No. 649,870. Patented May 15, 1900.

J. T. HOGAN.

BUTTONHOLE SEWING AND CUTTING MACHINE.

(Application filed June 15, 1897.)

(No Model.) 6 Sheets—Sheet 1.

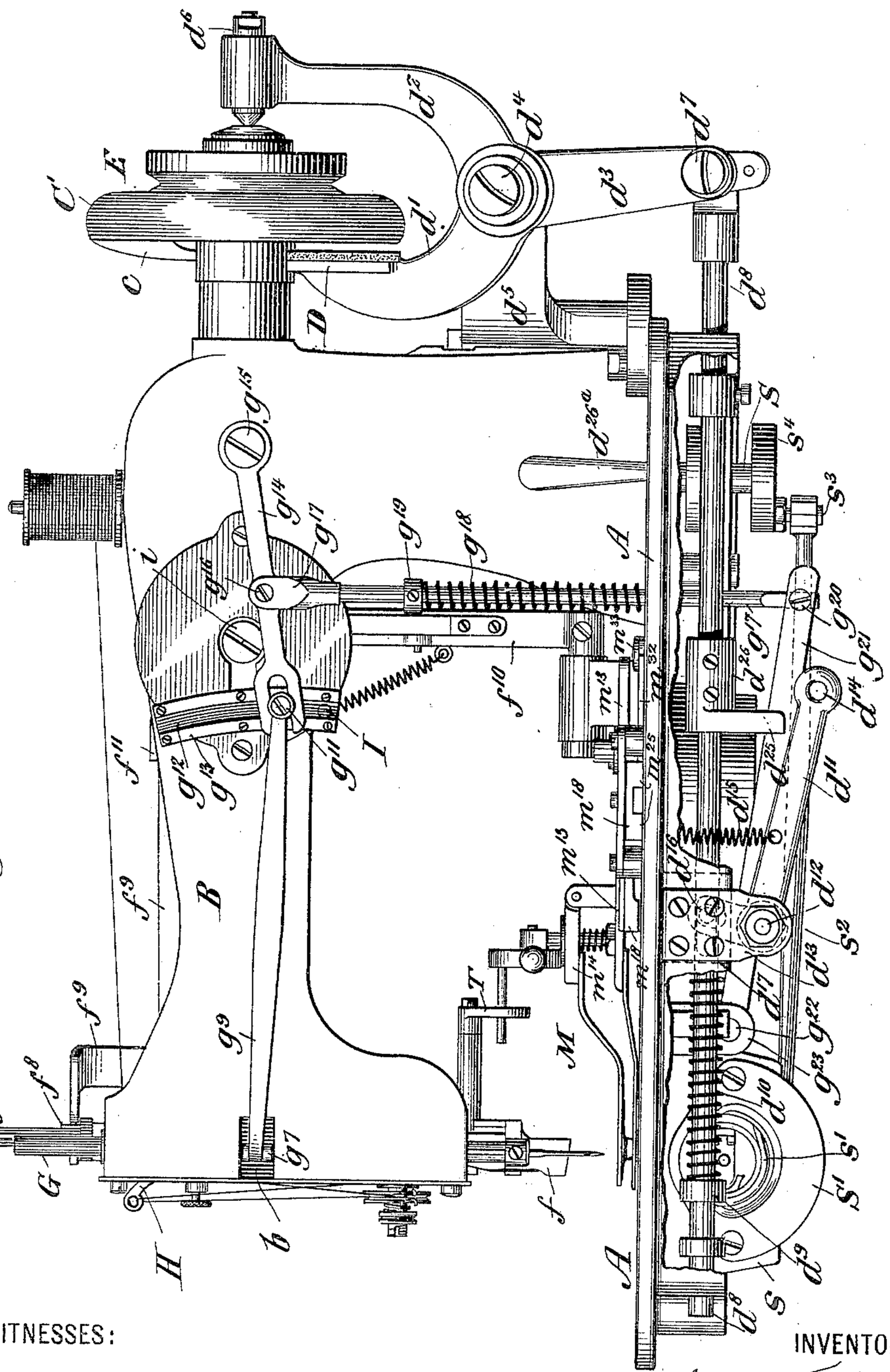

FIG. 1.

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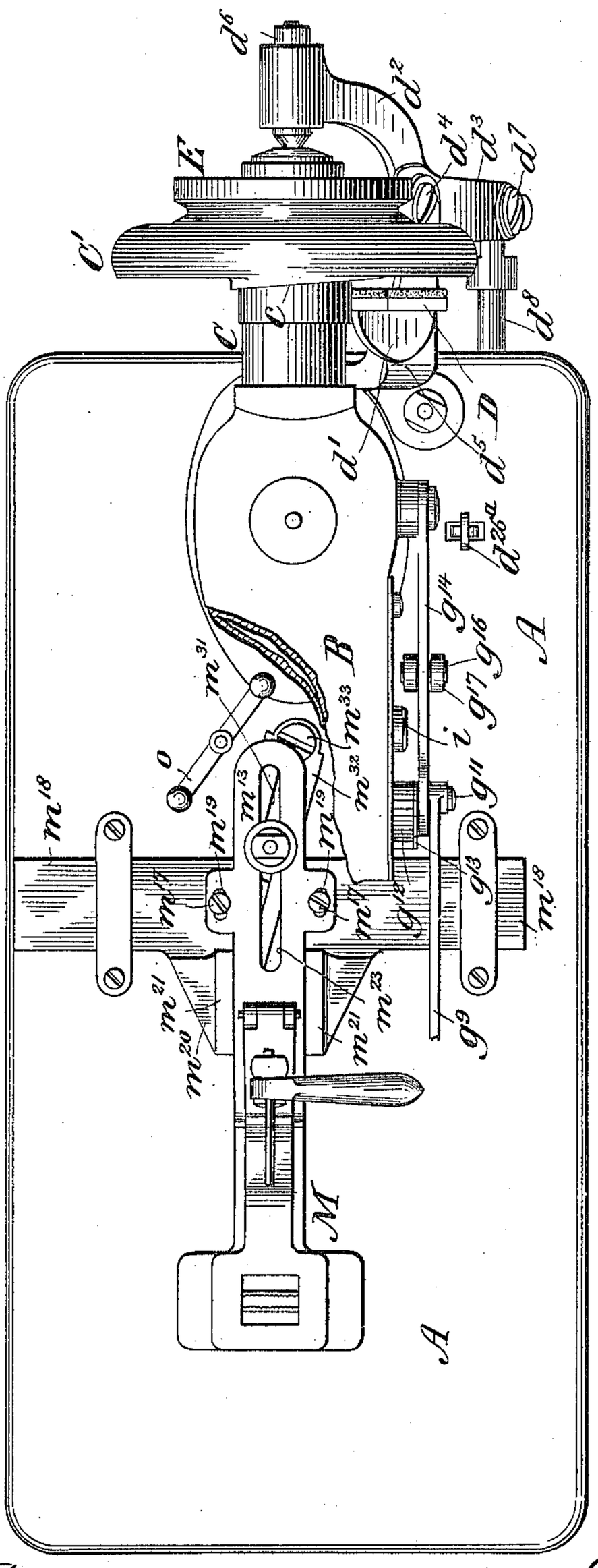

Fig. 2.

