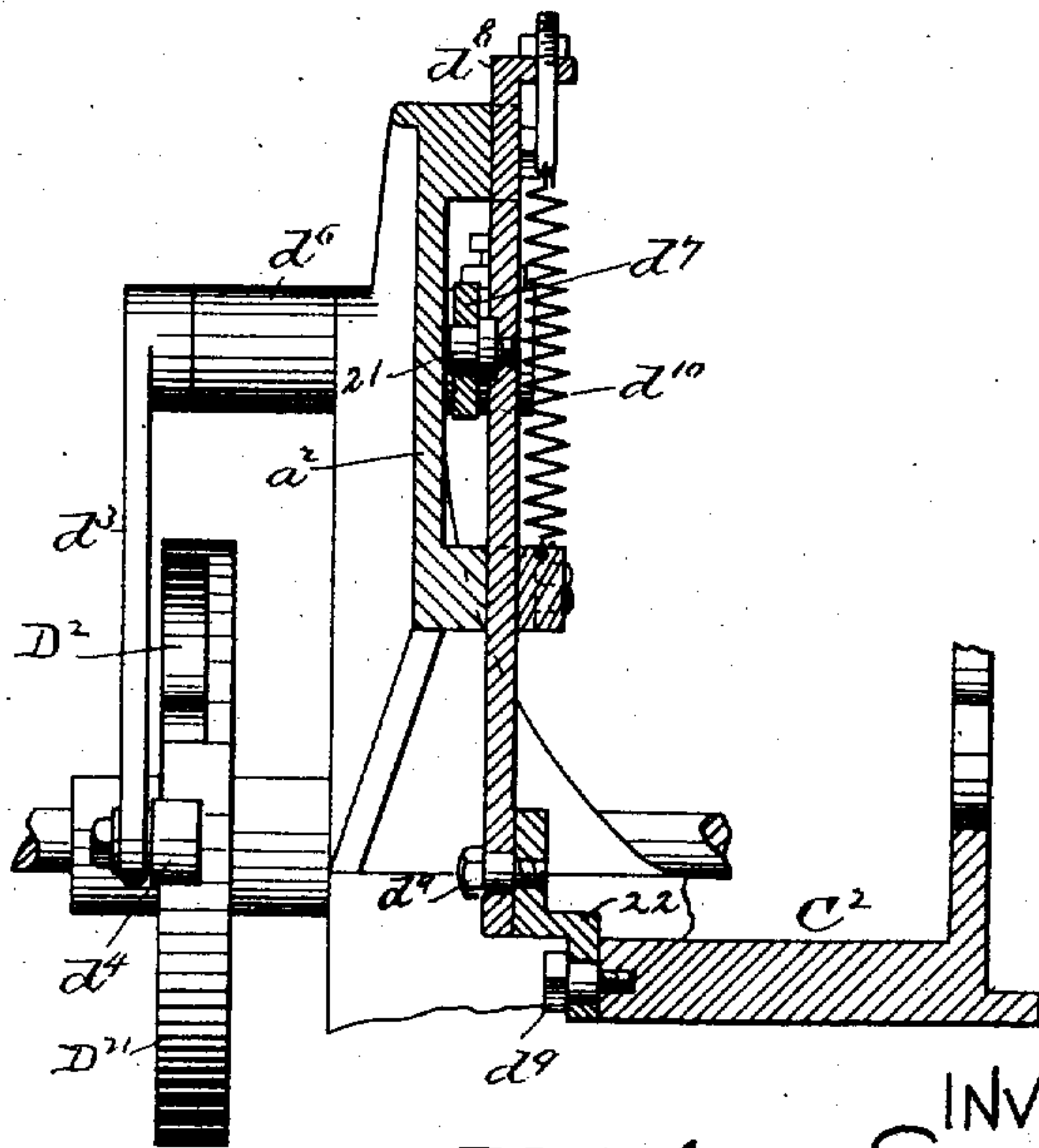


Fig. 40.

WITNESSES.

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INVENTOR.

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Charles T. Raymond

UNITED STATES PATENT OFFICE.

ERASTUS WOODWARD, OF SOMERVILLE, MASSACHUSETTS, ASSIGNOR TO THE MORLEY BUTTON SEWING MACHINE COMPANY, OF PORTLAND, MAINE.

MACHINE FOR SEWING ON BUTTONS.

SPECIFICATION forming part of Letters Patent No. 390,148, dated September 25, 1888.

Application filed September 13, 1886. Serial No. 213,376. (No model.)

To all whom it may concern:

Be it known that I, ERASTUS WOODWARD, of Somerville, in the county of Middlesex and State of Massachusetts, a citizen of the United States, have invented a new and useful Improvement in Machines for Sewing on Buttons, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The invention relates to a machine for sewing on buttons having projecting eyes to fabrics, preferably by means of two double-thread locked stitches extending from the under side of the fabric through the eye of the button and on the line upon which the buttons are set, each of these double-thread stitches being locked upon the under side of the fabric as it is taken. It is in many respects an improvement upon the inventions described in Patents Nos. 343,947, 343,948, and 343,949. It employs a barbed needle carried or supported by a needle bar held by a swinging or vibrating head, which is reciprocated upon diverging lines for the purpose of forming the stitches, and provided with a traversing movement for the purpose of feeding the material and attached buttons. The needle is reciprocated to form the stitch through the material to which the button is to be attached and slightly in advance of the eye of the button or of the button-holding device to engage the thread, which is carried by a spool held in a reciprocating shuttle. The needle upon taking the thread from a thread-carrier of peculiar construction is then caused to move upward through the fabric, backward, and downward through the eye of the button, to present the looped thread to the loop-holding device, and to the shuttle, which is immediately operated or moved to pass through the loop. The needle, without the thread, then moves upward through the eye of the button, forward, and downward through the material upon the same line as that of its first downward movement. It again engages the thread presented to it by the thread-carrier, draws it upward through the material, moves backward and again downward through the eye of the button, again presents a loop to the shuttle, which passes through it, and com-

