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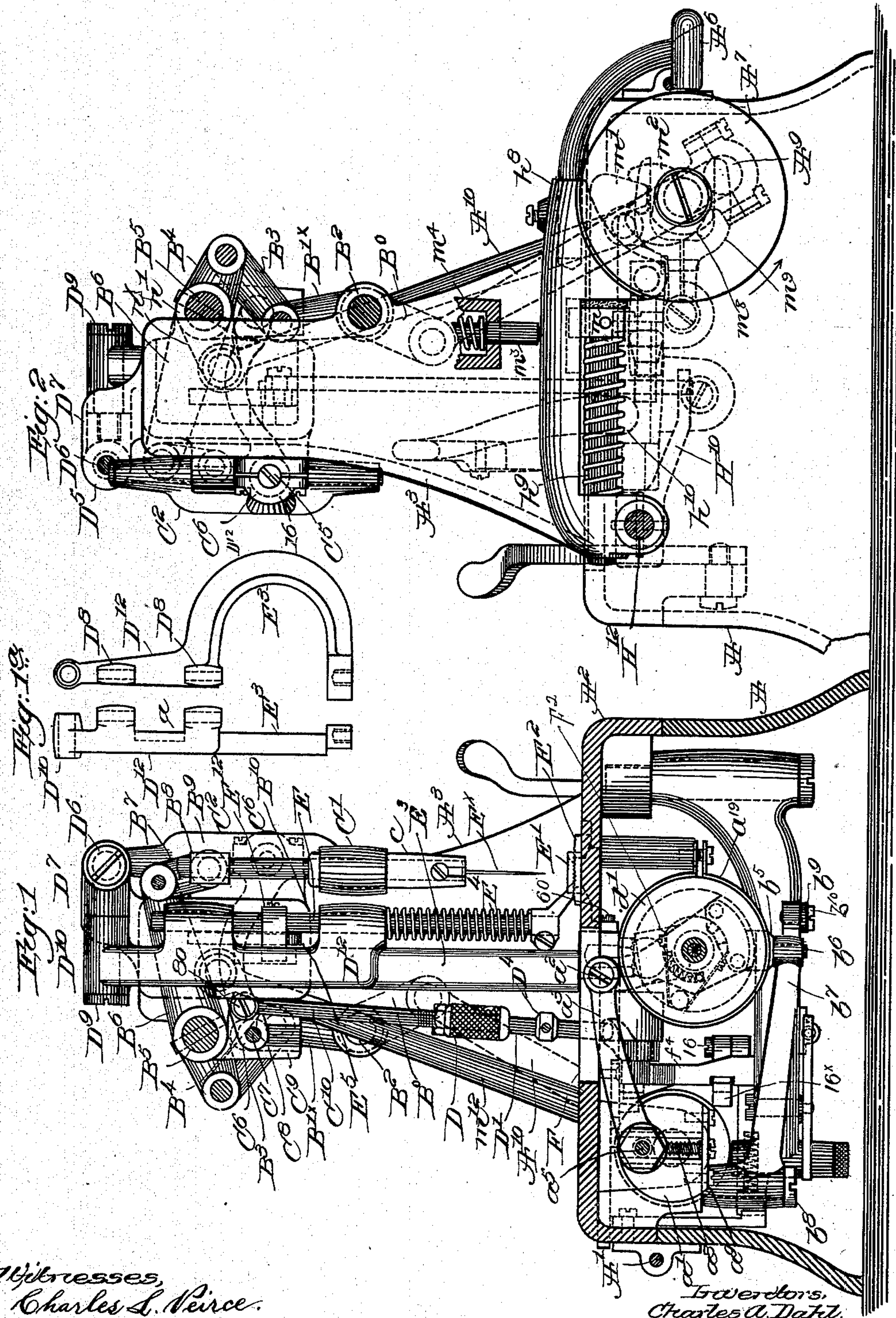
Patented Nov. 25, 1902.

C. A. DAHL & G. S. HILL.
BUTTONHOLE SEWING MACHINE.

(Application filed Feb. 5, 1902.)

(No Model.)

5 Sheets—Sheet 1.



Witnesses,
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Herman J. Sartori.

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George S. Hill,
by Wesley Gregory

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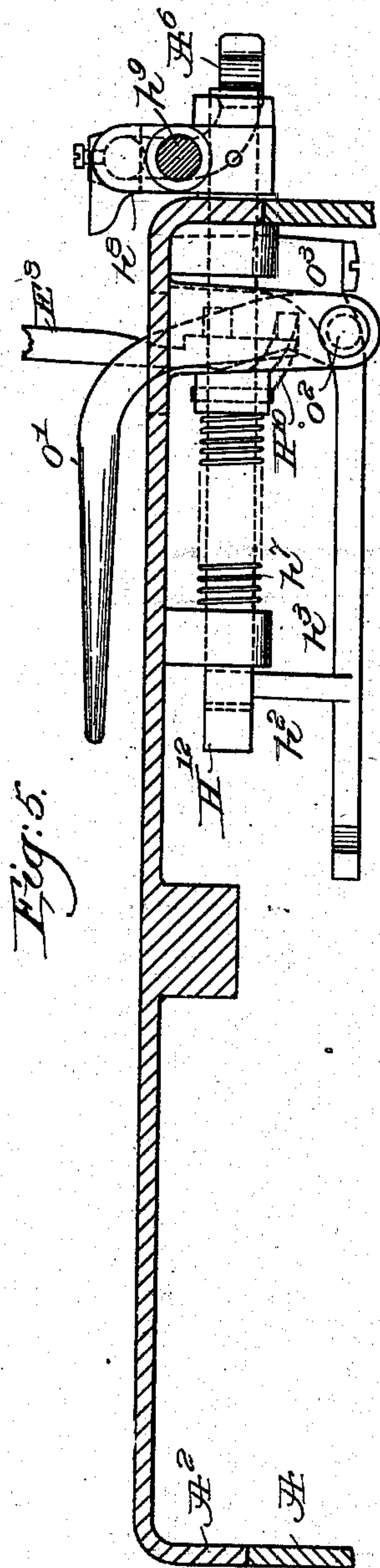
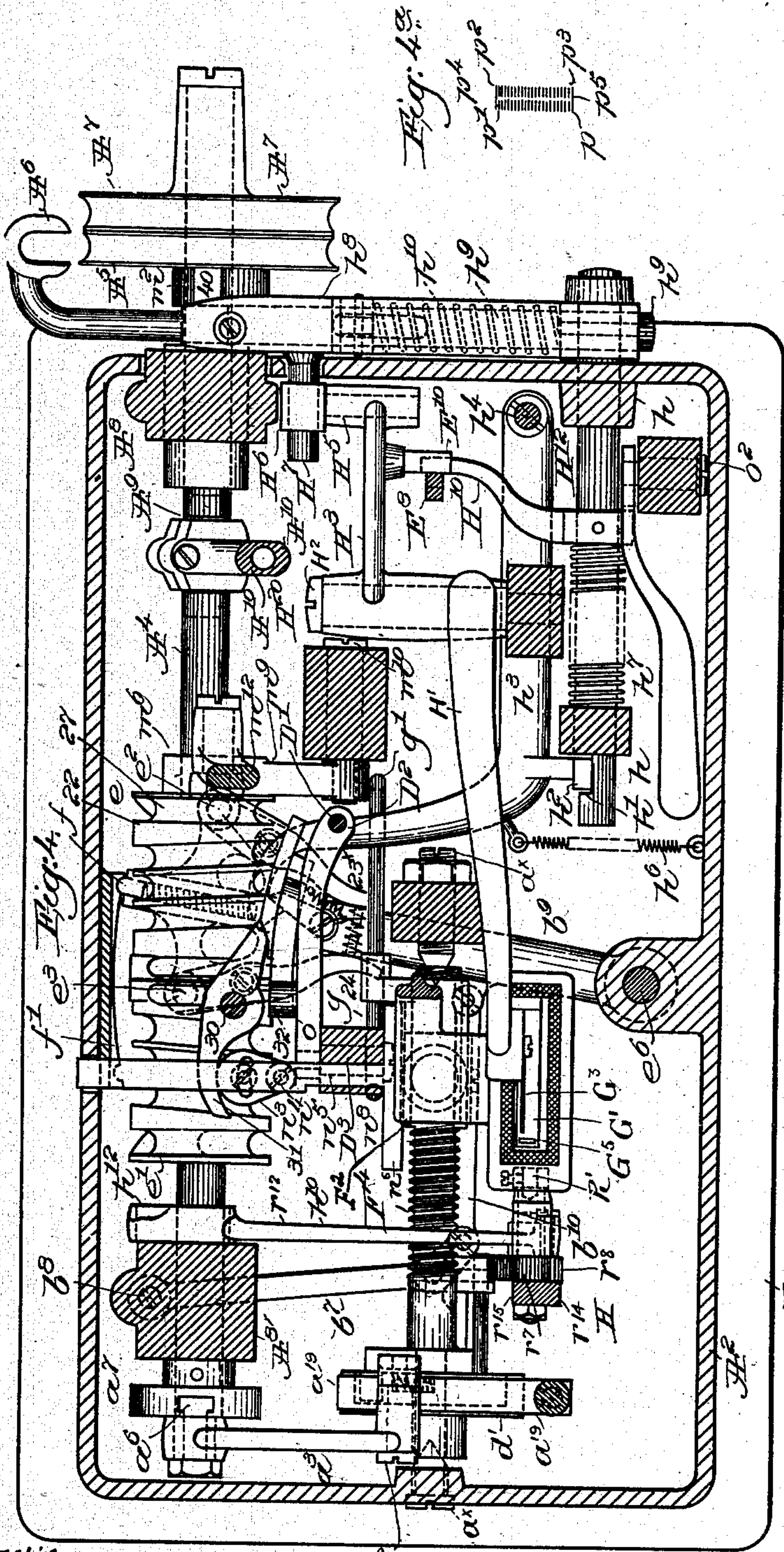
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5 Sheets—Sheet 3.