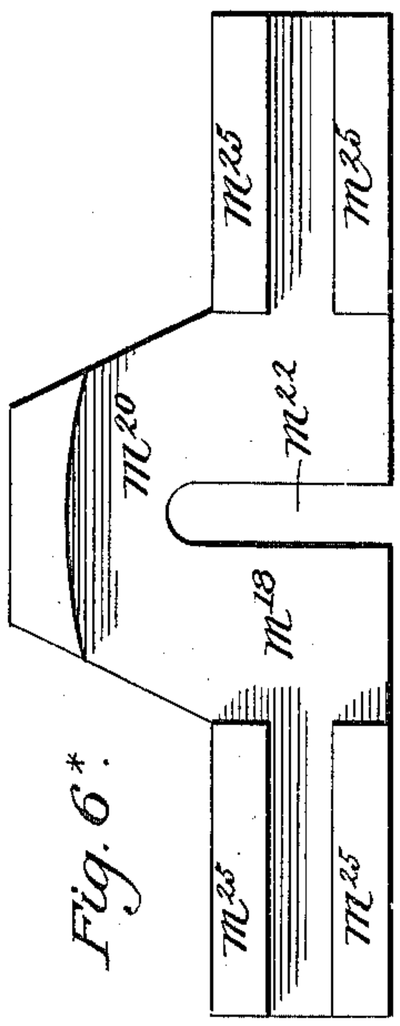

Fig. 6*.

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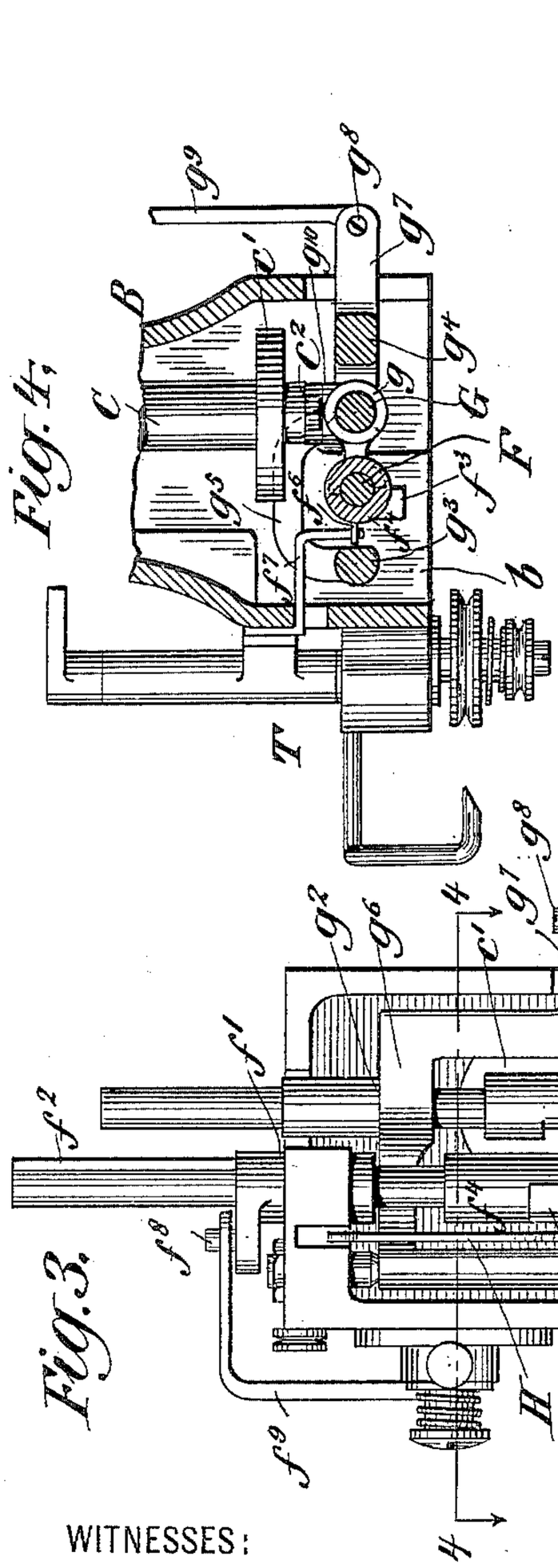

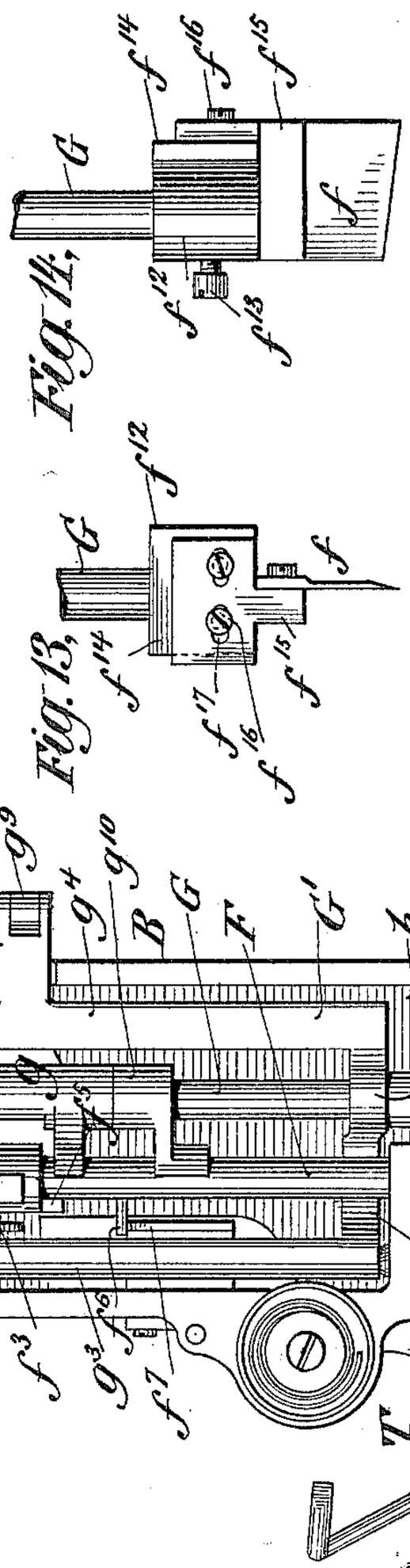

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Fig. 4.