pletes the second stitch. The needle upon its fourth reciprocation, instead of lifting from the eye of the button and while yet in the eye of the button, moves forward farther than the distance or point to which it is moved in taking its thread, and carries the button and fabric with it any distance required for spacing the buttons. It then lifts from the eye of the button and returns to its original position, again moves downward, and engages the thread preparatory to immediately sewing on the next button in order. The work is held upon the horn or work-support by a clamp or presser-foot, except during the forward movement of the material or fabric and attached button by the needle.

In the drawings, Figure 1 is a view of the machine in front elevation. Fig. 2 is a plan view thereof. Fig. 3 is a view in elevation of the end at the left of the front. Fig. 4 is a detail view in perspective, enlarged, to represent the action of the upper thread-drawer, and also showing a portion of the work-arm, the needle, and a part of the button-feeding mechanism. Fig. 5 is a view in elevation of the end at the right of the front of the machine. Fig. 6 is a view in rear elevation. Fig. 7 is a sectional elevation. Fig. 8 represents in perspective, enlarged, a portion of the work-support or horn and various of the stitch-forming devices. Fig. 9 is a view of the same parts, representing them in a different position. Fig. 10 is a detail view showing the shuttle in the act of taking a loop from the needle. Fig. 11 is a view in perspective of one of the covering-plates to the shuttle-race, inverted, to represent a block or pivot used in connection with the under thread-drawer, to which reference is hereinafter made. Figs. 12, 13, and 14 are views illustrating the construction of the mechanism for operating the upper thread-holder. Fig. 15 is a view in perspective, enlarged, of the devices for holding and presenting the buttons to the needle or stitch-forming devices. Fig. 16 is a view in perspective of the thread-carrier or device for presenting the thread to the needle. Fig. 17 is a view in elevation and plan illustrating the devices or mechanism for rotating or turning the button-carrier. Fig. 18 is a view illus-

trating in section and elevation a portion of the button-feeding mechanism. Fig. 19 is a sectional view to illustrate the construction of the locking device for holding the button in the button-carrier as it is being moved from the end of the chute to a position at the end of the needle. Fig. 20 is a view illustrating the position of various of the cams and their connections, to which reference will be herein-
 10 after made. Fig. 21 represents in elevation the devices for reciprocating the needle-bar and providing it with a period of rest while the fabric is being fed. Fig. 22 is a view of the same parts, representing them in the position which they occupy when the needle is about to be moved to feed the fabric. Fig. 23 represents in elevation cams for operating the thread-carrier and needle-bar. Figs. 24 and 25 are detail views of the needle and its pointed support. Fig. 26 is a vertical section through the needle-bar and head supporting the same. It also represents the bar for carrying the pointed needle-support. Fig. 27 shows the mechanism for providing the head carrying the needle-bar and the loop engaging or holding hook in the shuttle-race with traversing movements. Fig. 28 represents the same parts in the position which they occupy at the end of the traversing movement of said head and hook. Fig. 29 is a view in elevation of the needle, to show especially the form of its point. Fig. 30 is a detail view illustrating the cam and mechanism for operating the lower thread-drawer. Fig. 31 is a view of the cam and parts for operating the device for presenting the thread to the needle. Figs. 32 and 33 illustrate in plan view the operation of the lower thread-drawer. Fig. 34 is a view in perspective of the shuttle-carrier. Fig. 35 is a view, enlarged, of the shuttle, a portion of the shell being broken out to expose the interior. Fig. 36 is a rear elevation thereof, enlarged. Fig. 37 is a longitudinal section on a horizontal plane through the carrier and shuttle. Fig. 38 is a vertical cross-section taken through the driving-post of the shuttle-carrier. Fig. 39 is a detail elevation showing the presser-foot-lifting mechanism; and Fig. 40 is a sectional elevation on line 40 40, Fig. 39.

A is the frame of the machine. It has the broad base a , an upwardly-extending section or bracket, a' , cast therewith, which supports the shafts, and studs supporting the various
 55 cams, levers, and other devices hereinafter referred to. It also has an arm, a^2 , extending forward from the bracket a' , which carries the needle-bar and other mechanism.

A' is the needle. It has a barb, a^3 , at its lower end and a point, a^4 , which is out of line with the center of the needle, and has a long taper or bevel, a^5 , upon one side for the purposes hereinafter indicated. (See Fig. 29.) The needle is carried or secured to the needle-bar a^6 , and this needle-bar is held or supported by a head, a^7 , which is pivoted at a^8 , (see Figs. 2 and 6,) near the upper end of the head, to

the arm a^2 . The needle bar or rod is reciprocated vertically by means of the crank a^9 on the shaft a^{10} , (see Fig. 1,) which is driven by the spur-gear a^{11} on the main shaft B. (See Fig. 5.) This gear a^{11} meshes into a smaller gear, a^{12} , carried by the shaft a^{10} . The shaft has suitable bearings in the section a' of the frame, and also in a bracket, a^{13} , which is bolted to the base-plate of the machine. The crank a^9 is connected with the needle-bar by means of the short pitman or link a^{14} and the long lever a^{15} pivoted at a^{16} (see Fig. 1) to an arm or support, a^{17} , (see Figs. 2, 20, and 21,) which is made movable for the reasons and by mechanism hereinafter indicated. The outer end of the lever a^{15} is connected with the needle-bar by the link a^{18} . This crank movement gives the needle a continuous reciprocating vertical movement, except during the feeding of the fabric after the button has been sewed on, when the movement is interrupted and converted into a horizontal movement.