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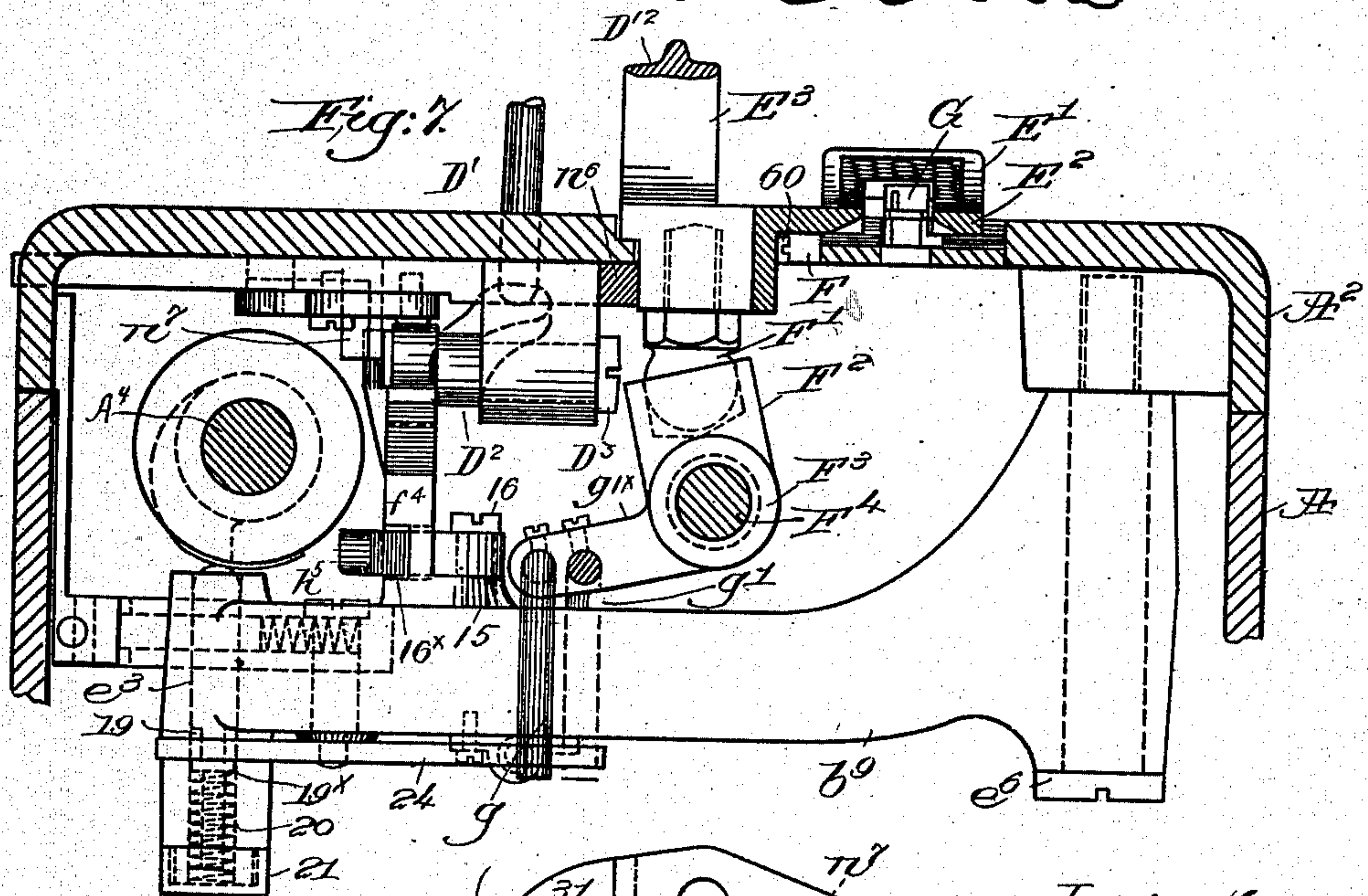
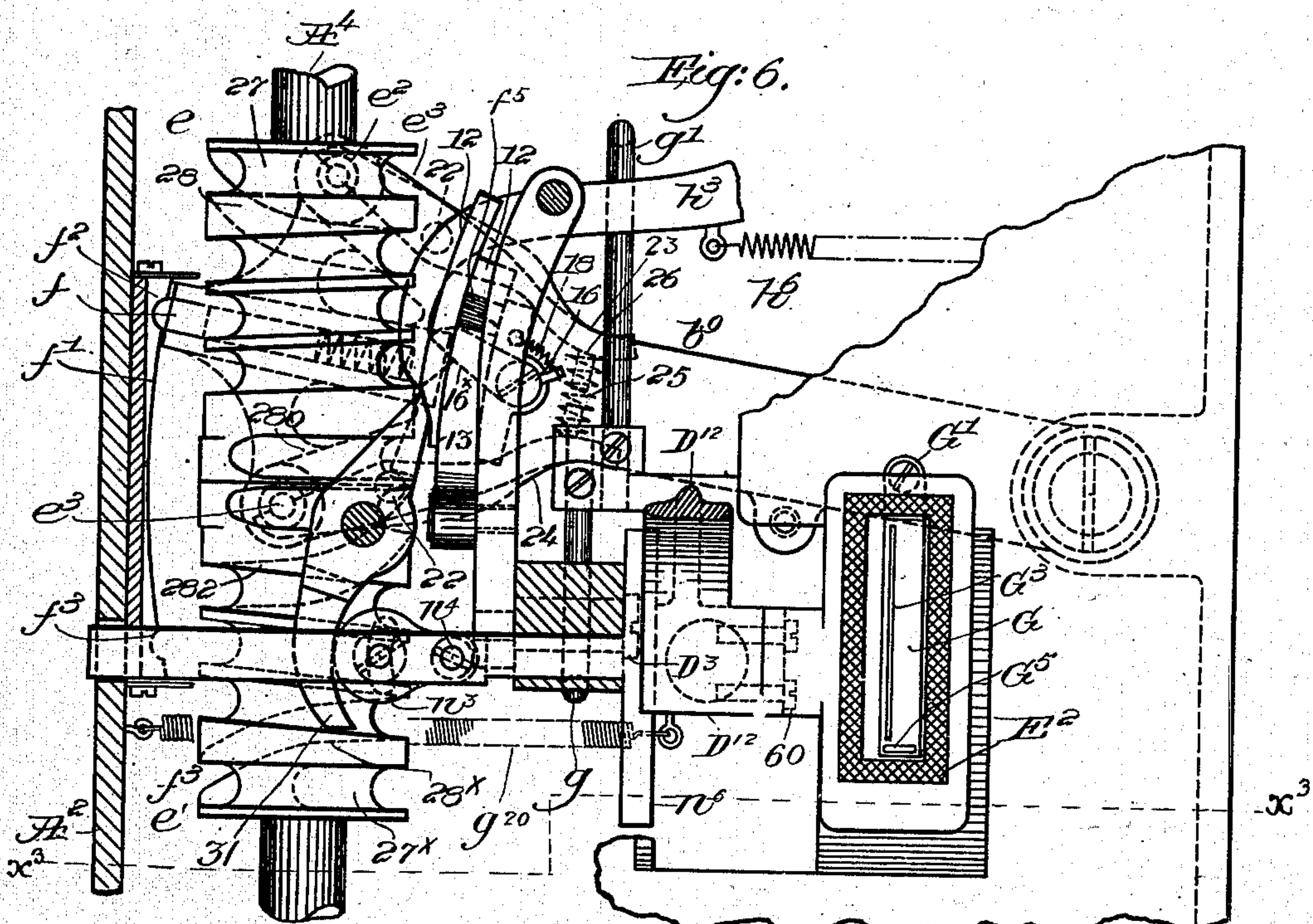
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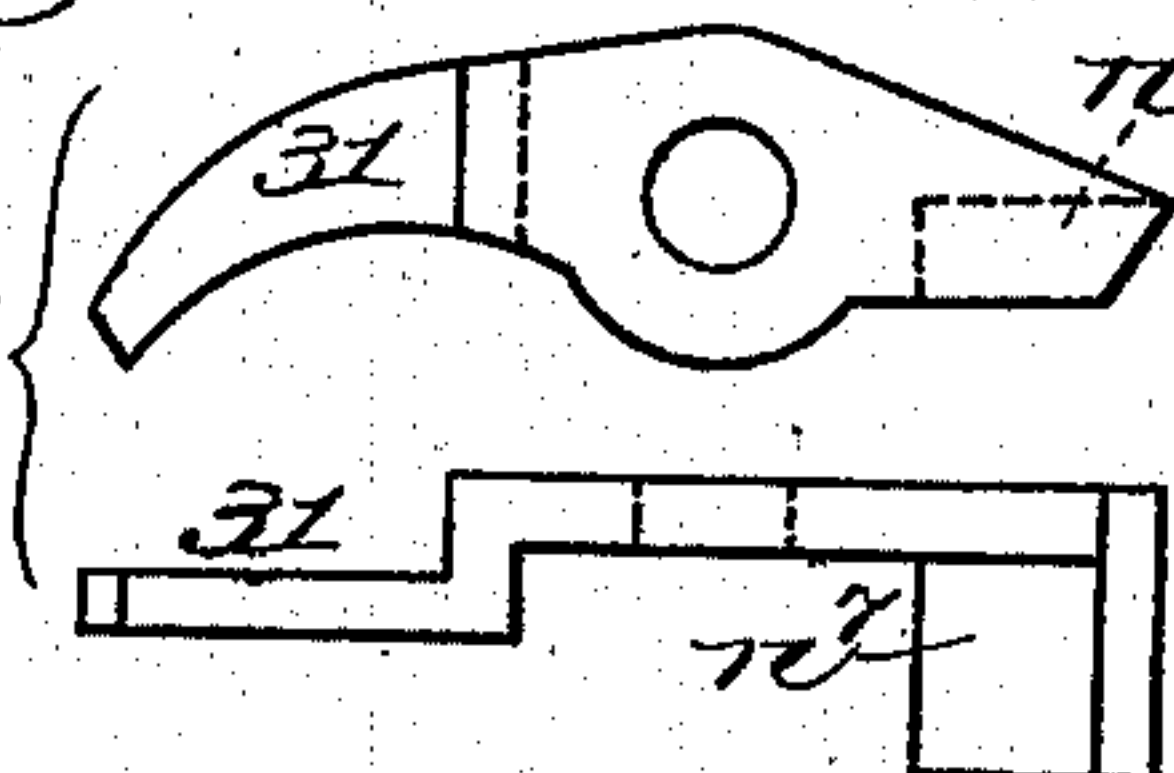
(No Model.)