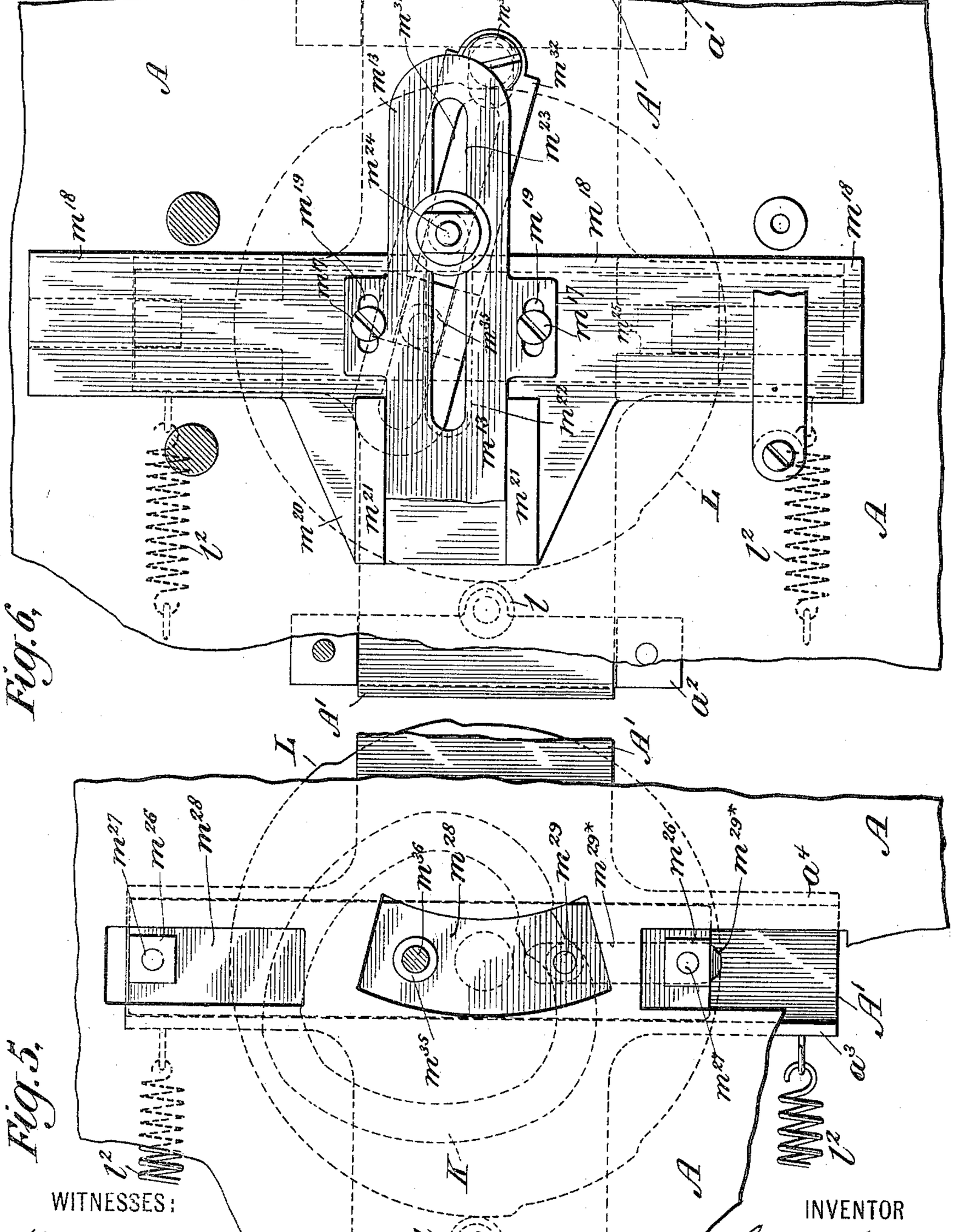

Fig. 5.

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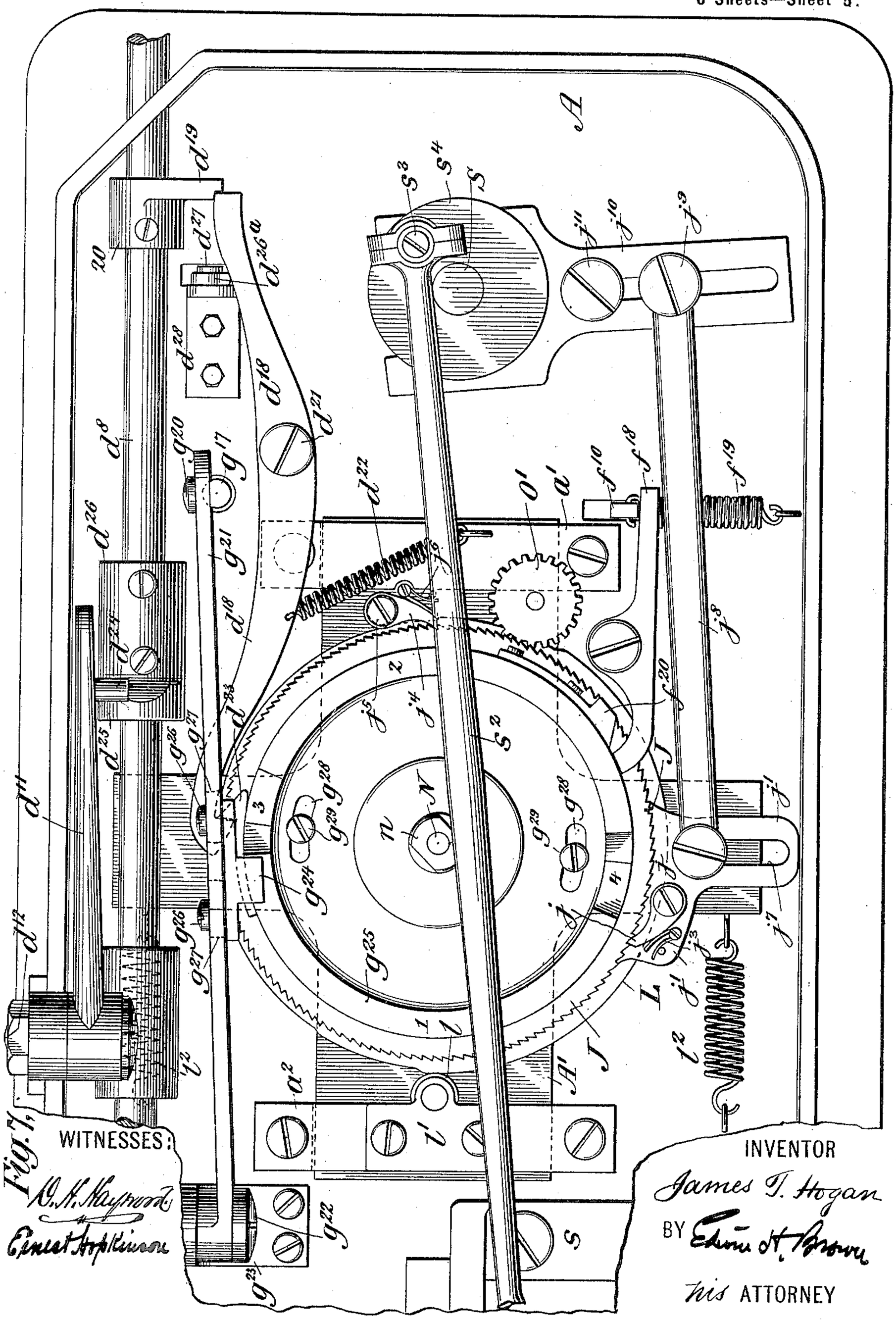

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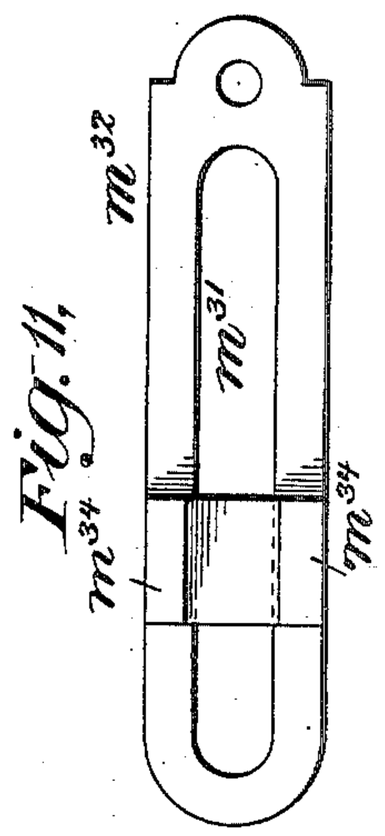