It is necessary that the needle-bar and needle should be reciprocated, first, so that the needle shall pass through the fabric upon a line in advance of the point where the button is to be attached, or outside of the eye of the button, for the purpose of taking thread, and at the end of this reciprocation the bar and needle must be returned to a position to bring the needle over the eye of the button which is being fed to it, and upon the needle's second reciprocation it should pass through the eye of the button and the fabric back of the point where it first entered the material. The loop is then taken by the shuttle and one stitch completed. The needle then lifts and is returned to its original position, and is again reciprocated through the fabric in advance of the button to again engage the thread, and it is at the end of this third reciprocation immediately returned to the position over the eye of the button, and it is again moved downward through it, carrying the thread with it, which is again taken by the shuttle and a second stitch formed. The needle-bar and needle then at the end of the first half of the fourth reciprocation, without lifting, move forward to feed the fabric and attached button, the work-clamp being at that instant released sufficiently to allow such movement to take place, and during this feed movement of the needle-bar and needle the needle is not lifted. In other words, its reciprocation is stopped during this feeding interval; but at the end of the feed movement it is moved upwardly and backwardly to its original position preparatory to taking thread for the attaching of the next or second button. These traversing movements of the needle and needle-bar are obtained by swinging the block or head a^7 by means of the cam-groove a^{19} , Figs. 27 and 28, in a cam-disk on the main shaft B, the lever a^{20} having a cam-pin, a^{21} , which enters the cam-groove a^{19} , and a long link, a^{25} . The lever a^{20} is pivoted at a^{22} to a movable support or lever, a^{23} , which is pivoted at a^{24} to the section a' of

the frame, and which is movable by a cam, as will be hereinafter indicated, to move the fulcrum-point of the lever a^{20} during the time the needle is feeding the fabric and the attached button, and for the purpose of increasing the throw or movement which it is necessary to give the needle-bar block or head at that time.

The cam a^{19} , lever a^{20} , and link a^{25} give the needle-bar block or head the traversing or transferring movements necessary to change the line of movement of the needle-bar; but to provide the block or head with the additional movement necessary for feeding the fabric and attached button I employ the lever a^{23} , carrying the fulcrum-point of the lever a^{20} , and this lever a^{23} is stationary, excepting during the time the needle is used for feeding the fabric, when it is caused to be moved by the cam-groove a^{26} in the cam-disk a^{27} on the shaft a^{28} , which is connected with the main shaft B by means of the small spur-gear a^{29} on the main shaft and by the large spur gear a^{30} on the shaft a^{28} .

The bell-crank lever a^{23} , the lower arm of which carries the fulcrum of the lever a^{20} , is operated at the proper intervals to give the long horizontal or feeding movements to the needle-bar head a^7 by the bell-crank lever a^{31} , the lower arm of which latter has a pin entering the cam-groove a^{26} of the disk a^{27} , the upper arm of the said lever a^{31} , and also the upper arm of the lever a^{23} , being provided with slots a^{37} , (see Fig. 6,) in which is arranged an adjustable or sliding block, a^{35} , which forms a connection between said levers. (See Figs. 2, 6, 20, 27, and 28.) The block a^{35} is carried by a pin, a^{36} , between which and the lever a^{23} is interposed the washer a^{39} . It will be obvious that by loosening the said nut and changing the position of the adjustable block a^{35} the throw of the lever a^{23} may be varied, as may be desired, to regulate the extent of the feeding movement given to the needle bar head a^7 .

It will thus be apparent that by means of the above-described mechanism the needle-bar head has regular traversing or horizontal movements imparted to it from the cam a^{19} , for the purpose of reciprocating the needle laterally to cause it to form alternate stitches inside and outside of the eye of a button, and after a predetermined number of such stitches have been formed and the button properly secured the said needle-bar head is given a long horizontal movement from the cam-groove a^{27} when the needle is in the work, for the purpose of feeding the work along preparatory to sewing on the next button. It is necessary, also, that the needle-bar and needle should not be moved vertically during the time that the needle is feeding the fabric forward; and although the needle-bar and needle are reciprocated by a crank and lever, yet I am enabled to obtain this stopping of the reciprocation of the needle-bar and needle by moving the fulcrum-point of the lever so that it takes up the movement of the crank and prevents it from being trans-

mitted by the lever to the needle-bar. This is accomplished by moving the support or arm a^{17} of the fulcrum or pivot a^{16} of the lever a^{15} by means of the cam-groove a^{40} (see Fig. 21) in the side of the gear-wheel a^{30} on the shaft a^{28} . This cam-groove a^{40} is connected with the arm a^{17} by means of the arm a^{41} , bearing a cam pin, a^{42} , which enters the cam-groove a^{40} , and the end of which connects by means of a stud or shaft, a^{43} , (see Fig. 21,) which has a bearing at a^{44} (see Fig. 2) in the part a' of the frame, with the outer end of the arm or support a^{17} , the connecting-stud a^{43} and the arms a^{41} and a^{17} forming a bell-crank lever.