5 Sheets—Sheet 4.



Witnesses,
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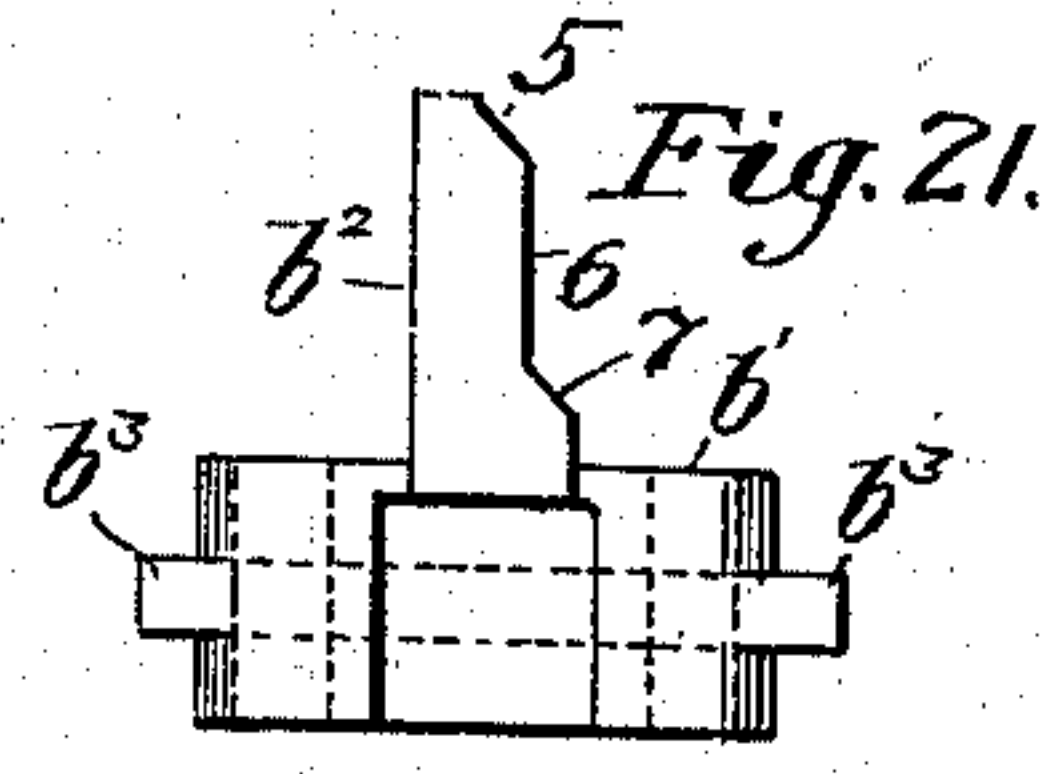
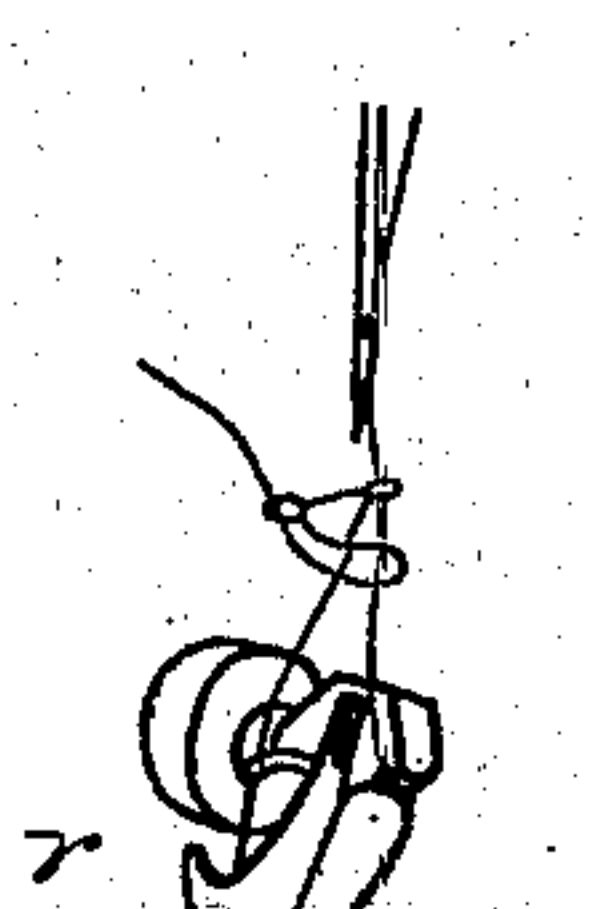
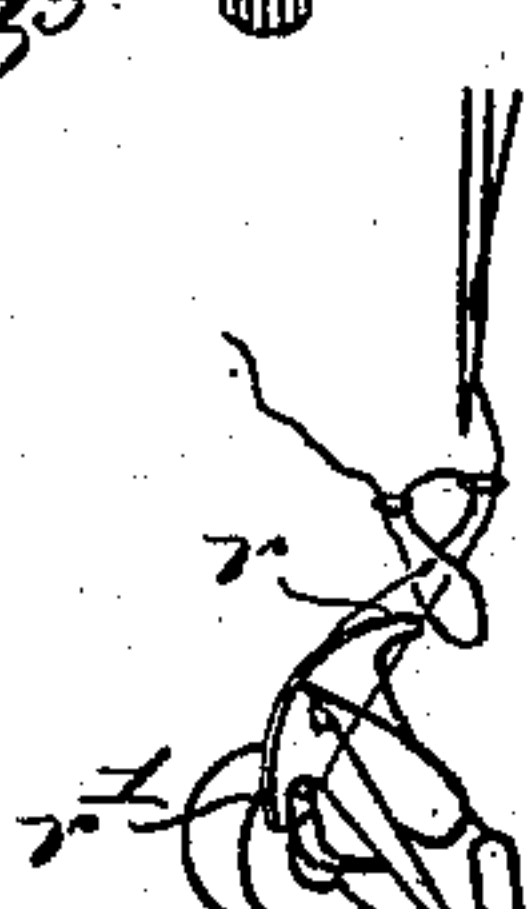
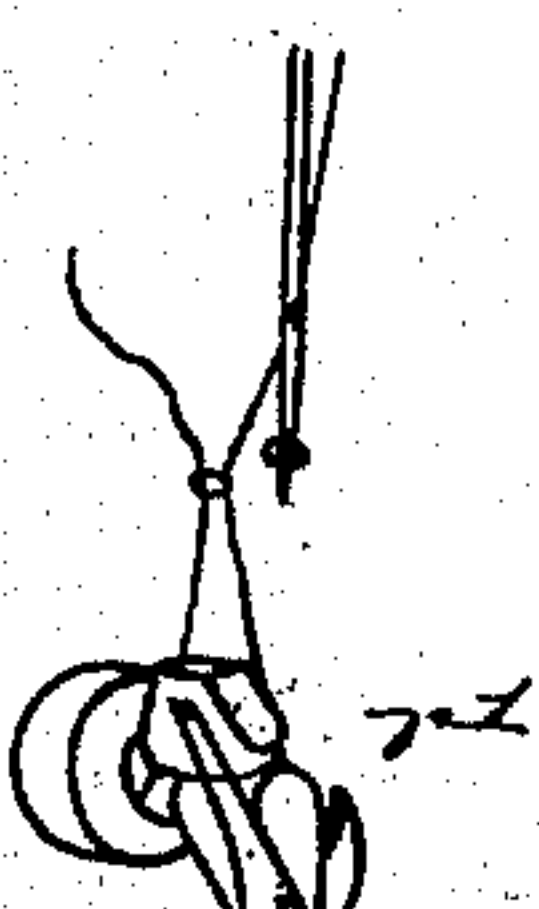
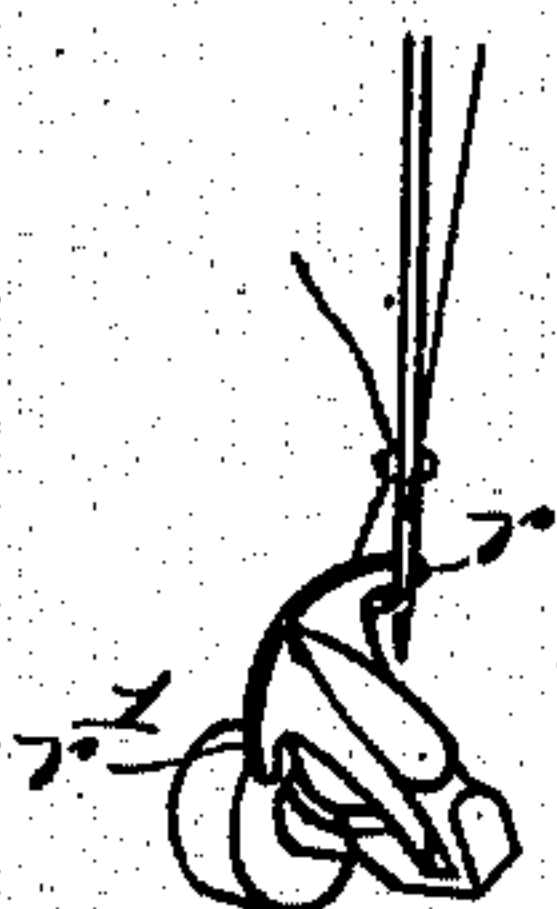