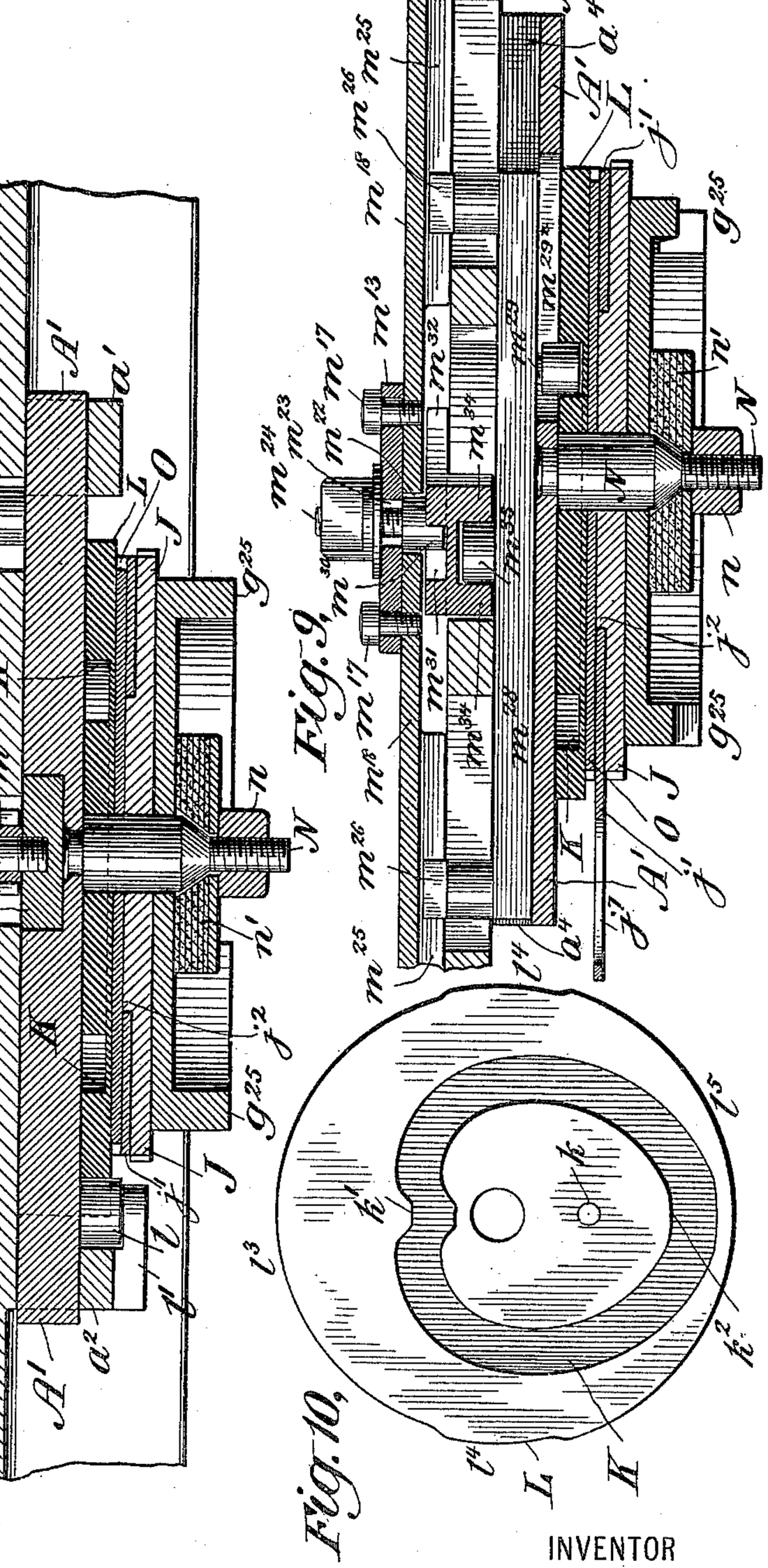

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UNITED STATES PATENT OFFICE.

JAMES T. HOGAN, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO THE NATIONAL MACHINE COMPANY, OF TROY, NEW YORK.

BUTTONHOLE SEWING AND CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 649,870, dated May 15, 1900.

Application filed June 15, 1897. Serial No. 640,857. (No model.)

To all whom it may concern:

Be it known that I, JAMES T. HOGAN, of Jersey City, in the county of Hudson and State of New Jersey, have invented a certain new and useful Improvement in Buttonhole-Machines, of which the following is a specification.

I will describe a machine embodying my improvement and then point out the novel features in the claims.

In the accompanying drawings, Figure 1 is a front view of a machine embodying my improvement. Fig. 2 is a top view of the same, certain parts having been broken away. Fig. 3 is an end view of the arm of the machine, showing the needle-bar-supporting mechanism, the cover being removed for the purpose of exposing such mechanism. Fig. 4 is a horizontal section at the plane of the dotted line 4 4, Fig. 3. Fig. 5 is a top view of certain parts. Fig. 6 is another top view of certain parts. Fig. 6× is an inverted plan or bottom view of a bar and appurtenances represented in Fig. 6. Fig. 7 is an inverted plan of certain portions of the machine beneath the bed-plate, this view being upon a larger scale. Fig. 8 is a longitudinal vertical section taken through the axial line of the feed-wheel. Fig. 9 is a transverse vertical section taken through the axial line of the feed-wheel. Fig. 10 is a top view of a cam. Fig. 11 is a bottom view of a feed-lever comprised in the machine. Fig. 12 is a transverse section of the said lever. Fig. 13 is a view of the rear side of the lower end of the cutter-bar and of the rear edge of the cutter. Fig. 14 is a side view of these parts.

Similar letters of reference designate corresponding parts in all figures.

A designates the bed of the sewing-machine.

B designates the arm, having the main shaft C arranged horizontally in its upper portion. Affixed to this shaft is a disk C′, having on that side which is toward the arm of the machine a protuberance consisting, as here shown, of a circumferentially-inclined surface *c*, which coöperates with a stop D. This stop is shown as supported by a three-arm lever d' d^2 d^3, which is fulcrumed by a pin or screw d^4 to a bracket d^5, which may be attached to the bed A and arm B of the machine. Mounted loosely upon the main shaft beyond the disk C′ is a belt-pulley E, and this has frictional engagement with the adjacent side of the disk C′, a washer of friction-generating material, such as paper, being preferably interposed. Such a washer may be inserted in a recess formed in the side of the disk C′.

The arm d^2 of the lever d' d^2 d^3 bears against the side of the belt-pulley E and serves to press it toward the disk C′. This arm of the lever is preferably provided for this purpose with an adjustable pin or screw d^6 opposite the center of the belt-pulley E. It will be seen that when the lever is oscillated in one direction by power applied to its arm d^3 it will move the belt-pulley toward the disk C′ and the stop D away from the disk C′, but that when it is moved in the reverse direction the pressure of the belt-pulley against the disk C′ will be relaxed and the stop D will be moved to a position to stop the disk C′.