The cam a^{40} is so timed that at the end of the first half of the fourth reciprocation of the needle bar the fulcrum a^{16} of the needle-bar lever a^{15} is moved downward, and this neutralizes the upward movement which the crank is giving the rear end of the lever, so that the needle-bar and lever are not reciprocated during the forward feeding movement which is then taking place. Immediately upon the end of the feeding movement the cam acts to return the fulcrum a^{16} to its original position, and the needle and needle-bar complete the last half of their fourth reciprocation and are returned, as above described, to a point or line upon which they are reciprocated to take thread for the sewing on of the next button.

I have now described the mechanism for giving the needle the several movements which it has in relation to the shuttle and in relation to the eye of the button, and which it also has for feeding the fabric; but before proceeding to describe the button feeding mechanism and the stitch-forming devices I would say that the shank of the needle is supported by an arm, A^2 , (see Figs. 24, 25, and 26,) which has a curved supporting-piece, a^{45} , which surrounds or very nearly surrounds the shank of the needle. This arm A^2 is fastened to a slide-plate, a^{46} , which moves in ways in the swinging needle-bar head or block behind the needle-bar. Its office is fourfold, for it not only operates to support the needle, but it also has a point, a^{47} , which serves as a cover to the barb of the needle, and which operates to cover it after it has been drawn or moved upward with the thread, and while it is transferring and moving downward and until it has entered the eye of the button. The point further serves to enter the eye of the button in advance of the needle to center it and bring it in line with the needle. It further operates to remain in the eye of the button after the button has been sewed on during the feeding movement, and until the needle withdraws therefrom, in order that during such withdrawal of the needle the barb or hook may be covered, and so as to prevent it from engaging the eye of the button as it is being withdrawn. These movements are given the bar a^{46} , supporting the arm A^2 , by means of the stud or pin a^{48} , (see Figs. 1, 26, and 27,) which projects from the upper end of the bar in line with the needle-bar a^6 , so that upon the upper part of the upward

movement of the needle-bar the upper end thereof comes in contact with the stop or pin and moves the arm upward therewith. A spring, a^{49} , serves to draw or move downward the bar a^{16} until the stud or pin a^{50} comes in contact with the stop a^{51} . (See Fig. 6.) These movements, however, are not all that are necessary for providing the point of the arm A^2 with the functions above indicated, for upon the movement of the needle to feed the fabric and for the purpose of shielding its barb and the eye of the attached button it is necessary that the arm should move down farther than it is permitted to move by the stop a^{51} . (See Fig. 6.) To permit this additional throw or movement, the stop is provided with a surface, a^{52} , which is somewhat lower than the surface a^{53} , and the surface a^{53} is made of such a width that upon the swinging of the needle-bar block or head during the feeding of the fabric the stud or pin rides from the said surface a^{53} onto the lower surface, a^{52} , so that the arm A^2 is moved or drawn downward by the spring a^{49} sufficiently to permit the point to enter the eye of the attached or sewed-on button before the needle is withdrawn therefrom.

It will be seen that the barb is covered and the needle is supported from the time it clears the work-plate and fabric upon its upward movement until the point a^{47} of the support A^2 has entered the eye of the button, when the point becomes stationary until the needle lifts, when it lifts with the needle and comes forward with it, covering the barb until it again enters the throat for the second stitch, and upon the upward movement of the needle from the fabric the barb is again covered by the point and the point operated to enter the eye of the button in advance of the needle, as before. Upon the fourth reciprocation of the needle the arm carrying the support A^2 moves forward horizontally with the needle and is dropped to its lowest position or level, so that it remains in the eye of the needle during this forward feeding movement. It is given a dropping movement during this forward movement, because the button is drawn by it and the needle from the button-holder, and as the button-holder is higher than the work-support the button is caused to drop somewhat upon leaving its holder, and the point, in order to still maintain its position in the eye of the button, must have a corresponding dropping movement given to it. At the end of the feed movement the point remains in the eye of the button until the barb of the needle has been lifted above the eye, and it then operates to act as a shield in preventing the barb of the needle from engaging the eye of the button as it is withdrawn.

The button feed or supply mechanism is automatic in its action and furnishes a continuous supply of buttons in regular and successive order to the needle, with their eyes brought into position to receive the needles, and each button is held in this position while it is attached. It comprises the hopper C, ar-

ranged to receive and hold a large number of buttons in bulk, and they are fed therefrom into the chute or conveyer c and arranged therein in order for attaching, substantially as described in Patent No. 343,949. At the end of the chute c there is a button receiver and carrier, C' , (see Fig. 19,) which comprises a holder or socket, c' , (see Figs. 4 and 15,) of a size to receive the head of the button, and having a recess, c^2 , for receiving the shank of the eye of the button. The carrier also has a latch or locking arm, c^3 , arranged to be moved upon the upper portion of the head of the button to hold it in place. This carrier is upon the end of a shaft, c^4 , and is given a quarter-revolution by means of the gear c^5 (see Figs. 17 and 19) upon the said shaft c^4 and the lever c^6 , which is pivoted at c^7 , and which is reciprocated or moved at the desired interval by the cam-groove c^8 in the cam-disk c^9 upon the shaft c^{10} , which is supported by means of a bracket, c^{11} , (see Fig. 1,) bolted to the base a of the frame, and is positively revolved by means of the gear-wheel c^{12} thereon and the gear-wheel c^{13} upon the extension c^{14} of the shaft a^{28} , which meshes therewith. The lever c^6 has at its end a short segment, c^{15} , which meshes or engages the teeth of the gear c^5 .