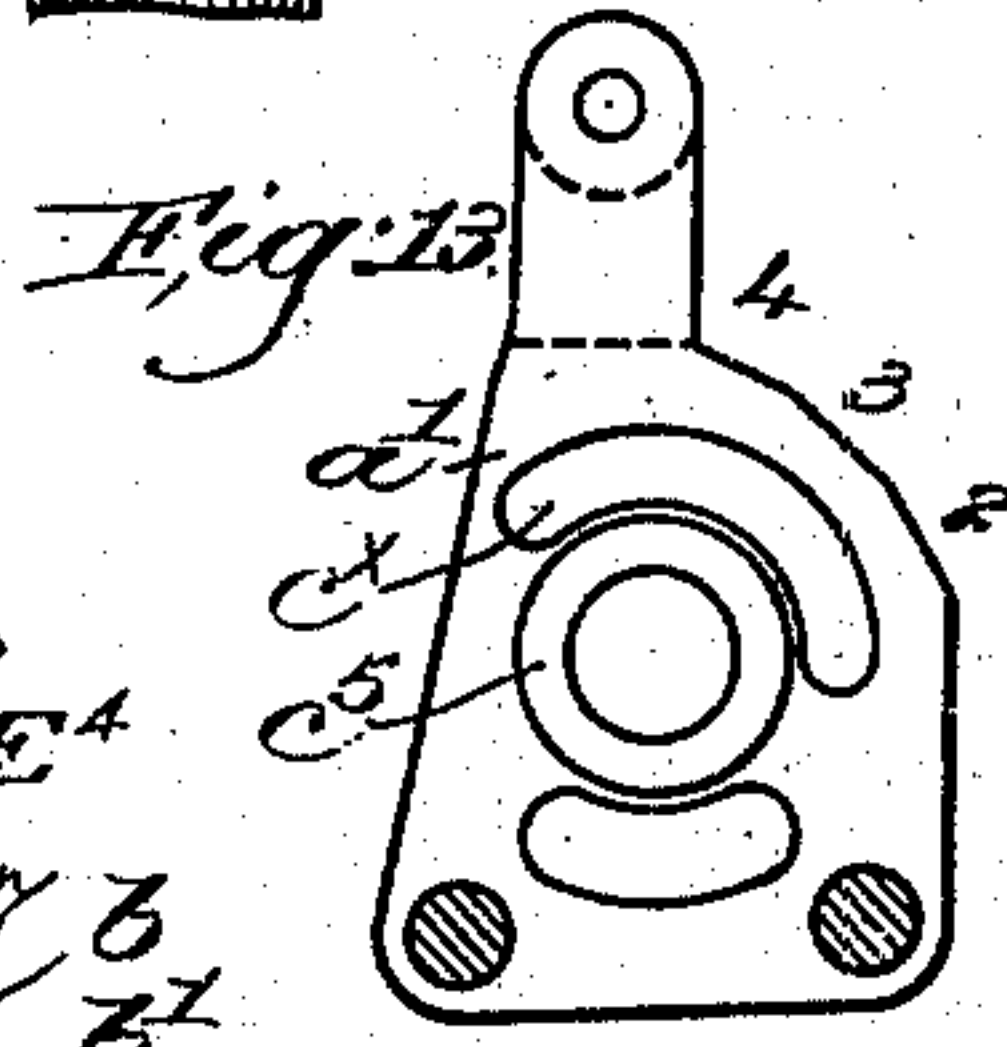
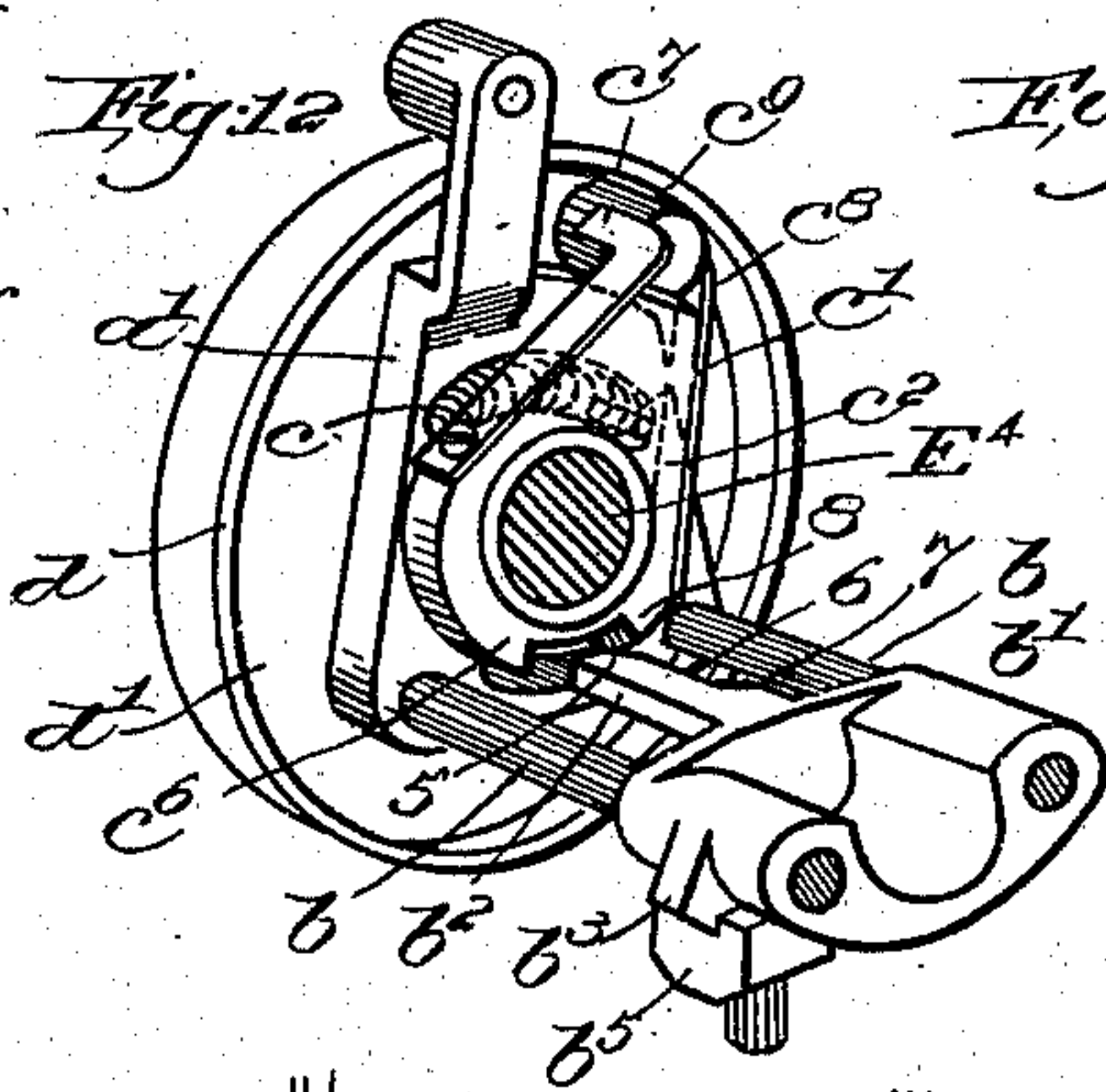
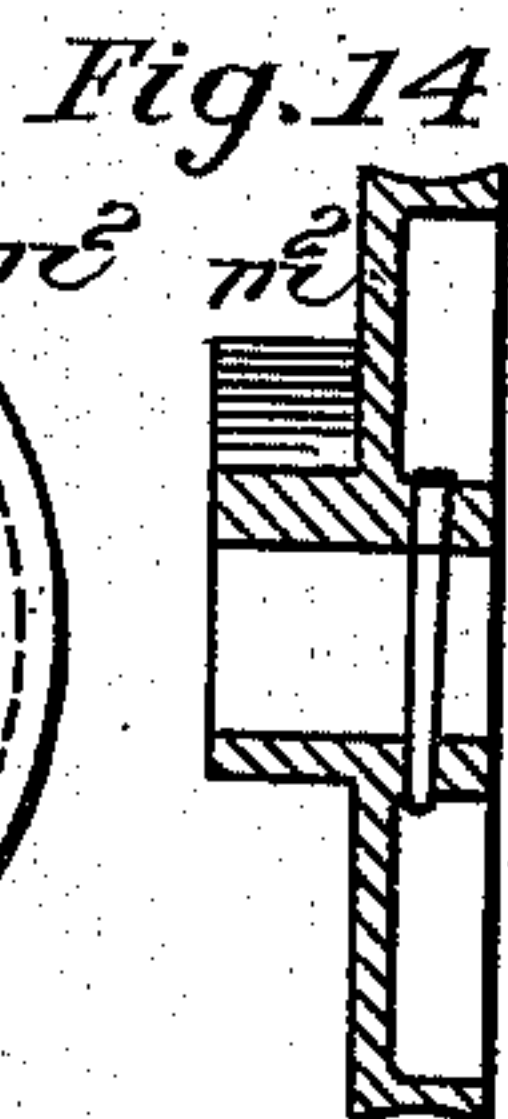
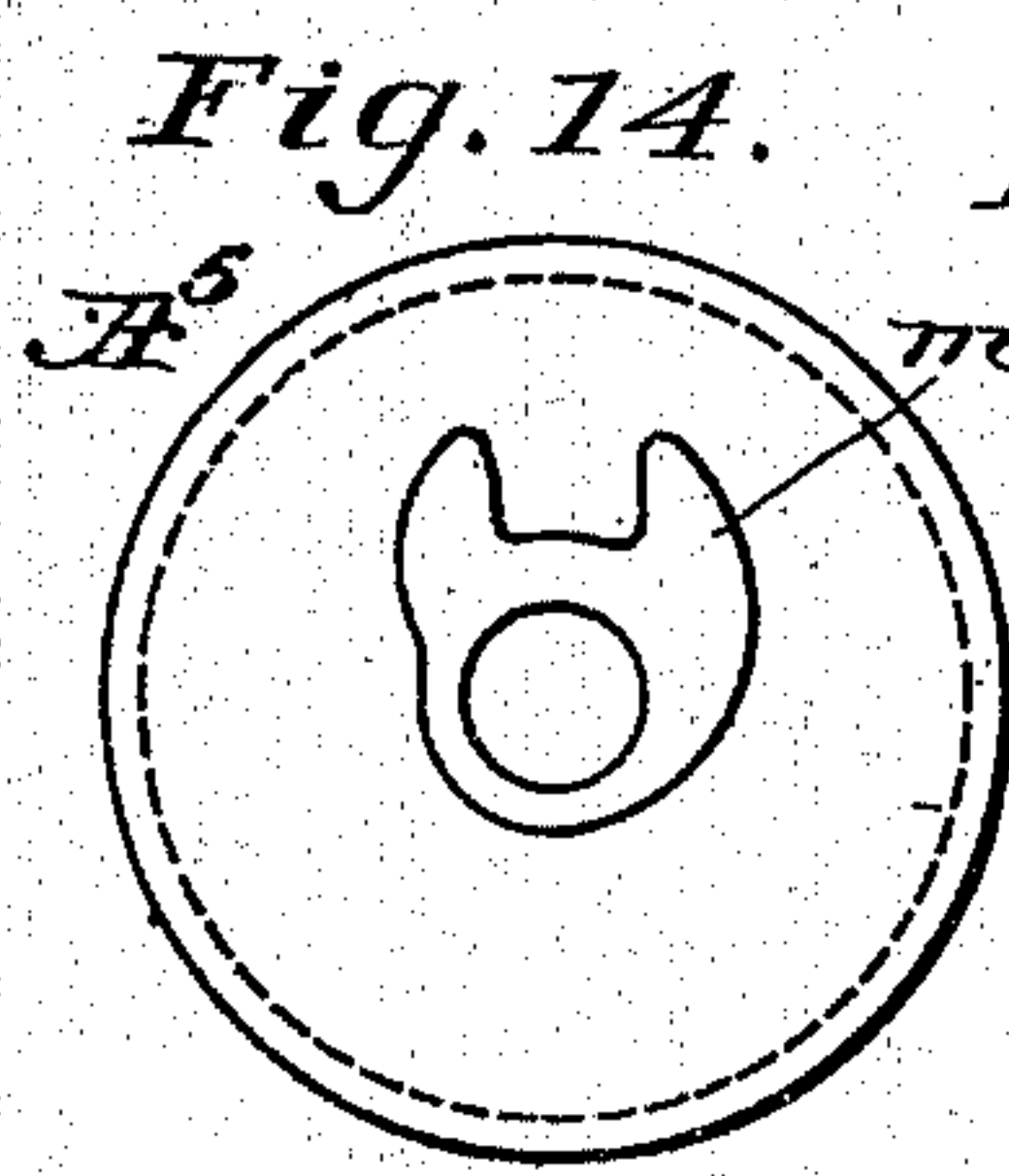
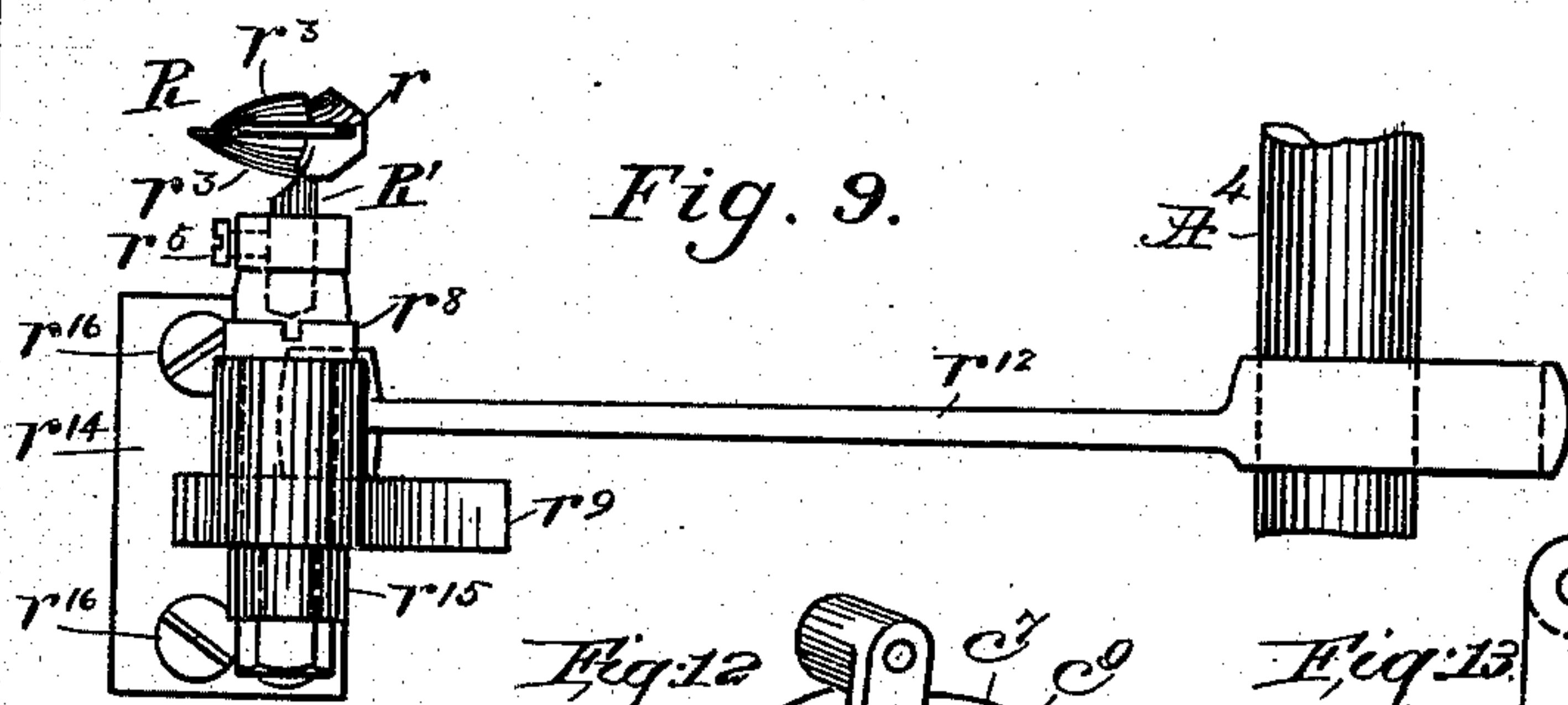
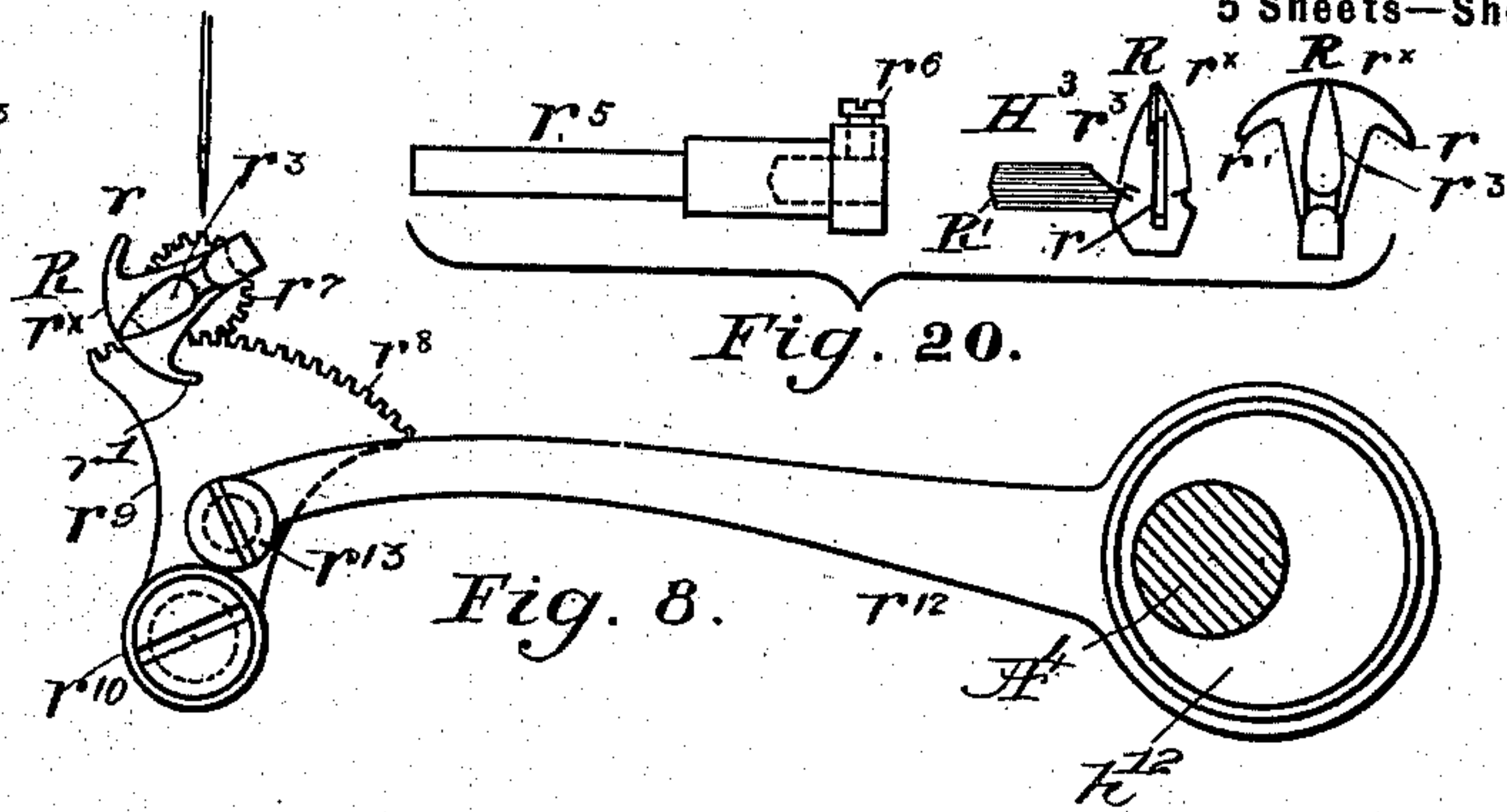
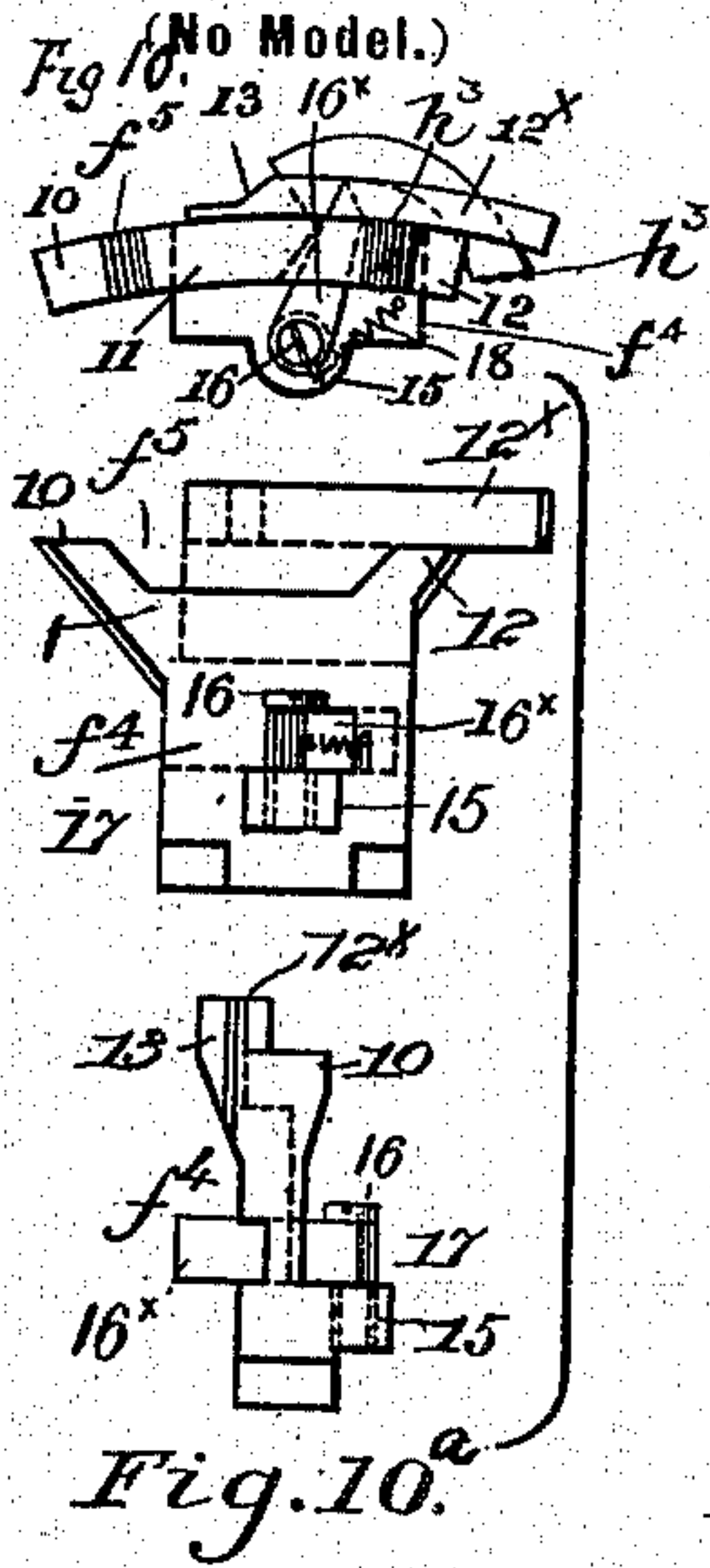
Fig. 11