The arm d^3 of the lever is pivotally connected by a pin or screw d^7 with a rod d^8, fitted to bearings formed integral with the bed A and arranged to slide lengthwise of the bed along the under side of the same. Between one of these bearings and a collar d^9, which is affixed to the rod d^8, a helical spring d^{10} is coiled around the rod. This spring acts in a direction to oscillate the lever in such direction as to apply the stop to the disk C′ and relax the pressure of the pulley E upon said disk.

A lever d^{11}, fulcrumed to a pin d^{12}, that is supported by a bracket d^{13}, fastened to the bed A of the machine, is connected by a chain fitted to an eye d^{14} with a treadle that is intended to be actuated by the operator to depress the lever. Normally a spring d^{15} will oscillate this lever upwardly. The lever d^{11} is a bell-crank lever. It has an upright arm that is provided with a pin d^{16}, which engages with a slot or notch in a collar d^{17}, fastened to the rod d^8. By depressing the lever d^{11} the rod d^8 will be moved longitudinally against the force of the spring d^{10}, and thus the lever will be oscillated in such direction that its stop will be removed from the disk C′ and the belt-pulley E will be pressed against said disk to cause the operation of the machine.

The lever d^{11} is not held by the treadle in

the position to which it is adjusted, but is left free, so that the parts may be reversed in their action automatically. When the lever d^{11} is depressed, it is, however, locked in position by means of a lever d^{18}, that engages with a notch in a finger d^{19}, extending from a collar d^{20}, which is affixed to the rod d^{8}. The lever d^{18} is fulcrumed to a pin or screw d^{21}, passing through the bed A of the machine. A spring d^{22} acts to oscillate the lever d^{18} into a position to engage with the finger d^{19} when permitted so to do by a cam d^{23}, whose operation will hereinafter be more fully described. It is a cam that is carried rotarily around to its operating position once for each buttonhole that is cut and stitched. It has an inclined forward end that coacts with a correspondingly-inclined end of the lever d^{18}, and it is by the coaction of these inclined surfaces that the said lever is oscillated in the contrary direction to that in which it is moved by the spring d^{22}. Whenever the cam d^{23} oscillates the lever d^{18}, it disengages it from the finger d^{19}, thereby allowing the spring d^{10} to move the rod d^{8} in the proper direction to relax the pressure of the belt-pulley E against the disk C′ and to apply the stop to said disk.

When the treadle which is employed to depress the lever d^{11} is released after having depressed the lever, the spring d^{15} will raise the lever to its normal position, and thereby it will bring a finger or roll d^{24} into contact with the end portion of a finger d^{25}, extending from a collar d^{26}, that is fastened to the rod d^{8}. The finger or roll d^{24} will remain in contact with the end portion of the finger d^{25} until the cam d^{23} disengages the lever d^{18} from the finger d^{19} of the rod d^{8}, thereby allowing the rod to be moved by the spring d^{10}. When this happens, the spring d^{15} raises the lever d^{11} still farther, and thereby shifts the finger or roll d^{24} to one side of the finger d^{25} of the rod d^{8} to later come in contact with it, as hereinafter pointed out, thereby locking the rod d^{8} against any outward movement, or, in other words, against any movement in the direction contrary to that in which the spring d^{10} is capable of moving it. While the rod d^{8} is locked by the finger or roll d^{24} against any outward movement, the incline c of the disk C′ will come opposite to the stop which is affixed to the arm d' of the lever D and will crowd against said stop until the latter positively arrests its movement.

The lever d^{18} may be disengaged from the finger d^{19} by a hand-lever d^{26a}, which is fulcrumed by a pin d^{27} to a bracket d^{28}, extending downwardly from the bed A of the machine. The lower arm of this lever d^{26a} crosses the lever d^{18}, and its upper arm extends above the bed.

F designates a cutter-bar supported in the end of the arm B, so that it may reciprocate vertically and also oscillate about its axis. It is shown as having a cutter f of a length adapting it to cut an entire buttonhole at one stroke. In this example of my improvement the cutter operates at about the time the stitching begins; but this timing is not essential to my invention.

It will be seen, Fig. 3, that the arm B has in its outer end a chamber b and that the cutter-bar extends through this chamber, being supported by a bearing formed in the bottom of the chamber and by a bearing formed in a collar f', fitted in the top of the chamber. A spline or feather f^{2} engages the cutter-bar with the collar f', so that by oscillating the collar an oscillatory movement will be imparted to the cutter-bar in addition to its reciprocatory movement. The purpose of the oscillatory movement is to oscillate the cutter into and out of a position in line with the buttonhole to be formed and also for the purpose of engaging and disengaging the cutter-bar and the part which is to reciprocate it. In the present instance the reciprocation of the cutter-bar is effected by the needle-bar G, the latter having affixed to it for this purpose a collar g, provided in one side with a notch into which may be swung a toe or finger f^{3}, that extends from a collar f^{4}, affixed to the cutter-bar. As here shown, the collar f^{4} of the cutter-bar is provided with a stop-shoulder f^{5}, which will contact with a portion of the collar g of the needle-bar to arrest the cutter-bar in its oscillatory movement as soon as it comes into the position in which it should operate to cut a buttonhole. When the cutter-bar has been elevated to its highest position and oscillated out of engagement with the needle-bar, a pin f^{6}, extending radially from the cutter-bar, will be carried over a support f^{7}, and thus the cutter-bar will be maintained in an elevated position until it has to operate again. Then it will be oscillated so that its pin f^{6} will leave the support f^{7} and the cutter will assume an operative position. Besides this, the cutter-bar will be properly engaged with the needle-bar. The collar f' is provided with a pin f^{8}, which is attached to a rod f^{9}. The rod f^{9} is oscillated vertically by a lever f^{10}. It is permitted to engage with a lever f^{11}, that is affixed to one end of a rock-shaft I, that is journaled in the arm B of the machine and driven by a cam that is mounted upon a screw-stud i, the said cam being geared to the main shaft C. At the proper time the lever f^{10} throws it out of engagement with the lever f^{11}. As all this mechanism for operating the cutter is old and well known, I have not attempted to illustrate it, nor shall I describe it in detail.

The lever f^{10} projects downwardly through the bed A of the machine for the purpose of coacting with a lever f^{18}. A spring f^{19} holds it in contact with the lever f^{18}. A rotary cam f^{20} operates the lever f^{18}, and hence the lever f^{10}.

While the cutter may be mounted upon the cutter-bar in any desired manner so far as the operation of other parts of the machine are concerned, I prefer to mount it in the

manner illustrated. It will be seen, Figs. 13 and 14, that a collar f^{12} is fitted to the lower end of the cutter-bar and secured there by means of a screw f^{13}. As the cutter-bar is cylindrical and the hole in the collar f^{12} is also cylindrical, it is possible to adjust the collar rotarily upon the cutter-bar by suitably manipulating the screw f^{13}. The collar f^{12} has one flat side f^{14} and is flat on the bottom. An L-shaped piece f^{15} is fitted to the flat side f^{14} of the collar and to the bottom of the collar f^{12} and is secured thereto by means of a screw f^{16}, passing through the upright portion of the L-shaped piece f^{15} and into the flat side f^{14} of the collar f^{12}. The upright portion of the L-shaped piece f^{15} has a horizontal slot f^{17}, through which the screw f^{16} passes. Hence the L-shaped piece may be shifted horizontally. As the flat side f^{14} of the collar f^{12} is at the rear of the collar f^{12}, it is possible to shift the L-shaped piece in the direction of the length of the arm B of the machine, which will be transversely to the length of a buttonhole. As the cutter is fastened to the L-shaped piece f^{15}, the adjustment of the L-shaped piece in the manner just explained will effect the shifting of the cutter, so that it may be made to cut a buttonhole upon the descent of the needle while making either an edge-stitch or a depth-stitch. As the cutter is provided with horizontal slots through which pass screws that fasten it to the L-shaped piece f^{15}, it may be independently adjusted endwise. These possibilities of adjustment are advantageous, because when the cutting is done substantially in advance of the stitching, or, in other words, at the beginning of the stitching, it is desirable that the cutter should operate during the descent of the needle for making a depth-stitch, whereas if the cutter is to operate after the substantial completion of the stitching it will be more desirable to have it descend during the descent of the needle for making an edge-stitch.