The button-carrier is arranged so that it occupies a position at the end of the chute c , so that when in that position it can receive automatically from the chute one button with its eye extending laterally between the two arms which form the recess for receiving it, and while it is in this position the latch or button-locking device c^3 is held back, so as to expose the full opening to the carrier, by means of the rod c^{16} , to the end of which the locking arm c^3 is secured, (see Fig. 19,) and which is movable horizontally in the tubular shaft c^4 by means of the lever c^{17} , pivoted at c^{18} , and the face-cam c^{19} of the cam-disk c^9 . The lever c^{17} has a cam-roll which bears against the face cam, and the other end of the lever has a loose connection with or bears against the end of the rod c^{16} . The lever is adapted to be moved positively by the face-cam to push the lock or latch c^3 outward to open the socket, and the cam-roll is kept in contact with the face-cam by means of the spring c^{20} . (See Fig. 2.) The socket having received the button from the chute, the end of the lever c^{17} is moved outward to release the rod c^{16} , and a spring, x^{20} , (see Fig. 19,) serves to automatically move the rod c^{16} and close the latch or lock upon the head of the button. This closing movement is immediately followed by the partial revolution of the carrier, the mechanism operating its shaft turning the carrier a quarter-revolution, which turns the button, of course, a quarter-revolution and brings its eye in line with the arm A^2 and the needle, which are at that instant moved into said position and are descending while the button is being moved by its carrier downward and outward into a position to expose its eye. The carrier and chute are otherwise so shaped that upon this forward movement

of the carrier a section thereof behind the socket serves to close the chute and keep the buttons held therein until the button has been drawn from the socket and it is returned to receive the next one in order.

In order that the button after it has been attached may leave the carrier, it is necessary that the cam and lever for unlatching or unlocking it should be operated immediately before or at the very beginning of the feed movement of the fabric, so that the locking-arm c^3 shall be moved away from the sockets sufficiently to permit the attaching button to be moved therefrom.

The mechanism for forming the stitch comprises a number of elements or devices, which will now be described.

D is an arm or horn projecting laterally from the section a' of the frame, to which it is bolted. It supports the work-plate d , (see Figs. 2 and 4,) which has a long slot or throat, d' , formed therein, and it has also the roughened or serrated surface d^2 parallel with the throat, and upon which the fabric is held clamped during the sewing by the presser-foot D' , which is carried or supported upon the end of the frame C^2 of the button-feeding mechanism, and this frame is pivoted to the shaft e^{10} , so that the presser-foot is held in place to some extent by the weight of this frame.

The presser-foot D' is lifted at proper intervals to permit of the feeding of the work by means of the cam projection D^2 on the cam-disk D^1 , said cam projection engaging a roller-stud, d^4 , at the lower end of an arm, d^3 , of a bell-crank lever consisting of the arms d^3 d^7 , said lever being pivoted on a stud, d^6 , supported by the bracket or frame a' . The forward end of the arm d^7 of the said bell-crank lever is forked to engage a pin, 21, attached to a vertically-movable bar or plate, d^8 , sliding in ways in the bracket or arm a^2 , (see Figs. 39 and 40,) said bar or plate d^8 being connected by the angle-plate 22 and screws d^9 with the pivoted frame C^2 , to which the presser-foot D' is attached. The spring d^{10} serves to return the parts to their normal positions after being lifted by the cam projection D^2 and to hold the presser foot in yielding contact with the work. The bell-crank lever may have a rearwardly-extending arm, d^{11} , Figs. 2 and 39, which can be pressed upon to lift the presser-foot when desired.

The arm D has a raceway, E, in which the shuttle E' is reciprocated, and this raceway is covered by plates e e' , the upper surfaces of which form continuations of the work-plate. (See Fig. 4.)

The shuttle E' is provided with the bobbin e^2 , which is held in place by a support, e^3 , and spring-latch e^4 . The thread from the bobbin passes through an eye, e^5 , in the shuttle-cavity, thence over the tension-bar e^6 , then through a yielding eye, e^7 , and through the shuttle-eye e^8 . The shuttle also has its forward end or head, e^9 , (see Fig. 8,) provided with a sharp steel point, e^{10} , which takes the thread or loop

from the needle, and it also has immediately behind its head a shoulder, e^{12} , for receiving the stud or post e^{13} of the shuttle-carrier e^{14} , so that the shuttle is driven by its head, as will hereinafter appear. I do not, however, make any claim to this shuttle in this application, the same being embraced by my application No. 213,375, filed September 13, 1886.

The shuttle-carrier e^{14} comprises a metal plate of suitable length and width to receive the shuttle and play in the race, and which moves in suitable guides. It is reciprocated by means of the crank e^{15} (see Fig. 7) on the main shaft B and the pitman e^{16} . It has also the post e^{13} , above mentioned, which is arranged to project upward behind the shoulder e^{12} at the head of the shuttle, as above referred to. The said shuttle-carrier is also provided with a needle-guide plate or post, E^3 , (see Fig. 9,) which is located in front of the point of the shuttle, and which is somewhat inclined on its inner side. This inclined reciprocating needle-guide is for the purpose of preventing the needle from being sprung outward, so that the said needle, when in its lowermost position, will be in proper place to insure the engagement of the point of the shuttle with the loop of needle-thread.