C. A. DAHL & G. S. HILL.
BUTTONHOLE SEWING MACHINE.

(Application filed Feb. 5, 1902.)

5 Sheets—Sheet 5.



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UNITED STATES PATENT OFFICE.

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BUTTONHOLE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 714,284, dated November 25, 1902.

Application filed February 5, 1902. Serial No. 92,606. (No model.)

To all whom it may concern:

Be it known that we, CHARLES A. DAHL, residing at Lynn, and GEORGE S. HILL, residing at Haverhill, county of Essex, State of Massachusetts, citizens of the United States, have invented an Improvement in Sewing-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to sewing-machines more especially devised for overstitching the edges of buttonholes and other openings in material.

In the machine to be herein described the stitch is represented as formed of one thread carried by an eye-pointed penetrating needle, the loop of needle-thread below the material, both at its thrust for the edge and for the depth stitch, being engaged by a complementary device located below the cloth-clamp, said device acting at one descent to engage a loop of needle-thread and spread and hold said loop, while the device engaging a loop of thread at a subsequent descent of the needle passes the loop last engaged by it through the loop of thread left thereon at a previous descent of the needle. The work-clamp and the means for supporting and actuating the same are novel, and the clamp has a movement both in the direction of the length of the buttonhole and also laterally with relation to the length of the buttonhole. The stitching is commenced at or near one end of the buttonhole, is carried along one side of the buttonhole, and then the clamp is shifted to place it in position to receive barring-stitches, and thereafter the movement of the work-clamp in the direction of the length of the buttonhole is reversed, while stitches for the second side of the buttonhole are made, and arriving at the end of the buttonhole the longitudinal movement of the clamp is stopped and other barring-stitches are made to complete the buttonhole, and the clamp is then moved laterally to place it into its normal or starting position. The work-clamp, suspended at its upper end from a pivot substantially over or in the line of movement of the needle-bar, has a substantially universal

movement. The upper end of the needle-bar, connected by a link with the arm of a suitable rock-shaft, has its bearing in a horizontally-movable gate, such a bearing making it possible to employ a very short needle-bar.

We have aimed to produce a very rapid high-speed machine, and the main shaft is actuated by a peculiar link-motion that, as herein represented, insures two complete reciprocations of the needle-bar and needle to one rotation of the main shaft.

We have provided novel means for controlling the longitudinal movements of the work-clamp and its periods of rest while barring is being done and while the relative positions of the clamp are changed to enable first one and then the other edge of a buttonhole to be stitched. The means herein illustrated comprises a screw that is rotated in one direction while the stitching is being done for one edge of the buttonhole, said screw having its direction of rotation reversed to move the clamp longitudinally in the opposite direction while the second side of the buttonhole is being stitched. The screw is left at rest after each side of the buttonhole has been stitched while the barring is being done for each end of the buttonhole.

To control the direction of movement as well as the periods of rest of the screw, we have provided a double or right and left hand worm that is fixed upon a shaft that is rotated continuously in one direction, and said worm is made effectual to change the position of the clutch for actuating the screw that the screw may be rotated in one or the other direction or be left at rest as the exigencies of the stitching require.

The machine to be described is provided with cutting mechanism that, as herein provided, acts to cut the buttonhole after the same has been stitched; but this invention is not limited to cutting the buttonhole after the completion of the stitching, as, if desired, the cutting might be done prior to the stitching.

Figure 1 of the drawings is a view of our machine looking at the same from the left-hand end thereof, the bed and its support be-

ing in section to better show the parts that would otherwise be concealed. Fig. 1^a is a detail detached and on a smaller scale of the work-clamp carrier E³. Fig. 2 is a right-hand end view of the machine shown in Fig. 1, part of the bed and its support being represented as transparent to show some of the parts that would otherwise be covered. Fig. 3 represents a front side view of the machine, the bed and its support being broken out to disclose the parts below it, the dotted lines showing parts inclosed within the usual overhanging arm. Fig. 4 is a view looking down upon Fig. 3 below the dotted line α , said line passing just below the under surface of the bed. Fig. 4^a shows the buttonhole stitched. Fig. 5 is a detail chiefly to show part of the stopping mechanism and the lever for putting it into its inoperative position. Fig. 6 is an enlarged plan view showing part of the bed of the machine, the throat-plate, part of the work-clamp, and the right-and-left worm, and some of the devices actuated by it on a larger scale. Fig. 7 is a sectional detail in about the line α^3 , Fig. 6. Fig. 8 is a detail in side elevation showing the looper and looper-actuating mechanism. Fig. 9 is a plan view thereof. Fig. 10 is a plan view of the part f^4 detached, together with part of the lever h^3 . Fig. 10^a shows two different views of the part f^4 of the lever h^3 detached, together with the actuator and part of the end of the latch h^3 . Fig. 11 shows two views of the actuator 31. Fig. 12, in perspective, shows the two members of the clutch, the gripper-shifter, and means to move it. Fig. 13 represents the inner side view of the member a' ; Figs. 14 and 14^a, details in side elevation and section of the cam m^2 and the fast pulley. Figs. 15 to 19 are details of the needle and looper and thread to illustrate the making of a stitch; Fig. 20, three detail views of the looper and its shaft. Fig. 21 shows the saddle detached.

In the drawings, A represents a suitable support to stand on a table, said support, as herein represented, having hinged to it at A' the bed A² of the machine, said bed having rising from it the usual overhanging arm A³.

The main shaft A⁴ of the machine has fast upon it a belt-pulley A⁵, that receives a suitable belt, (not shown,) said belt being actuated from any usual counter-shaft to drive the shaft A⁴. The belt is embraced by the fork of a belt-shipper A⁶, forming part of so-called "stopping" means that may be moved, as will be described, at proper times to place the belt on a loose pulley A⁷, mounted on said shaft, as when the stitch-forming mechanism is to remain at rest. Instead of the particular fast and loose pulleys we may substitute any usual form of clutch-pulley controlled in any usual way.

The shaft A⁴, sustained in suitable bearings A⁸ A^{8x}, has a crank A⁹, that is embraced by the end of a link A¹⁰. The upper end of the link A¹⁰ is connected to one arm B⁰ of a bell-crank lever free to turn about a suitable

stud B² parallel with shaft A⁴. The upper end B' of the bell-crank is jointed by a link B³ to an arm B⁴, connected with a rock-shaft B⁵, extended along the gooseneck to the front of the machine, where said shaft has connected with it an arm B⁶, herein represented as having jointed to its end a link B⁷, that is in turn jointed to a stud projecting backwardly from a block B⁸, suitably connected, as by a screw B⁹, with the upper end of a needle-bar B¹⁰.

The needle-bar is surrounded by a sleeve-bushing C, that may be forced into a single hollow hub or bearing C' at the end of a gate C², herein represented as free to be rocked about a stationary stud C³, said gate having a backwardly-extended arm C⁴, provided with preferably a ball-like termination C⁵, that is embraced by concaved portions of a link C⁶, herein represented as extended through the overhanging arm. The link C⁶ at its opposite end (see Fig. 1) embraces a stud-screw C⁷, extended from a block C⁸, that, as herein shown, is free to be adjusted vertically in a groove at one side of a downwardly-extended arm C⁹ of a rock-shaft having a hollow sleeve C^x loosely embracing the shaft B⁵. The link C⁶ has connected with it, as herein represented, by a screw 80 a regulator comprising a rod C¹⁰, having applied to its screw-threaded end a turnbuckle D, which in turn sustains an enlarged part of the upper end of a rod D'. The lower end D' of the rod of the regulator rests upon a lever D², having as its fulcrum a stud D³. (See Fig. 4.) The regulator has a spring D^x, connected therewith, that acts normally to depress said regulator, so that a stop D⁴ thereon will contact with the bed-plate except when a cam f^5 , to be described, actuates the lever D² to lift the regulator. By turning the turnbuckle D the effective length of the regulator may be changed to change the position of the block C⁸ in the arm C⁹ to provide for any desired length of depth stitch. The movements of said regulator in the direction of its length by the lever D² provides for such change automatically in the lateral movement of the gate at the ends of the buttonhole as to enable long barring-stitches to be made.

Referring again to the sleeve-bearing C, sustained in the gate, it surrounds the needle-bar below the block to which the needle-bar-actuating devices are connected, and the needle-bar has no bearing above the block referred to, as in other sewing-machines heretofore made and known to us, and in this way it becomes possible to use a very short needle-bar, and this feature is claimed in connection with the vibrating gate. The overhanging arm, as herein represented, has an ear D⁵, that sustains a horizontal stud D⁶, on which is pivoted the hub of a link D⁷, carrying a stud-screw D⁹, that receives loosely the hub D¹⁰ of a work-clamp carrier D¹², having connected with its lower end, by screws 60, the under member E² of the two-part work-

clamp. The upper member E' of the work-clamp is carried at the end of a bar E , free to be moved in bearings D^8 of the carrier D^{12} . The carrier is shaped to leave a space E^3 , in which the work outside the upper member of the clamp may enter. The shank E of the upper member is surrounded by a spring E^4 , that rests at its lower end upon the upper clamp member and at its upper end against one of the bearings D^8 , said spring acting normally to close the work-clamp. The clamp may be opened to release the work by an arm E^5 of a lever pivoted on a stud E^6 , a second arm E^7 of said lever having jointed to it in suitable manner a depending leg E^8 , shown in Fig. 3 as having at its lower end a shoulder E^9 , that may be engaged and moved by a projection E^{10} , to be described, carried by the cutting mechanism, as the latter after cutting a buttonhole is being returned to its normal inoperative position to enable the work to be released, the end E^5 of said rocking lever at such time meeting the block E^{12} , secured to the shank E by a suitable screw. The block E^{12} is shaped to act against the edge a of the lever D^{12} and prevent any twisting or turning of the bar E in the carrier, so that the upper member of the clamp is always kept in proper alinement with the lower member thereof.

It will be noticed that the stud D^6 occupies a position above the bearing for the needle-bar substantially at right angles to the longitudinal axis of the needle-bar and also substantially parallel with the length of the buttonhole. The stud-screw D^9 occupies a position substantially at right angles to the length of the buttonhole and is free to turn about the stud D^6 , and the longitudinal axis of said stud occupies a position to intersect a line coincident with the longitudinal axis of the needle-bar. This stud and stud-screw so sustain the work-clamp at its upper end and suspend the work-clamp that it may be moved freely both in the direction of the length of the buttonhole and also in the direction of the width of the buttonhole, said pivots so sustaining the work-clamp that it has a substantially universal movement. This feature of sustaining or pivoting the work-clamp, as stated, at its upper end is of great importance, as it reduces the clamp to the fewest number of parts and enables it to be moved with the minimum of friction when changing the position of the work as required with relation to the needle carried by the needle-bar. We intend to claim, broadly, this method of sustaining the work-clamp.

The bed A^2 of the machine is herein represented as cut away somewhat, as at F , to receive the lower end of the carrier D^{12} , and the lower side member E^2 of the work-clamp has depending from it a ball-stud F' , that is embraced by a tubular extension F^2 (see Fig. 7) of a screw-threaded sleeve F^3 , embracing a screw F^4 , forming part of clamp-feeding means, said screw being rotated, as will be

described, in one and then in the opposite direction to effect the longitudinal movements of the cloth-clamp while stitching the side edges of a buttonhole.

The lower member E^2 of the cloth-clamp is (see Fig. 7) represented as slotted to embrace a throat-plate G , attached to the bed of the machine by a suitable screw G' . The upper face of this throat-plate will preferably be concaved and will have a slot G^3 longitudinally of its length, in which may descend a cutter G^4 , said throat-plate having a needle-hole slot G^5 substantially at right angles to the cutting-slot. The lower member of the work-clamp embraces the throat-plate, and the clamp when moved longitudinally to insure the stitching of the sides of a buttonhole is moved lengthwise of the throat-plate. The space at the lower side of the lower member of the clamp is wide enough to enable said member to be moved laterally with relation to the length of the throat-plate not only far enough to provide for stitching one and then the other side of a buttonhole, but also to provide for any desired length of barring-stitch.

The stitch-forming mechanism complementary to the needle is shown detached in Figs. 8, 9, and 20 as a looper R at the end of a stub-shaft R' . The looper is shaped to present a convexed edge r^x , having at its opposite ends points r and r' . The body r^3 of the looper between these points is thickened to enable the looper as one or the other point r or r' enters a loop of needle-thread to spread the same and hold it spread, so that as the opposite point of the looper enters the next loop of needle-thread the last loop to be taken may be made to enter the previous loop of needle-thread. The looper has a slot r^4 , in which the needle may descend. The stub-shaft enters a hole in a short shaft r^5 and is connected adjustably with said shaft by a set-screw r^6 . The shaft r^5 has its bearing in a block r^{14} , (see Fig. 9,) having a depending leg r^{15} , the block r^{14} being connected with the under side of the work-support by screws r^{16} . The shaft r^5 has fixed to it a pinion r^7 , that is engaged by teeth r^8 of a segmental plate r^9 , pivoted at r^{10} , said plate deriving its movement from an eccentric h^{12} on shaft A^4 and a strap r^{12} , connected by a stud-screw r^{13} with said plate.