Later on I shall describe means whereby the cutter may be timed to operate at the beginning or at the end of the stitching operation.

The needle-bar G works through the chamber *b*, formed at the end of the arm B and reciprocates through openings formed in the top and bottom of such chamber and made of such size as not to interfere with the necessary movements of the needle-bar. It is mounted in a well-known manner to reciprocate vertically, and it may be combined in any suitable manner with the main shaft, so as to be reciprocated thereby. The needle-bar G is not supported directly by the arm B of the sewing-machine, but in a yoke or frame G′, which reciprocates in the direction of the length of the arm B, so that the needle will be carried first on one side and then on the other side of a given line to produce edge-stitches along the center line of a buttonhole and depth-stitches at one side thereof. It will be seen, Fig. 3, that the yoke or frame G′ has a bearing g' at its lower extremity and a bearing g^2 at it upper extremity and that the needle-bar is supported in both of these bearings in such manner that it may reciprocate vertically through them. The yoke or frame G′ is mainly of rectangular form, it being composed of two vertical portions g^3 g^4, connected near their ends by horizontal portions g^5 g^6, the bearings g' g^2 being formed integral with these horizontal portions g^5 g^6. The vertical portion g^3 has vertical trunnion-bearings at its upper and lower ends in the end of the arm of the machine, so that the entire yoke or frame may oscillate horizontally. The vertical portion g^4 is provided with an arm g^7, that is at its outer extremity connected pivotally by a pin or screw g^8 with one end of a horizontal reciprocating rod g^9. By means of this rod the yoke or frame G′ is oscillated horizontally, and thus it is made to carry the needle-bar to and fro, or, in other words, to give it the jogging movement necessary for the production of stitches. The mechanism for operating this rod g^9 I will describe presently.

The needle-bar is reciprocated vertically by means of a disk c', which is affixed to that end of the main shaft C which terminates near the needle-bar G. Upon this disk is a wrist-pin c^2, and such wrist-pin coacts with a collar g^{10}, which is affixed to the needle-bar G. The disk c' is constructed to constitute a cam for operating a take-up lever H; but as this forms no part of my present invention I will make no further mention of it.

The rod g^9 is connected with a stud g^{11}, that extends from a block fitted in a slideway g^{12}, formed in a lever g^{13}, which is rigidly affixed to the front end of the shaft I, so that when said shaft is oscillated by the cam before mentioned it will oscillate this lever g^{13} and the latter will reciprocate the rod g^9. Obviously by shifting the position of the stud g^{11} along the lever g^{13}, so that it will be nearer to or farther from the fulcrum-shaft I, the amplitude of the reciprocation of the rod g^9 will be varied. For shifting the stud g^{11} lengthwise of the lever g^{13} I employ in the present example of my invention a lever g^{14}, that is fulcrumed to a pin or screw g^{15}, fastened to the arm B of the machine. The free end of this lever is longitudinally slotted or forked to embrace the stud g^{11}. Intermediate of the ends of the lever g^{14} it is pivotally connected by a pin g^{16} to a rod g^{17}. A helical spring g^{18} surrounds this rod between the bed A and a collar g^{19}, that is fastened by a set-screw to the rod g^{17}. By means of this spring the rod g^{17}, and hence the lever g^{14} and the stud g^{11}, will be moved upward whenever there is no counteracting force.

The lower end of the rod g^{17} is pivotally connected by a screw g^{20} with a cam-lever g^{21}. This lever g^{21} is fulcrumed to a pin or screw g^{22}, supported in a bracket g^{23}, extending downwardly from the bed A. Intermediate

of its ends the lever g^{21} is provided with a laterally-extending toe or finger g^{24}, that bears upon a cam g^{25}. The toe or finger g^{24} is fastened to the lever g^{21} by screws g^{26}, that pass through slots g^{27}, extending lengthwise of the lever, so as to afford provision for adjusting the toe or finger toward either end of the lever. Thus provision is afforded for adjusting to a nicety the movement imparted to the stud g^{11} lengthwise of the lever g^{13}. It also affords provision for timing the shifting of the stud g^{11} along the lever g^{13}, because by shifting such toe or finger in one direction or the other along the lever g^{21} the cam will operate upon it either sooner or later.

The cam g^{25} is a rim-cam, or, in other words, a cam formed on the under side of an annular or rim-like part.

Any suitable shuttle mechanism may be employed. In the present instance a shuttle is fitted into a race S′, which is fastened to a bracket s, that is secured to the under side of the bed A. A shuttle-driver s' propels the shuttle and is comprised in a lever that is oscillated by means of a rod s^2, which derives motion from a wrist-pin s^3, extending from a disk s^4, affixed to an upright shaft S, geared to the main shaft C. As here shown, the cam g^{25} is formed integral with the disk, having slots g^{28}, which are concentric with the center or axis of the cam. Through these slots pass screws g^{29}, that engage with the under side of the feed-wheel J. The slots g^{28} afford provision for adjusting the cam g^{25} relatively to the feed-wheel. The feed-wheel is affixed to a cam K, which is the cam which produces the progressive feeding movement lengthwise of a buttonhole. It will be seen that this cam K is a groove-cam. Integral with the cam K is a cam L, which may be termed a "change-cam," because it changes the position of the fabric in which the buttonhole is being stitched, so that the stitches will occur in different relations to the center line of a buttonhole. To be more explicit, this cam will cause the stitches to be arranged in rows for the sides of a buttonhole and in groups for the ends of a buttonhole to constitute barring. As in this form of machine the fabric in which the buttonhole to be worked is held in a clamp M, the cams K L operate upon this work-clamp. The means whereby they are enabled to fulfil their functions will be described later on. Between the piece comprising the cams K L and the feed-wheel J a gear-wheel O is arranged. The feed-wheel J, the gear-wheel O, the piece comprising the cams K L, and the piece comprising the cam g^{25} are all provided at or near the center with a hole, so that they may be fitted upon a stud N, that is fastened to a bed-plate A′, fitted in bearings a' a^2, extending downwardly from the under side of the bed A of the machine, the direction of the sliding movement of the bed-plate A′ being lengthwise of the arm B of the machine. The extremity of this stud N is screw-threaded and fitted with a nut n. A pin inserted in a hole k, formed in a piece comprising the cams K L and also fitted in similar holes in the feed-wheel J and gear-wheel O, locks the said part comprising the cams K L, the gear-wheel O, and the feed-wheel J together, so that they will turn in unison. Owing to the slots g^{28} and screws g^{29}, which secure the cam g^{25} to the feed-wheel, this cam g^{25} may be adjusted rotarily not only with reference to the feed-wheel, but to the cams K L. Intermediate of the disk from which the cam g^{25} extends and the nut n a friction device n' surrounds the stud N. It may consist of a disk of metal and a number of disks of leather or like material arranged intermediate of said disk of metal and the disk with which the cam g^{25} is formed.