In order that the shuttle may be held against the wall or face-plate e^{17} of the race while it is taking and passing through the loop, I have arranged in the end of the raceway a spring, E^3 , (see Fig. 8,) which bears upon the outer or rounded surface of the shell of the shuttle while it is in this part of the race taking the loop. In order that the thread and loop may be properly held for engagement by the shuttle, I have arranged a loop engaging and holding point, F, which comprises an arm having a hook, f , and a recess, f' , formed thereon, arranged to project slightly into the raceway and slightly toward the direction in which the thread is moved by the shuttle. Upon the downward movement of the needle with the thread the shuttle-point immediately engages the loop and opens or exposes it, moving it, of course, forward while so doing. This brings the inner thread, or that thread upon the flat side of the shuttle, into the recess f' and behind the hook f , which is then stationary, and this holds the loop below or upon a line with the point of the shuttle, so that the loop is not dragged by the shuttle as it comes forward, but is held in that position while the shuttle passes through it. As, however, the needle moves forward after it has passed down through the eye of the button the second time to deliver the thread of the second stitch or the second loop to the shuttle, and as it moves in the race to feed the fabric before the shuttle has passed through the loop, it is necessary upon this forward movement of the needle to also move the hook F with the needle, so that the relative position of the thread or loop in relation to the hook, needle, and shuttle cannot be changed during this feeding movement of the fabric and the formation of the second

stitch. To accomplish this result and to provide the hook or loop-holder F with substantially the same extent of movement as that given the needle in feeding, and also to enable the feed-adjusting devices to adjust the length of the feed or movement of this hook F, or, in other words, so that the length of the horizontal movement of the needle and the hook may be adjusted by one adjusting device, I have secured the hook or loop-holder F upon the end of a slide-bar, f^2 , which is movable in suitable ways in the arm D, and which is connected by a link, f^3 , (see Figs. 7 and 27,) with the end of the lever a^{23} , which carries the movable fulcrum or pivot a^{22} of the lever operating the swinging needle-bar block or head a^7 , (see Fig. 27,) so that this loop-holding hook is operated by the same cam which operates to move the fulcrum of the needle-bar-head lever which provides the needle with its feed movement.

In the operation of forming the stitch I have found it desirable to use, in addition to the elements above mentioned, a thread-carrier, G, (see Figs. 8, 9, and 16,) which is reciprocated immediately below the throat-plate and in the back of the raceway, and which is formed or provided with the vertical recess g between the arms or points g' g^2 and g^3 g^4 and the horizontal recess g^5 between the arms g' g^3 and the arms g^2 g^4 .

The thread carried or fed to the needle passes through the horizontal recess g^5 , and the vertical recess permits it to be moved into the barb of the needle, or into a position from whence it can be reached by the barb. Of course the vertical recess is deeper than the horizontal recess. The carrier is attached to the end of the long slide-bar g^6 , which is operated by the lever g^7 , connecting-link g^8 , and lever g^9 , having a bearing, g^{10} , and cam-groove g^{11} in the gear-wheel a^{11} on the main shaft. (See Figs. 7 and 20.) There is also employed a take-up and thread-carrier, H, (see Figs. 8, 9 and 11,) which comprises an arm, h , having an outwardly-extending projection or hook, h' . This arm is pivoted at the end of the slide-bar h^2 , which has bearings in the arm D, and which is reciprocated or moved by the lever h^3 , (see Figs. 7 and 30,) pivoted at h^4 and having a cam-pin, h^5 , which enters a cam-groove, h^6 , in the cam-disk h^7 upon the shaft c^{14} . The arm h also has a projection, h^8 , which is shaped substantially as represented in Figs. 8 and 9, and there is arranged to project downward from the covering-plate e' of the race a pin or block, h^9 , against which the curved edge h^{10} of the arm is adapted to bear. This pin or block acts to govern or control the movement of the hook h' of the arm or lever h , so that upon the outward movement of the slide h^2 the said hook is thrown forward from the side of the raceway into the race, as shown in Fig. 8, and upon the backward movement of the slide the arm is caused by the pin to take a circular movement or path from the race into the recess h^{11} in said plate e' . (See Fig. 11.) The hook is given this movement from the race after the

shuttle has passed it upon its forward movement and when the said shuttle has brought the leading thread into a position to be taken by the hook. The hook is then turned to draw the leading thread past the thread-receiving recess g^5 of the thread-carrier and laterally from the raceway into the recess h^{11} . Upon the backward movement of the shuttle the hook h' is moved forward and outward simultaneously with the forward movement of the carrier G and releases the thread. This hook is located and operated so that it serves to take and hold the slack leading thread, and to then give it off to the needle while the shuttle makes its backward movement, so that the needle is supplied with thread from both sides and the thread is prevented from reeving in the barb.

Another device necessary in forming the stitch is the upper thread-holder, M. (See Figs. 12 and 13.) This device is adapted to hold the thread which the needle draws upward through the fabric taut, or from becoming slackened while the needle is moving backward and downward to carry the loop through the eye of the button and present it to the shuttle, when it releases the thread by a lateral movement and returns again to its original position and remains stationary until the needle has engaged the thread for the second stitch, when it is moved outward and forward to hold the thread, as before. These movements are provided by the joint action of the cam-groove m in the disk m' (see Fig. 20) upon the main shaft, the lever m^2 , pivoted at m^3 , the long link m^4 , the lever m^5 , having a fulcrum at m^6 , the link m^7 , (see Fig. 7,) which engages the arm m^8 of the cam-block m^9 , and the said cam block. This cam-block is carried or supported by a block, m^{10} , which has a stud, m^{11} , (see Figs. 12 and 13,) extending backward through a hole, m^{12} , in the bracket M', and which supports a coiled spring, m^{13} , which bears against the said bracket M' or washers thereon, and a nut, m^{14} , and serves to hold the arm m^{15} , which carries or supports the holder M, and which is pivoted at m^{16} to lugs m^{17} , extending from the block m^{10} , firmly against the surface of the cam disk or block m^9 . This cam disk or block has two cams, m^{18} m^{19} . The cam m^{18} is arranged and shaped to bear against the upper end of the arm or lever m^{15} above the pivot or fulcrum point m^{16} , and the cam m^{19} to bear against the lever below the said pivot, and upon a partial rotation of the cam-block m^9 by the cam-groove m and connecting devices mentioned the lever or arm m^{15} is moved by one cam or the other, so that its lower operative end or holder, M, is moved both toward and from the line of movement of the needle, and by a further movement of the cam-block m^9 the arm is given a traversing movement. In operation it is first moved laterally by the partial rotation of the cam-disk in front of the thread after it has been drawn upward through the fabric by the needle. It is then moved away from the needle to take up the slack as the needle moves down-