The screw F^4 is herein represented as sustained upon pointed screws a^x , and the screw is screwed into threads at the interior of the sleeve F^3 . The screw F^4 is embraced by a member a' , forming part of a clutch for rotating the screw, said member having projecting from it (see Fig. 1) a stud a^2 , that is embraced by a link a^3 , united at its other end to a screw a^5 , extended from a block a^6 , made adjustable in a slot of a plate a^7 , attached to the end of the main shaft. The block a^6 is engaged by a screw a^8 , restrained from longitudinal motion by a plate a^9 , attached to the plate a^7 , the rotation of said screw providing for imparting a greater or less throw to the

clutch member, and consequently a greater or less movement of the shaft and screw to space the stitches more or less closely at the edge.

Viewing Fig. 13, showing the member a' detached, it will be seen that said member has three dissimilar surfaces 2 3 4, and at one side said member is grooved at c^x to receive a spring c , one end of which abuts against one end of said groove and the other end against a pin c' of a gripper shifter or changer c^2 , represented as having a hole to embrace the sleeve c^5 of said member a' , said gripper-shifter having two shoulders c^6 and 8 at its lower end, in which normally stands the gripper-actuator, herein shown as a saddle b' , having a cam b^2 , provided with three faces 5 6 7, said actuator being free to slide on two pins b , extended from the member a' . (See Fig. 12.) The saddle has a lip b^3 , that is embraced by a grooved block b^5 , having a stem b^6 , that pivots said block upon a lever b^7 , pivoted at b^8 on a suitable stud carried by the framework. The lever b^7 derives its movement from a lever b^9 , to be described, through a link b^{10} , connecting said two levers. The shifter has connected with it, as represented, two springs c^7 and c^8 , that project somewhat beyond the end thereof, and between these springs where they project beyond the shifter we locate a gripper c^9 . When the cam 5 of the actuator rests against the shoulder 8 of the shifter, the gripper occupies a position on the lowest face 2, and consequently as the member is vibrated the gripper engages the flange d , shown as a wheel of a second member d' , fixed to the worm F^4 , said members a' and d' forming a clutch or actuator for the screw forming part of the clamp-feeding means, and turns said screw from left to right. A brake-band a^{19} embraces the member d' and prevents it overrunning. When the central portion 6 of the cam b^2 meets said lug 8, then the gripper occupies a position on the central face 3 of the member a' , and in the vibrations of said member a' the gripper is disengaged from the second member of the clutch, and at such time the screw F^4 stands at rest. When, however, the cam-face 7 meets the projection 8 of the shifter, the gripper occupies a position on the face 4 of the member a' nearest its connection with the link a^3 , and at such time the gripper clutches the flange of the second member d' , when the member a' moves in the direction of the arrow thereon, Fig. 3, and consequently the second member and the screw F^4 , with which it is connected, are rotated in an opposite direction. In this way, through the gripper-shifter having the three faces and the cam b^2 , it becomes possible to automatically change the position of the gripper with relation to the faces 2 3 4 to provide for rotating the screw either to the right or to the left or to stop the rotation of the screw between its changes of motion, the stopping of the rotation of the screw being for a period of time equal to at least one full rotation of the main

shaft. In this way we provide means for feeding the work-clamp longitudinally for stitching one side of the buttonhole and stopping the feeding of the clamp after stitching one side of the buttonhole, while the clamp is shifted in order that the stitching may be carried to the other side of the buttonhole and barring may be done, and then the rotation of the screw is reversed to feed the clamp in the opposite direction, that the opposite side of the buttonhole may be stitched, and then the rotation of the screw is again stopped, that barring-stitches may be made, and the clamp shifted to again place it in starting position.

The main shaft A^4 has secured upon it a right and left worm $e e'$, having grooves varying in pitch, one or the other of said grooves receiving a pin e^2 or e^3 , movable vertically in a lever b^9 , pivoted at e^6 . The pins e^2 and e^3 are alike, and viewing Fig. 7 it will be seen that each pin has an annular groove 19 and a shoulder 19^x and that the pin is sustained by a spring 20, the outer end of which is supported by a threaded hollow sleeve 21, screwed into the lever b^9 to sustain said spring, it sustaining the pin, and causes it to project from the upper side of the lever b^9 . The lever b^9 has pivoted on it at 22 two like locking devices 23 and 24, shown as levers, each adapted at one end to enter the annular groove of one of said pins and hold it retracted in the lever b^9 against the pressure of spring 20. The inner ends of the levers 23 and 24 are acted upon by a spring 25, surrounding pins 26, one carried by each of said levers, as shown best in Fig. 7. Whenever one of the adjustable trippers g or g' is depending (see Figs. 3 and 7) from an arm g'^x , carried by the sleeve F^3 , movable to actuate the work-clamp, meets a locking device 23 or 24, said device is moved to release one of the pins e^2 or e^3 , letting it be projected from the lever into the substantially annular part 27 or 27^x of the grooves of one or the other of the worms e or e' , an abrupt part 28 or 28^x of the worm rotating with the shaft A^4 acting to quickly move the lever b^9 about its pivot e^6 in a direction to cause it through the link b^{10} to move in one or the other direction the saddle having the cam b^2 . The end of the lever b^9 has a spring-sustained shoe f , the face of which bears against a raceway f' , having stops $f^2 f^3$ at its ends to limit the stroke of said lever, the friction of the shoe against the raceway preventing undue movement of said lever b^9 . The side of the lever b^9 next to the bed-plate is suitably grooved to receive a cam-block f^4 . (Shown in detail in Fig. 10.) The cam-block f^4 has a high point 10, a cam f^5 , leading to a depression 11, and a high point 12. Rising from the back of this cam is a ledge 12^x , the face of which nearest the free end of the lever b^9 has a cam 13. The foot of the cam-block has an ear 15, bored to receive a stud-screw 16, (see Fig. 6,) upon which is mounted an actuator 16^x (see Fig. 6 and dotted lines, Fig. 10) for releasing the stopping means to be

described, said actuator being represented as a tongue that is extended through the hole 14 in said block, (see Fig. 10,) the free end of the tongue projecting toward the free end of the lever b^9 , a suitable spring, as 18, acting normally to keep the tongue against one side wall of the hole 14. The double worm is employed to move the lever b^9 and its connected parts to control the action of the work-clamp-feeding means and cause the gripper c^9 (see Fig. 12) to rotate the screw F^4 in the proper direction to effect the automatic feeding of the clamp in the direction for stitching both sides of the buttonhole in the proper order.

As herein shown, the screw F^4 is turned by its actuating means in one direction and then in an opposite direction, and, as herein provided for, the rotation of the screw is stopped while barring-stitches are being made. The lever b^9 in its movements also acts, as will be described, through the cam f^5 of the block f^4 to permit the extent of lateral movement of the needle to be increased automatically for the production of barring-stitches and also in moving the actuator 16^x for controlling the movement of the stopping mechanism of the machine after completing the stitching of a buttonhole.

The buttonhole-cutter G^4 is connected in suitable manner with one end of a lever H^1 , having its hub mounted on a stud-screw H^2 , said lever having a backwardly-extended arm H^3 , that receives loosely a stud H^5 , (see Fig. 4,) having at one end a sleeve H^6 , that embraces loosely a horizontal stud H^7 , extended from an arm h^8 , forming part of the stopping means to be described, said stud standing in said sleeve and actuating the cutter positively in both directions as the machine is to be stopped after the completion of a buttonhole. The arm H^3 has extended from it the projection E^{10} , before described, that as the cutting mechanism comes into its inoperative position after having cut a buttonhole engages the shoulder E^9 of the leg E^8 , acted upon by spring n , and lifts the upper member of the clamp to release the work.

The bed has suitable bearings h , that receive a rock-shaft H^{12} , having a suitable shoulder h' , that may be engaged by a projection h^2 of a lever h^3 , pivoted at h^4 , said lever having at its free end a cam h^5 , (shown best in Figs. 4, 6, and 10,) said cam being adapted to be met just as the machine is to be stopped by the actuator 16^x , movable with the lever b^9 . The rock-shaft H^{12} has pinned upon it an arm H^{10} , and between said arm and one of the lugs sustaining the rock-shaft said shaft is surrounded by a strong spring h^7 , that acts when the projection h^2 is removed from engagement with the shoulder h' to move the rock-shaft longitudinally of its bearings or to the right, viewing Fig. 4, to effect the stopping of the main shaft. A suitable spring, as h^6 , connected with the lever h^3 , holds the latter in position to retain the stopping mechanism in a position to retain the fast and loose pulleys or

other equivalent clutch mechanism on the shaft A^4 in position to rotate said shaft. The arm h^8 , pinned to the outer end of the rock-shaft H^{12} , has secured to it the belt-shifter A^6 . The arm h^8 is acted upon by a pressure device m^3 , shown as a rod free to slide in a suitable bearing m^4 , fixed to the overhanging arm, the upper end of said rod entering loosely an adjustable hollow nut m^5 , screwed into said bearing, the end of the nut acting on the upper end of a spring m^6 , the lower end of said spring resting on a washer m^7 , suitably secured to the rod. Pressure of the pressure device on the arm h^8 may be varied as desired by turning the nut m^5 .

During the operation of stitching when the parts are in the position shown in Figs. 3 and 4 the leg E^8 is held by the arm H^{10} out of the range of movement of the projection E^{10} , carried by the cutting mechanism. The arm h^{8x} has suitable depending lugs that receive a brake device h^9 , shown as a rod surrounded between said lugs with a spring h^{10} , said rod having pinned upon it a suitable block m , that sustains one end of said spring, said rod at its right-hand end (see Fig. 2) having a depending toe m' , that is adapted to be acted upon by the edge of a cam m^2 , the shape of which is shown fully in dotted lines, Fig. 2, fast on the main shaft A^4 , the greater diameter of the cam being utilized to turn the rock-shaft H^{12} after the lever h^3 shall have been moved to release said shaft, as will be described, that the rock-shaft and its attached parts may be moved to the right, Fig. 4, under the action of the spring h^7 , such movement of the rock-shaft causing the toe m' to stop over the cam m^2 , and said cam raises the arm h^8 , causing the stud H^7 to rise and turn the lever H^1 in a direction to cause the cutter to act and cut a buttonhole, the spring m^6 being compressed during the descent of the cutter H , so that said rod acts on the cam m^2 as a brake to retard the movement of the shaft A^4 . The cutter-lever having been fully actuated to cause the cutter H to cut the buttonhole-slit, the toe m' in the rotation of the cam m^2 enters the notch 40 of said cam and instantly stops the machine, with the needle-bar and needle out of the work. During the movement of the rock-shaft H^{12} to the right, viewing Fig. 4, the projection H^{10} from said rock-shaft is put in such position that the spring n , normally acting to move the leg E^8 to the right, Fig. 3, puts the projection E^9 of said leg in position to be engaged by the projection E^{10} from the backwardly-extended arm of the cutter-lever as the said arm is moved downwardly as the toe m' enters the notch 40, so that it will be understood that as the cutting mechanism is moved into its inoperative position through the action of the stopping mechanism the stud E^{10} raises the upper member of the work-clamp.

The shaft A^4 is provided with a substantially three-cornered cam m^8 , that is embraced by a fork m^9 , having its fulcrum on a stud

m^{10} , sustained in a suitable bearing depending from the bed, said fork having connected to it the link m^{12} , joined to the arm n^x of the sleeve-hub in which the block C^8 before described is made vertically movable to vary the extent of the lateral movement of the needle gate and bar for making longer or barring stitches.

The bed-plate has a stud-screw 30 (shown in section in Fig. 4) that serves as a pivot for an actuator 31, instrumental in moving the work-clamp laterally to insure the proper position of said clamp and material that the stitching may follow along one or the other side of the buttonhole.

The actuator 31 has a concaved face that rests normally in contact with a block n^3 , mounted to swing about a stud-screw n^4 , carried by a substantially T-shaped slide $n^5 n^6$, the part n^6 contacting normally with one side of the clamp-carrier just below the top of the bed-plate. The block n^3 is slotted to receive a set-screw to enable the block to be adjusted to provide for more or less lateral movement to the clamp for a wider or narrower depth stitch. The actuator 31 has also depending from its lower side a cam-lug n^7 , (see Fig. 11,) that is acted upon by the cam-face 13 of the ledge 12.

The lever D^2 , before described as sustaining the lower end of the controller $C^{10} D'$, has projecting from one side of it a suitable roller or other stud 32, that at times is struck by the two high points 10 and 12 of the block f^4 , before described, the high point 10 nearest the left-hand end of the machine acting on said stud when the first side of the buttonhole is being stitched, the other high point 12 sustaining said stud when the second side of the buttonhole is being stitched, the stud entering the space 11 between said high points during the barring when longer stitches are to be made.