The cam g^{25} makes one complete rotation for each buttonhole. It has two flat surfaces 1 2 and two intermediate notches 3 4, which are diametrically opposite each other. While the two rows of side stitches are being formed the toe or finger g^{24} will be in contact with the portions 1 2 of the cam g^{25}. During the formation of the barring-stitches at the ends of the two rows of side stitches the toe or finger g^{24} will rise in the notches 3 4. It will seen that the rear faces or sides of these notches are inclined. As in this way the rod g^{17} will be made to shift the stud g^{11} farther from the fulcrum-shaft I, the amplitude of the jogging movement of the needle-bar G will be increased, and consequently the barring-stitches will be longer than the side stitches. They will be made gradually shorter—that is, each one succeeding another will be shorter for the last few stitches because of the inclined rear faces of the notches 3 4. This variation in the length of the barring-stitches is advantageous, because it will result in staying the end of a buttonhole better than if the stitches were all of the same length. Not only do the shorter stitches stay the material where the longer stitches could not stay it, but the shorter stitches also tie down the longer stitches.

The feed-wheel J may be of any suitable form. I have shown it as being operated by means of a pawl j, pivoted to a lever j', which is mounted upon a hub j^2, with which the feed-wheel is provided. A spring j^3 holds the pawl in engagement with the ratchet-teeth on the periphery of the feed-wheel. A pawl j^4, pivoted to a stud j^5, extending from the bed-plate A′ and impelled against the periphery of the feed-wheel by means of a spring j^6, prevents backlash of the feed-wheel. The lever j' is provided with a longitudinal slot j^7, and with this slotted portion is connected a rod j^8, the means for making the connection being represented as a screw passing through the end of the rod j^8 through the slot j^7 of the lever j' and having a head on one side of the lever j' and a nut applied to it at the other side. The rod j^8 is pivotally connected, by means of a screw j^9 and a nut, with a lever j^{10}, the said lever be-

ing longitudinally slotted where the screw j^9 passes through it. By the longitudinal slotting of the levers j' j^{10} provision is afforded for adjustments which will vary the throw of the pawl j. Thus stitches may be coarser or finer or, in other words, farther apart or nearer together. The lever j^{10} is fulcrumed to a screw-stud j^{11}, that is fastened to the bed A of the machine. Beyond this fulcrum the lever is bifurcated and operates a cam affixed to the shaft S, and from this cam is derived the motion which is transmitted to the feed-pawl j.

The gear-wheel O engages with a pinion O', affixed to a shaft supported in a bearing carried by the bed-plate A' and extending through a slot in the bed A of the machine. At the upper end this shaft is provided with a handpiece o, whereby the pinion O', and consequently the gear-wheel O and the feed-wheel J and the cams K L, may be turned by hand.

M designates a work-clamp, the particular features of which are claimed in the application filed by me on November 9, 1899, Serial No. 736,365, this clamp comprising a bar m^{13}, to which is hinged a lever m^{14}, which lever at its free end supports the shank portion of the top plate of the work-clamp.

The bar m^{13} is fastened by screws m^{17} to a bar m^{18}. Preferably the bar m^{13} will be provided with longitudinal slots m^{19} where the screws m^{17} pass through it, as thus convenient provision for adjusting the cloth-clamp relatively to the needle and cutter is afforded.

The bar m^{18}, Figs. 6 and 6×, has on the side which is the nearer to the cloth-clamp a projection m^{20}, whose sides are shown as converging; but this feature of construction is not material. On the upper side of the projection m^{20} are two ribs m^{21}, between which the bar m^{13} fits. They serve as steadiments, so as to prevent any oscillation of the bar m^{13} independently of the bar m^{18}. Extending transversely of the bar m^{18} is a slot or notch m^{22}. This extends through that side of the bar which is the farther from the work-clamp. The bar m^{13} is provided with a longitudinal slot m^{23}, which is in line with the slot or notch m^{22}, and in the slot m^{23} of the bar m^{13} is fastened a stud m^{24}. As shown, it may be clamped in position by means of a nut applied to a screw with which it is provided. Owing to the fact that this stud is fastened through a longitudinal slot in the bar m^{13} and the bar m^{18} is provided with a coincident slot or notch m^{22}, the stud m^{24} may be adjusted lengthwise of the bar m^{13} and may protrude downwardly through the bar m^{18}. On the under side of the bar m^{18} are pairs of ribs m^{25}, forming slideways fitting blocks m^{26}, fitted loosely upon studs m^{27}, which are screwed into a bar m^{28}. This bar m^{28} is fitted in a slideway in the upper side of the bed-plate A'. To afford a long bearing for the bar m^{28}, the bed-plate is provided with laterally-extending arms a^3 a^4.

The bar m^{28} is provided with a stud m^{29}, which extends downwardly through a slot m^{29*} in the bed-plate A' into the groove of the cam K. The bar m^{28} therefore derives motion from the cam K in directions transverse to the length of the arm B of the machine or, in other words, in the direction of the length of the opening in the work-clamp and lengthwise of a buttonhole produced. This motion is what is generally called the feed motion progressively lengthwise of a buttonhole.

It will be seen that the feed-cam K has dwells k' k^2. These, Fig. 10, consist of portions concentric with the axis of the cam. They allow the cam to rotate during the formation of barring-stitches without producing any feed of the work-clamp.

The lower end of the stud m^{24} is provided with an antifriction-roller m^{30}, that fits in a longitudinal slot m^{31}, formed in a lever m^{32}, which is fulcrumed by a pin or screw m^{33} to the bed-plate A'. The slot m^{31} is necessary to allow adjustments of the stud m^{24} lengthwise of the bar m^{13} and transversely of the bar m^{18}.

From the under side of the lever m^{32} extend jaws m^{34}, which embrace a roller m^{35}, mounted upon a stud m^{36}, that extends upwardly from the feed-bar m^{28}. By this means the feed-bar m^{28} serves to oscillate the lever m^{32}. The lever m^{32} transmits motion through the stud m^{24} to the bar m^{18}, and consequently to the work-clamp, in the direction of the length of a buttonhole. It will be seen, therefore, that the feed-cam does not directly impart motion to the work-clamp in the direction for feeding, but imparts motion directly to the feed-bar m^{28} in the feeding direction, and the latter imparts the feeding movement to the work-clamp through the lever m^{32} and the bar m^{18}, carrying the bar m^{13}, to which the work-clamp is attached. One advantage of this is the opportunity afforded for adjustments to suit different sizes of buttonholes simply by shifting the stud m^{24} nearer to or farther from the fulcrum of the lever m^{32}.