ward and the shuttle backward, and this movement is occasioned by the further rotation of the cam *m*. The upper thread-holder is then moved transversely to disengage it from the thread, and is then returned to its original position, to again engage the thread, by a further movement of the cam-disk.

I prefer to make the portion of the device which forms the holder or arm *M* in the form represented in the drawings and to connect it with the lever *m*¹⁵ by means of a horizontal pivot, *m*²⁰, so that the outer end of the holder may yield downward to permit the thread to disengage itself therefrom in case it should not have become disengaged by the backward movement of the holder. This downward movement is in opposition to a flat spring, *m*²¹, which is secured to the face of the arm *m*¹⁵ and bears against the upper edge of the holder *M*.

In operation the fabric to which the buttons are to be attached is placed upon the work-plate and beneath the presser-foot, and upon the starting of the machine the presser-foot drops automatically upon the work, clamping it against the work support or plate. The needle immediately moves down through the fabric slightly in advance of the button-holder. The shuttle-thread is presented to it by the thread-carrier, the thread having previously been placed by hand across the ends of the thread-carrier, and brought up through the throat and passed under a holding spring on the inner side of the arm *D*. The needle lifts through the fabric, drawing the thread with it. The button-carrier immediately moves the button into position for attachment. The needle immediately descends or moves downward through the eye thereof and the fabric, the upper thread-holder having by its positive movement away from the needle held the thread. The loop is engaged by the loop hook. The shuttle immediately enters the loop and passes through it, draws the thread, and tightens the stitch. The lower thread holder takes the leading thread and carries the slack to one side of the race. The needle moves downward and forward to a position to take thread from the thread-carrier, which has had the thread this time presented to it by the thread holder. The shuttle moves backward. The needle takes the thread at the instant the end of the shuttle comes opposite it upon its backward movement and again moves upward through the fabric, as before, the shuttle continuing its backward movement and then advancing to take the second loop, and while the shuttle is moving forward the needle is operated to feed the fabric and button by a traversing movement and while the second stitch is being completed, and this operation of the machine is continuous—that is, it is not stopped between the sewing of the buttons. Of course the presser-foot is lifted immediately before the fabric and needle are fed forward and automatically returned to clamp the material at the end of the feed movement.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. The combination, in a sewing-machine, of a needle-bar, a barbed needle supported thereby, a work support, a shuttle-race, a loop-engaging hook arranged to project into the race near its bottom, a shuttle having a reciprocating motion in said race, and means for reciprocating said needle-bar, comprising a crank, a lever operated thereby connected with the needle-bar, its fulcrum, and a cam for controlling the position of the fulcrum, substantially as described.

2. In a sewing-machine, the combination, with a work support, of a movable needle-bar head above said work support, a needle-bar reciprocating vertically in said head, a barbed needle carried by said bar, means for operating said needle bar head to move the needle-bar and needle horizontally after each stitch, a shuttle-race, a shuttle, operating mechanism for the latter, a loop-engaging hook below said work support, said hook extending into the shuttle-raceway to engage the shuttle-thread, and a vibrating thread-controlling lever above said work support, substantially as set forth.

3. In a sewing-machine, the combination, with a movable needle-bar head and needle-bar, of a cam and intermediate connections to operate said head to move the needle-bar and needle horizontally to feed the work, a lever for reciprocating said needle-bar vertically, a crank with which said lever is connected, an arm or lever by which the fulcrum of said lever is carried, and a cam for operating said fulcrum-carrying arm or lever to counteract the normal action of the said crank and suspend the vertical movement of the said needle-bar and needle while the feeding movements are occurring, substantially as set forth.

4. In a sewing-machine, the combination, with a work-plate or work-support and a vertically-reciprocating needle-bar and barbed needle above the same, of a reciprocating shuttle and vibrating thread-hook below said work support, the thread holder or thread-controller *M* above said work support, a lever, *m*²¹, by which said thread-controller is carried, and devices for vibrating said lever in two different planes at right angles to each other to impart universal movements to said thread-controller, substantially as set forth.

5. In a button-sewing machine, the combination, with a button-presenting mechanism, a reciprocating needle-bar and needle, and a device to co-operate with the latter in forming stitches, of a needle-support, *A*², having a button-centering point, *a*¹⁷, a bar by which said support is carried, and means for reciprocating said bar, the latter being timed to cause said button-centering point to descend in advance of the needle to center the eye of a button, substantially as set forth.

6. The combination, in a sewing-machine, of a swinging head, a needle-bar carried thereby,

a barbed needle supported by the bar, mechanism for imparting horizontal feeding movements to said needle-bar and needle, a needle-support, A^2 , having a point, a^{47} , a bar carrying the said needle-support A^2 , having the pin a^{48} , and having a pin, a^{50} , at the upper end thereof; the spring a^{49} , and the arm or stop a^{51} , having surfaces a^{52} a^{53} , and devices for imparting to the needle-bar and its supporting-head the movements indicated, all substantially as described.