In the operation of the machine let it be assumed that a buttonhole (see Fig. 4^a) is about to be stitched; that the sleeve F^3 occupies the position shown at the right, Fig. 4; that the stitching is to be commenced at p , (see Fig. 4^a;) that the upper member of the work-clamp is held up by the engagement of the projection E^{10} of the cutting mechanism in its inoperative position with the leg E^8 ; that the rock-shaft H^{12} occupies its farthest position to the right, with the toe m' of the rod h^9 in the notch 40 of the cam m^2 ; that the belt is on the loose pulley A^7 ; that the gripper c^9 , forming part of the actuating mechanism for turning the screw F^4 to feed the clamp, is in contact with the lowest face 2 of the member a' , and, finally, that the free end of the lever b^9 occupies its farthest position toward the right-hand end of the machine, Fig. 4, and that both pins e^2 and e^3 are held by their locking devices 23 and 24. Now the operator engages the starting-lever o' , pivoted on a stud o^2 , sustained by a hanger o^3 , and turns said lever, causing it to act upon the arm H^{10} , slide

the rock-shaft H^{12} to the left, viewing Fig. 4, into the full-line position therein shown, thereby transferring the belt from the loose 70 onto the fast pulley and enabling the spring h^6 to turn the lever h^3 , that it may engage and retain the rock-shaft H^{12} in said position, the arm H^{10} in this movement of the rock-shaft acting against the leg E^8 , releasing it from the projection E^{10} of the cutter-carrying lever, 75 letting the upper clamping member descend upon the material held in the work-clamp. The transference of the driving-belt onto the fast pulley immediately starts the shaft A^4 80 and the stitch-forming mechanism and causes the gripper c^9 in the movement of the member a' to engage the interior of the concavity of the second member d' of the clutch used to start and rotate the screw F^4 in the direction 85 to move the sleeve F^3 and work-clamp longitudinally that the stitching may follow from the point p to p' . As the stitching arrives at the point p' the tripper g' meets the locking device 23, carried by the lever b^9 , releasing the 90 pin e^2 and permitting that pin to enter the substantially annular part 27 of the groove e of the worm, and said pin having gotten into the groove 27 the steep or abrupt part 28 of said groove acts quickly to move the lever b^9 toward 95 the left, Fig. 4, far enough to withdraw the cam b^2 from the notch in the gripper-shifter c^2 , such movement of the shifter placing the gripper on the middle face 3 of the member a' and thereafter for at least one rotation of the 100 shaft A^4 and it may be for a longer period, according to the number of barring-stitches that it is desired to make, the longitudinal movement of the work-clamp is arrested by stopping the rotation of the screw F^4 . The 105 worm e moves the lever b^9 continuously until the pin e^2 runs out of said groove 27, and during this time the portion 2 of the cam acts against the shoulder 8 of the gripper-shifter and maintains said gripper on the central 110 portion 3 of the member a' , and finally the pin e^2 arrives in a second abrupt part 28^o of the worm e' and gives to the cam b^2 a further movement, causing the portion 7 thereof to act and turn the gripper-shifter far enough 115 to place the gripper on the higher surface 4 of the member a' , and thereafter as the member a' is reciprocated the rotation of the screw F^4 is reversed or turned in the opposite direction, causing the work-clamp to be moved in 120 the opposite direction under the stitch-forming mechanism to stitch the second side of the buttonhole from the point p^2 to p^3 . After the stopping of the longitudinal movement of the work-clamp by stopping the movement 125 of the screw, one side of the buttonhole having been stitched, the cam-face 13 acts on the lug n^7 of the actuator 31, turns the same to act on the block n^3 and move the slide-bar $n^5 n^6$ far enough to move the clamp laterally 130 sufficiently to place the opposite side of the buttonhole in the line of action of the needle, and at the same time the high part 10 of the cam f^5 retires from the roll 32, letting the roll

come over the space 11, permitting the lever D^2 to descend somewhat, so that the controller C^{10} D' may be moved downwardly and vary the lateral throw of the gate as desired, according to the length of the bar-stitches, the needle-bar making barring-stitches p^4 while the depressed portion 11 of said cam passes under the roll 32. A spring g^{20} , connected with the framework and with the lower end of the work-clamp carrier d^{12} , acts to keep said carrier in contact with the face n^6 of the slide-bar n^5 n^6 . Immediately as the direction of movement of the screw is reversed to enable the stitch-forming mechanism to stitch the opposite side of the buttonhole the high part 12 of the cam f^5 comes under the roll 32 and elevates the lever D^2 and the rod C^{10} , &c., to again make the lateral throw of the needle equal only to the length of the depth-stitch. During the movement of the lever b^9 from the position where the pin e^2 was free to enter the groove of the worm e into the position where said pin was again forced automatically back into position to be engaged by a locking device the pin e^3 was retained in its withdrawn position and the change of position of the lever b^9 placed the pin e^3 in line with the annular portion 27^x of the groove of the worm e' . Now as the clamp and sleeve are returned toward their starting positions—say into the position shown at the right in Fig. 4—the tripper g meets the locking device 24, releases the pin e^3 , and enables it to enter the annular part 27^x of the groove of the worm e' , where it is immediately acted upon by an abrupt part 28^x , as described, of the worm e , that withdraws the cam b^2 from between the lugs of the gripper-shifter, placing the gripper opposite the central portion 3 of the member a' , thus stopping the feed of the screw for the proper period during barring at p^5 , and finally said pin, entering the second abrupt part 28 of the worm e' , is further moved to place the gripper on the lowest part 2 of the member a' , the position that it occupied when the stitching of the buttonhole was commenced, and as the lever b^9 completes its movement to the right the actuator 16^x meets the beveled end of the latch h^3 and turns the same to release the rock-shaft H^{12} and enable the hook E^9 of the leg E^8 to come under the projection E^{10} of the cutter-carrying lever, the arm h^8 moving the rod h^9 to cause the belt to be taken to the loose pulley, placing the rod h^9 in position to be acted upon by the cam m^2 , that before the main shaft A^4 is stopped moves the rock-shaft H^{12} , causing the arm H^{10} to act upon the under side of the projection E^{10} of the cutter-carrying lever to depress the cutter to cut the buttonhole.

We believe that we are the first to move automatically longitudinally of the buttonhole a work-clamp sustained above the bed-plate, that the stitching may follow along the opposite sides of the buttonhole, and also the first to move a work-clamp longitudinally by means

of a screw actuated in such manner that the direction of movement of the work-clamp may be changed automatically to provide for moving the work-clamp longitudinally in opposite directions to enable both sides of a buttonhole to be stitched.

We believe that we are the first to provide a clutch with a member having a plurality of faces and a gripper-shifter that may be shifted or turned automatically at the desired times with relation to said member to place said gripper in contact with one or another of said faces to effect without alteration of the direction of movement of the member a' the rotation of a screw carrying the second member of the clutch in one or the opposite direction or to leave said clutch member at rest, and we desire to claim this feature broadly, irrespective of the particular mechanical construction of the parts.

We also believe that we are the first to employ a right and left hand worm to actuate devices to control the lateral position of a work-clamp with relation to stitch-forming mechanism to provide for placing the work-clamp and the material therein in proper position under the control of the stitch-forming mechanism that stitching may be done at one and then at the opposite side of a buttonhole, said worm also controlling means whereby the lateral vibration of the needle may be changed automatically to enable barring-stitches to be made at the ends of the buttonhole.

In the production of the stitch it will be understood that the needle descends at what is to be the outer end of the depth-stitch and then at what is to be the edge of the buttonhole without any intermediate feeding of the work between said two descents.

In the production of a stitch, referring to Figs. 15 to 19, let it be assumed that the needle has made a descent for the depth-stitch and started upward and that the point r of the looper is just entering the left-hand side of the loop of thread. In the further movement of the parts the looper turns into its farthest position, (see Fig. 16,) and the needle rises from the material, the looper holding the loop of thread taken by its point r spread about the looper, as represented. The needle again descends, this time, let it be supposed, at the edge of the buttonhole, and the point r' of the looper in the reverse movement thereof engages the loop thrown out from the needle, this time, however, at the right-hand side of said loop, (see Fig. 17,) and as the looper continues its movement to the left (see Fig. 18) the loop of thread taken from the needle at the edge is passed through the loop of thread held spread on the looper, and finally the looper returns again into the position shown in Fig. 19, where it holds the loop of thread taken from the needle at that descent thereof, forming the edgestitch, and from this position the movement of the looper is reversed, it coming into the position Fig. 15,

and so on, repeating the operation for each stitch.

The needle-thread is subjected to the action of a suitable tension device r^2 , herein represented as sustained by the gate C', and the needle-thread, supplied from any suitable source and placed under the control of the tension device, is led therefrom to a suitable hole in an arm r^3 , connected with the upper end of the needle-bar, a slack-thread controller r^4 acting upon the thread between said arm and the lower end of the needle-bar.

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

1. A thread-carrying needle to penetrate the material alternately in the line of the edge of a buttonhole and in the line of the depth-stitch therefor, complementary means coacting with the needle, comprising a looper having two points, one of which engages the loop of needle-thread at one descent and the other the loop of needle-thread at the next descent, the looper at each operation taking the loop of needle-thread held by it through the previous loop of needle-thread.

2. A sewing-machine comprising a needle-bar having an eye-pointed needle, and a double-pointed looper coacting with said needle in the formation of overedge-stitches, one point of said looper entering a loop of needle-thread at one descent of the needle, the other point of said looper entering the loop of needle-thread at its next descent, the looper at each operation carrying the loop of needle-thread held by it through the previous loop of needle-thread, a shaft, and connections between said shaft and the needle-bar, and between said shaft and looper, to impart two full strokes to the needle-bar to one complete stroke of the looper.

3. A sewing-machine comprising a main rotatable under shaft having a crank, a parallel rock-shaft above the work-support, connections between said rock-shaft and needle-bar, and a bell-crank lever and two links interposed between said rock-shaft and rotatable shaft to cause two descents of the needle-bar to one rotation of said rotatable shaft.

4. A needle-bar having a needle, means to actuate the needle-bar, a looper comprising a loop-spreading body provided with a slot in which the needle may descend, and two outwardly-turned points, means to actuate the looper that its points may engage alternately loops of thread thrown out from the needle at successive descents, the body of the looper spreading each loop alternately for the passage through it of a succeeding loop.

5. A needle-bar having an eye-pointed needle, means to actuate said needle-bar, and a looper having a slot and two points, said points acting alternately in alternate loops of needle-thread, and passing the loop of needle-thread taken from the needle at one descent thereof through the previous loop of needle-thread yet held by the looper.

6. A needle-bar having an eye-pointed needle, means to actuate said needle-bar, a looper having two points oppositely turned, one point entering the loop of needle-thread formed at one descent of the needle, the other point entering a loop of needle-thread at a subsequent descent of the needle, said looper being constructed to spread the loop of needle-thread held by it, and insure the reception through it of the loop of needle-thread taken at a subsequent descent of the needle.

7. A needle-bar having an eye-pointed needle, and means to reciprocate said needle-bar, combined with a looper comprising two oppositely-turned points, the body of the looper being constructed to spread each loop and hold it spread that the opposite point of the looper may engage a loop of needle-thread and pass said loop through the spread loop held thereon.

8. In a buttonhole-stitching machine, stitch-forming mechanism comprising a needle-bar having an eye-pointed needle and suitable complementary devices to engage the loop of needle-thread to make stitches, a work-clamp comprising two clamping members, means to move said members in the direction of the length of a buttonhole, means to move said members at right angles to the length of the buttonhole about a horizontal axis located above the upper end of the needle-bar to enable the stitching to be carried from one to the opposite side of a buttonhole.

9. In a buttonhole-stitching machine, a work-clamp, stitch-forming mechanism comprising a needle-bar having an eye-pointed needle and a suitable complementary device, a horizontal stud located above the bearing for the needle-bar and sustaining said work-clamp, an actuator located below the cloth-clamp, means to move the actuator, and means between the actuator and clamp to turn the latter about said stud to enable the stitching to be carried from one to the other side of the buttonhole.

10. In a buttonhole-stitching machine, a horizontal stud substantially parallel with the length of the buttonhole, a stud-screw sustained by said stud and occupying a position at right angles to said stud, stitch-forming mechanism comprising a needle-bar having an eye-pointed needle and a suitable complementary device, a work-clamp suspended through said studs, and means to move said clamp in the direction of the length of the buttonhole and at right angles thereto.

11. In a buttonhole-stitching machine, stitch-forming mechanism comprising a needle-bar having an eye-pointed needle, and a complementary device coacting with said needle, a work-clamp having an upper and an under member to grasp the material between them and pivoted above the upper bearing for said needle-bar, and means to move the clamp and the material held by it in the direction of the length of the buttonhole.

12. A throat-plate, a needle-bar having a

needle, a complementary device coacting with said needle to form overedge-stitches, a work-clamp comprising two members, means to suspend said clamp above the throat-plate, means to move said work-clamp about its point of suspension in the direction of the length of the buttonhole during the stitching of the sides thereof, and an actuator, means to move it, and means intermediate said actuator and work-clamp to move the latter at right angles to the length of the buttonhole to enable the stitching to be carried on at one and then at the other side of the buttonhole.

13. In a sewing-machine, stitch-forming mechanism comprising a needle-bar and complementary device to make overedge-stitches, a throat-plate, a work-clamp pivoted above said throat-plate, and means to engage the lower end of the work-clamp below said throat-plate and move it in the direction of the length of the buttonhole.