7. In a sewing-machine, the combination, with a needle-bar, needle, and co-operating stitch-forming devices, of a swinging block or head in which the said needle-bar reciprocates vertically, a lever connected with the said block or head to vibrate the latter, and thus move the needle-bar and needle horizontally, a cam for operating said lever, a second lever carrying the fulcrum of the said first-named lever, a cam and connections for operating the said fulcrum-carrying lever to change the horizontal throw of the needle when the work is to be fed thereby, a shaft by which the said last-named cam is carried, and a train of gearing connecting said shaft with the needle-bar-operating shaft, whereby after a predetermined number of overseaming stitches have been made to attach a button an increased horizontal throw is given to the feeding needle-bar and needle to feed the work, substantially as set forth.

8. In a sewing-machine, the combination, with the swinging needle-bar head a^7 , of the needle-bar reciprocating vertically in the said head, the needle, the shuttle, the thread controlling devices, the lever a^{20} and its actuating cam, the rod a^{25} , connecting the said lever with the said head, the loop holder F , having hook f , the bar f^2 , by which the said loop-holder is carried, the lever a^{23} , connected with the said bar and carrying the fulcrum of the said lever a^{20} , and the cam and connections for operating said lever a^{23} , substantially as set forth.

9. The combination, in a sewing-machine, of a needle-bar, a barbed needle supported thereby, devices for imparting a reciprocating movement to said bar, a shuttle-race, a thread-carrier, G , within said race, having a vertical recess to receive the needle and across which the thread is moved, and horizontal recesses to receive the thread, a reciprocating shuttle, and a thread-holder or take-up comprising a curved arm located in relation to the thread-carrier and shuttle-race as described, and devices, substantially as specified, for moving said thread-holder in relation to the shuttle and said thread-carrier, substantially as described.

10. The combination of a swinging block or arm supporting a needle-bar, the said needle-bar, a barbed needle supported thereby, devices, substantially as specified, for providing the block and needle-bar with the traversing movements specified and the needle-bar with the reciprocating movements indicated, an arm having a work-support and shuttle-

race, a presser-foot for holding the work to the work-support during the formation of the stitches, a reciprocating shuttle-carrier, a shuttle carried thereby, a loop-engaging hook, the thread-carrier G , having a vertical recess to receive the needle and horizontal recesses to receive the thread for presenting the thread to the barb of the needle, a thread-drawer in the shuttle-race, and a thread-holder above the work-support, each adapted for action in relation to the shuttle and needle, respectively, as set forth, and devices for automatically feeding buttons one by one to the sewing mechanism, substantially as described.

11. In a button-sewing machine, the combination, with a stitch-forming mechanism and a work-support, of a pivoted frame, an automatic button-presenting mechanism carried by said frame, a presser-foot, also carried by said frame, and mechanism for operating said frame, whereby the said presser-foot and button-presenting devices are lifted from the work when the latter is to be fed, substantially as set forth.

12. In a button-sewing machine, the combination, with a stitch-forming mechanism and a work-support, of the pivoted frame C^2 , button-presenting devices carried by said frame, the presser-foot D' , also carried by said frame, the lever d^3 d^7 , the slide d^3 , connecting said lever and frame, and a cam for operating said lever, substantially as set forth.

13. In a button sewing machine, the combination, with a stitch-forming mechanism, of the work-supporting arm D , having the roughened or serrated surface d^2 , the presser-foot D' , bearing on said surface, the pivoted frame C^2 , by which said foot is carried, a button-presenting mechanism, also carried by said frame, and a cam and lever by which said frame is operated, substantially as set forth.

14. In a sewing-machine, in combination with a needle-bar, a barbed needle carried thereby, and devices for imparting to the needle-bar a reciprocating movement, the shuttle-race, a thread-carrier having the vertical recess g and the horizontal recess g^5 , a cam and connecting mechanism for providing it with the movements in relation to the needle specified, the thread-drawer H in the shuttle-race, a cam, and connecting devices for providing it with the movements in relation to the thread-carrier indicated, substantially as described.

15. The combination, with the needle and shuttle and their operating mechanisms, of the loop holder or controller, the lever m^{15} , to which said controller is pivoted, the spring m^{21} , to retain said controller in its normal position yieldingly, the vibrating block m^9 , to which said lever is pivoted, and mechanism for operating said block, substantially as set forth.

16. The combination, with the thread-controller M and the lever by which it is carried, of the vibrating block m^9 , to which said lever is pivoted, and which is provided with the

cams m^{18} m^{19} and arm m^8 , and means for rocking said cam-block.

17. The combination, with the vibrating cam-block m^9 and the lever m^{15} , pivoted thereto and having the thread-controller M, of the block m^{10} , on which the said cam-block is mounted, and which is provided with the stud m^{11} , the bracket M', the spring m^{13} , and nut m^{14} , substantially as set forth.

18. The combination, with the block m^{10} and its support, of the cam-block m^9 , having the arm m^8 , the thread-controlling lever pivoted to said cam-block, the link m^7 , the lever m^5 , the link m^4 , the lever m^2 , and the cam for operating said lever, substantially as set forth.

19. The combination, in a sewing-machine,

of a swinging head or block, a needle-bar carried thereby, a barbed needle supported by said bar, a crank, a lever operated by the crank and supported by a second lever, the said second lever and a cam for moving it at intervals, and an adjusting device between the cam and second lever for varying the extent of movement of the fulcrum, whereby the extent of the traversing movement for feeding the material and attaching the button may be varied, substantially as described.

ERASTUS WOODWARD.

Witnesses:

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