14. In a sewing-machine, a work-support, stitch-forming mechanism comprising a needle-bar and complementary device to make overedge-stitches, a throat-plate, a work clamp pivoted above said throat-plate, means located below the throat-plate and connected with said work-clamp to move said clamp longitudinally of the buttonhole and at right angles to the length of said buttonhole to insure the formation of stitches for both sides of a buttonhole.

15. In a sewing-machine, a work-clamp, a screw to move said clamp longitudinally in the direction of the length of a buttonhole while stitching one side thereof, means to stop the longitudinal movement of said clamp when the buttonhole has been stitched for the length desired, means to move automatically said clamp laterally to enable the stitching to be made for the opposite side of the buttonhole, and means to thereafter reverse automatically the movement of said clamp through the screw to provide for the stitching of the second half of the buttonhole.

16. In a sewing-machine, a work-clamp, a screw to move said clamp longitudinally in the direction of the length of a buttonhole while stitching one side thereof, means to stop the rotation of said screw when the buttonhole has been stitched for the length desired, means to move automatically said clamp laterally to enable the stitching to be made for the opposite side of the buttonhole, and means to thereafter reverse automatically the movement of said screw to move the clamp oppositely for the completion of the second half of the buttonhole.

17. In a sewing-machine, stitch-forming mechanism including a needle-bar and a complementary device for making overedge-stitches, a throat-plate, a work-clamp, means to pivotally sustain the work-clamp above the throat-plate, means to move the work-clamp about its point of suspension in the direction of the length of the buttonhole, and to move the work-clamp laterally with rela-

tion to the throat-plate after stitching one side of the buttonhole to provide for stitching the opposite side thereof, and means to change the relative positions of the work-clamp and stitch-forming mechanism to effect the production of barring-stitches.

18. In a sewing-machine, a stationary throat-plate concaved at its upper side, combined with a suspended two-part work-clamp to hold the work, the under member of said clamp having its upper side concaved, the under side of the upper member of said clamp being convexed.

19. In a sewing-machine, a throat-plate, a work-clamp composed of two members, means to pivotally sustain said work-clamp above the throat-plate, means to move the work-clamp about its pivotal point, a spring movable with said work-clamp and acting normally to force the upper member of the clamp toward the under member thereof, and means to lift the upper member of the clamp automatically after the completion of a buttonhole.

20. In a sewing-machine, stitch-forming means to form a series of overedge-stitches, a work-clamp, means to move the same to feed the material held thereby, a worm, a controller, and means actuated by said worm to actuate said controller to effect a change in the lateral movement of the needle-bar and needle of the stitch-forming mechanism at right angles to the length of the buttonhole to effect the production of barring-stitches at the end of a buttonhole.

21. In a sewing-machine, stitch-forming means to form a series of overedge-stitches, a work-clamp, means to move the same to feed the material held thereby, a right and left hand worm, a controller, and means actuated by said worm to actuate said controller to effect a change in the lateral movement of the needle-bar and needle of the stitch-forming mechanism at right angles to the length of the buttonhole to effect the production of barring-stitches at the end of a buttonhole.

22. In a sewing-machine, stitch-forming means to form overedge-stitches, a work-clamp, a screw to move the work-clamp in one direction while stitching one side of the buttonhole, and in the opposite direction while stitching the opposite side of the buttonhole, a right-and-left worm, and means actuated by it after the completion of the stitching at each side of the buttonhole to move the work-clamp laterally or at right angles to the length of the buttonhole to provide for forming the stitches for the opposite side edge of the buttonhole.

23. In a sewing-machine, stitch-forming means to form overedge-stitches, a work-clamp, a screw to move the work-clamp in one direction while stitching one side of a buttonhole, and in the opposite direction while stitching the opposite side of the same, a right-and-left worm, and means actuated by it at the completion of the stitching at

each side of the buttonhole to stop the rotation of the screw, and means to move the needle of the stitch-forming mechanism laterally for the production of overedge-stitches, and for imparting to said needle-bar and needle a longer lateral movement for barring the ends of the buttonhole.

24. A work-clamp, a screw in operative engagement therewith, a clutch composed of two members one fixed to the screw and the other loose on the screw, the loose member having a plurality of clutching-faces, a gripper interposed between said members, a gripper-shifter, and means to move the same independently of said members to change the position of the gripper and effect the rotation of the screw in one and then in an opposite direction.

25. In a sewing-machine, stitch-forming mechanism to form overedge-stitches, a work-clamp, a screw to move it longitudinally, a clutch member fixed to said screw, a movable clutch member having the screw as its axis of motion, a gripper intermediate said clutch members, means to change automatically the position of said gripper between said clutch members that the movable clutch member may act to rotate the screw in one direction while stitching one side of a buttonhole and in the opposite direction while stitching the opposite side of the buttonhole.

26. In a sewing-machine, a cloth-clamp, a screw, a two-part clutch, an intermediate gripper, and means to change automatically the position of said gripper between said clutch members that the screw may be moved in one or the other direction to move the clamp in the direction desired.

27. In a sewing-machine, a clamp, a screw, a clutch member fixed thereto, a gripper interposed between said members, means to change automatically the position of said gripper to temporarily stop the movement of the screw while said member continues in motion.

28. A work-clamp, stitch-forming mechanism to form overedge-stitches and barring-stitches, a screw, means to rotate said screw in one direction and then in an opposite direction to move the clamp longitudinally for the overedge-stitching of one and then of the other side of the buttonhole, and means to leave the screw at rest temporarily at the opposite ends of the buttonhole while barring-stitches are being made at right angles to the length of the buttonhole.

29. Stitch-forming mechanism to form overedge-stitches, a work-clamp, a screw to move the work-clamp, means to rotate said screw, and means moving with said clamp to stop the rotation of said screw at any desired point according to the length of buttonhole desired.

30. Stitch-forming mechanism to form overedge-stitches, a work-clamp, a screw to move the work-clamp, means to rotate said screw, means moving with said clamp to stop the rotation of said screw at any desired point ac-

cording to the length of buttonhole desired, means to cause the stitch-forming mechanism to make a series of longer or barring stitches at the end of a buttonhole, and means to then change the direction of movement of the work-clamp to enable the stitch-forming mechanism to stitch the opposite side of the buttonhole.

31. Stitch-forming mechanism to form overedge-stitches, a work-clamp, a screw to move the work-clamp, means to rotate said screw, means moving with said clamp to stop the rotation of said screw at any desired point according to the length of buttonhole desired, means to cause the stitch-forming mechanism to make a series of longer or barring stitches at the end of a buttonhole, means to then change the direction of movement of the work-clamp to enable the stitch-forming mechanism to stitch the opposite side of the buttonhole, and means to stop the rotation of the screw when the second side of the buttonhole has been stitched.

32. Stitch-forming mechanism to make overedge-stitches for a buttonhole, and to make longer stitches to bar both ends thereof, a suspended two-part work-clamp embracing the material, means to move the work-clamp to feed the material, stopping mechanism, locking mechanism to lock the stopping mechanism in its inoperative position during the stitching of a buttonhole, and a device to release said locking mechanism, that said stopping mechanism may act to stop the stitch-forming mechanism as the final end of the buttonhole is barred.

33. In a sewing-machine, stitch-forming mechanism to make overedge-stitches and longer barring-stitches at both ends of the buttonhole, a pivotally-sustained work-clamp to embrace the material, means connected with the lower end of the work-clamp to move the clamp longitudinally, and means to also move said work-clamp laterally after the completion of the stitching of one side of a buttonhole to place the clamp in proper stitching relation to the stitch-forming mechanism that the opposite side of the buttonhole may be stitched.

34. In a buttonhole-sewing machine, a work-clamp pivoted at its upper end, a sleeve jointed to the lower end of the clamp, and means to move said sleeve longitudinally for the length of a buttonhole, and to then move the sleeve and clamp in the opposite direction to its starting-point.

35. In a buttonhole-sewing machine, a suspended work-clamp, a sleeve jointed to the lower end of said clamp, means to move said sleeve, a double worm, a lever moved in one direction by one of said worms and in the opposite direction by the other of said worms, and means actuated by said lever to cause the sleeve-moving means to move the sleeve automatically in one and then in the opposite direction.

36. In a sewing-machine, stitch-forming

mechanism to form overedge-stitches, a work-clamp composed of an upper and lower member, a spring acting normally to close the clamp, clamp-opening means, buttonhole-cutting mechanism, stopping means to stop the stitch-forming mechanism at the completion of a buttonhole and to actuate the cutting mechanism to cut the buttonhole, said cutting mechanism as it is returned into its operative position after cutting a buttonhole engaging the clamp-opening means and opening the clamp, retaining the same opened while the machine is stopped.

37. In a sewing-machine, stitch-forming mechanism to form overedge-stitches, a work-clamp composed of an upper and lower member, a spring acting normally to close the clamp, clamp-opening means, buttonhole-cutting mechanism, stopping means to stop the stitch-forming mechanism at the completion of a buttonhole, and to actuate the cutting mechanism to cut the buttonhole, said cutting mechanism as it is returned into its operative position after cutting a buttonhole engaging the clamp-opening means and opening the clamp retaining the same opened while the machine is stopped, a starting device to release the stopping device, means to actuate the stopping device to move the same into its inoperative position to start stitch-forming mechanism, the stopping means in its movement to enable the stitch-forming mechanism to be started releasing the clamp-opening means to enable said clamp to be closed and grasp the material.

38. In a sewing-machine, overedge-stitch-forming mechanism, a work-clamp, cutting mechanism, stopping means, means to actuate the stopping means at the completion of a buttonhole to actuate the cutting mechanism to cut the material in the work-clamp, and means actuated by the cutting mechanism as the latter comes into its inoperative position to open the work-clamp for the removal of the material.

39. In a sewing-machine, a throat-plate, a work-clamp having an upper and lower member and having a universal pivot sustained entirely above the needle-bar, a spring acting normally on one part of said clamp to clamp the work upon the other part of said clamp, and means acting automatically at the completion of a buttonhole to separate the clamp for the release of the material.

40. In a sewing-machine, stitch-forming mechanism for forming overedge-stitches, a work-clamp, means to move said clamp laterally to put it in position to stitch one and then the opposite side edge of the buttonhole, a rotating shaft provided with a worm, means actuated by said worm to reverse the movement of the work-clamp after stitching one side of the buttonhole, stopping means, means acting normally to retain said stopping means in position to enable the shaft to be rotated, and a device actuated by said worm and provided with means for effecting the release of

the stopping means at the completion of a buttonhole.

41. In a sewing-machine, a needle-bar provided with an eye-pointed needle, a complementary device coacting with said needle to form stitches, a needle-bar-actuating rock-shaft, a gate in which the needle-bar is moved vertically through the movement of said rock-shaft, a rock-shaft embracing loosely said needle-bar-actuating rock-shaft, a lever connecting a depending arm of said loosely-sustained rock-shaft and an arm of said gate, a controller connected directly with said lever, and means to move said controller automatically to control the extent of lateral throw of the gate and needle-bar while overstitching the side edges of a buttonhole, and for barring the ends of the buttonhole with longer stitches.

42. In a sewing-machine, a shaft having a right-and-left worm, a lever moved in one and then in the opposite direction respectively by said worm, a screw, means to rotate said screw, and means controlled by said lever as it is moved by the worm to stop the rotation of the screw at the ends of the buttonhole, and to rotate said screw in one direction while stitching one side of a buttonhole, and in an opposite direction while stitching the opposite side of a buttonhole.

43. In a sewing-machine, a work-clamp, a sleeve loosely connected with said clamp and provided with trippers, a screw for moving said sleeve, clutch mechanism to actuate said screw, a shaft having a right-and-left worm, a lever having spring-controlled pins, locking devices for each of said pins, said tripping devices meeting said locking devices one after the other to release its pin to engage one or the other of the grooves of one or the other worm to move the lever, and devices controlled by the movement of said lever to change the condition of the clutch mechanism to rotate the screw in one and then in the opposite direction and leave the screw at rest between its periods of rotation.

44. In a sewing-machine, stitch-forming means to form overedge-stitches, a work-clamp suspended at its upper end above the throat-plate of the machine, a device connected with the depending lower end of the work-clamp, means to move said device to cause the longitudinal movement of the work-clamp in one and then in the opposite direction to provide for stitching both sides of a buttonhole, and means to move the lower end of said work-clamp laterally after completing the stitching of the first half of the buttonhole to place the material held by the clamp in proper relation to the stitch-forming mechanism that the second side of the buttonhole may be overstitched.

45. In a sewing-machine, stitch-forming mechanism to make parallel rows of overedge-stitches for both sides of a buttonhole, and longer barring-stitches at both ends of said parallel rows of stitches, a two-part clamp

suspended above the bearings for the needle-bar of the sewing-machine, and means to move said work-clamp longitudinally and laterally for the purposes stated.

- 5 46. In a sewing-machine, stitch-forming mechanism to make parallel rows of overedge-stitches for both sides of a buttonhole, and longer barring-stitches at both ends of said parallel rows of stitches, a two-part clamp
10 suspended above the bearings for the needle-bar of the sewing-machine, and means to move said work-clamp longitudinally and laterally for the purposes stated, buttonhole-

cutting mechanism, means to actuate it to cut a buttonhole, and means to automatically 15 open the work-clamp after the cutting of the buttonhole.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

CHARLES A. DAHL.
GEORGE S. HILL.

Witnesses:

GEO. W. GREGORY,
FRANCIS A. SHEA.