The change-cam L coöperates with a roller l, mounted upon a stud l', affixed to the bearing a^2 of the bed-plate A'. As the change-cam L is mounted upon this bed-plate and the roller l is mounted upon a stationary part of the machine, it follows that the cam will derive a bodily movement from its coaction with the roller and that such movement will be imparted to the bed-plate. Helical springs l^2, attached at one end to the arms a^3 a^4 of the bed-plate A' and at the other end to appurtenances of the bed A of the machine, tend to draw the bed-plate A' so as to move the change-cam toward the roller l. The projections of the cam will of course effect a movement in the contrary direction. The change-cam is composed of a number of concentric portions l^3 l^4 l^5, there being two short circumferential portions l^4 of the same radius and two long circumferential portions l^3 l^5 of radii different from each other and different from

the radius of the portions l^4. The long circumferential portion l^3 will prevent any movement of the work-clamp transversely to the length of a buttonhole while one row of side stitches is being formed, and the long circumferential portion l^5 will perform the same office for the work-clamp during the formation of the other row of side stitches. The other circumferential portions hold the clamp against jogging during the formation of the barring-stitches. The shoulders or offsets intermediate of the two short circumferential portions l^4 and the long circumferential portions l^3 l^5 serve to shift the work-clamp prior to and after the completion of two sets of barring-stitches which are formed at the ends of a buttonhole, the obvious purpose of thus shifting the work-clamp being to secure the proper disposition of the two rows of side stitches with reference to the center line of the buttonhole and to secure the disposition of the barring-stitches equally across the center line of the buttonhole on both sides.

It will be seen that the dwells k' k^2 of the feed-cam K, which suspend the feeding of the work-clamp, are operative at the time that the short circumferential portions l^4 of the change-cam hold the work-clamp in position for the barring-stitches and that while the dwells k' k^2 of the feed-cam are fulfilling their function and the short circumferential portions l^4 of the change-cam are maintaining the proper position of the work-clamp for the barring-stitches the notches 3 4 of the cam g^{25} become operative to shift the lever g^{21} and cause the stud g^{11} to be moved farther from the fulcrum-shaft I of the lever g^{13} for the purpose of increasing the amplitude of the jogging movement of the needle.

The stop-cam d^{23} is so positioned that it will immediately after the formation of the second set of barring-stitches oscillate the lever d^{18}, so that it will release the rod d^8 and permit the spring d^{10} to operate. As soon as the rod is moved by the spring the arm d^2 is moved away from the disk C and the arm d' moved toward the disk C′ to have the pad D in the path of the incline or protuberance c, so that as the protuberance engages with the pad a cam-like action by the incline on the pad occurs, which forces the finger d^{25} of the rod d^8 into engagement with the antifriction-roller, which is brought into position by the spring d^{15}. This roller will prevent any movement of the rod in the releasing direction and locks it, so that the rotation of the disk C′ will be stopped. This operation occurs if the incline or protuberance has not reached the pad when the machine is stopped. Should, however, the protuberance c be in front of the pad d when the rod is released by the lever d^{18}, the action above described will not immediately occur, and the disk will continue to rotate, thus carrying the protuberance past the pad. As soon, however, as the incline has passed the pad the spring d^{10} will move the rod farther in the locking direction to bring the pad directly in the path of the protuberance, so that when they engage again the cam-like action above described takes place to stop the machine.

In the illustrated organization the stitching of a buttonhole will begin with the formation of one row of side stitches, then one set of barring-stitches will be formed, next the other row of side stitches will be made, and finally the second set of barring-stitches will be formed. As the buttonhole is to be cut in the illustrated organization substantially at the beginning of the stitching, the cam f^{20} is positioned so that it will effect the descent of the cutter just after the first few stitches in the first row of side stitches shall have been made. I do not intend to be limited to the timing mentioned.

It will be seen that the cams d^{23} f^{20} are mounted upon the circumference of the cam g^{25}. Preferably they will be secured by screws passing through slots, which will permit of the adjustment of the cams d^{23} f^{20} circumferentially of the cam g^{25}.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a sewing-machine, the combination of a work-carrying clamp, a needle and concomitant parts for stitching work held in the work-clamp, means for producing jogging movements of the needle of different amplitudes, and a feed-cam for producing a longitudinal movement of the work-clamp, said feed-cam having dwells at opposite points for suspending the longitudinal movement of the work-clamp while the amplitude of the jogging movement of the needle is increased, substantially as described.

2. In a sewing-machine, the combination of a needle and concomitant parts, means for automatically producing a jogging movement of different amplitudes in the needle, a work-carrying clamp, a feed-cam for producing a longitudinal movement of the said clamp, said cam having dwells for suspending longitudinal motion at certain times, and a change-cam for shifting the work-clamp transversely to change the position of stitches relatively to the middle line of the work-clamp to secure the disposition of stitches equally across said line, substantially as described.

3. In a buttonhole-sewing machine, the combination with sewing mechanism and a work-clamp, of means for producing a feed lengthwise of a buttonhole, means for producing a relative jogging movement between the needle and work-clamp to form side stitches and a relative jogging movement of greater amplitude between the needle and work-clamp to form barring-stitches, means to suspend the lengthwise feed of the work-clamp at about the time barring-stitches are to be formed, and a change-cam for shifting the work-clamp transversely, when the lengthwise feed is suspended, to secure the disposition of barring-stitches equally across the center line of the buttonhole and to secure the

proper disposition of the side stitches, substantially as described.

4. In a sewing-machine, the combination of a needle and concomitant parts, means for producing automatically a jogging movement of different amplitudes in the needle, a heart-shaped feed-cam having concentric arcs at its smallest and largest radii for suspending longitudinal motion at certain times, and a change-cam composed of two short concentric arcs of equal radii and two long intermediate arcs having radii different from each other, and both different from the radii of the shorter arcs, the said two cams being so positioned with relation to each other as that the short arcs of the change-cam will operate at about the time the concentric arcs of the feed-cam are operating, substantially as described.

5. In a sewing-machine, the combination of a needle and concomitant parts, a cam for jogging the needle and varying the amplitude of its jogging movement, a work-carrying clamp, a feed-cam for moving the same in the direction of its length, and a change-cam for moving the clamp transversely to vary the position of the stitches with reference to its middle longitudinal line, the said cams being so constructed and positioned relatively to each other as that the short arcs of the change-cam will operate at about the time that the change-cam will shift the clamp and cause stitches to be made across its longitudinal middle line, the feed-cam will suspend the longitudinal movement of the work-clamp, and the cam for jogging the needle will change the amplitude of the jogging movement, substantially as described.

6. In a sewing-machine, the combination of a needle and concomitant parts, a cam for jogging the needle, another cam for varying the amplitude of its jogging movement, a cutter, and a cutter-controller adjustably connected to the last said cam, substantially as described.

7. In a sewing-machine, the combination with stitch-forming mechanism and feeding mechanism, of a protuberance affixed to the driving-shaft, a stop extending adjacent to and adapted to engage said protuberance, a spring-actuated rod connected to said stop, a projection on said rod, a lever engaging said rod to move the stop out of operative position, a second lever to engage said rod to hold the latter when moved by said first-named lever, means actuated by the feeding mechanism to release said second lever from engagement with said rod at the end of the stitching operation, and a finger on the first-named lever adapted to engage with said projection for locking the stop so that the said protuberance will engage with the stop as the protuberance is rotated, substantially as described.

8. In a sewing-machine the combination with stitch-forming mechanism, of mechanism for suspending the operation of the stitch-forming mechanism at a predetermined period comprising a disk affixed to the driving-shaft of the machine and having a protuberance upon one face, a stop extending adjacent to said disk, and means, comprising a rod having a finger and a spring-actuated lever having means adapted to engage with said finger, for locking the stop so that the protuberance on the disk will engage with it as the disk is rotated, substantially as described.

9. In a sewing-machine the combination with stitch-forming mechanism of mechanism for suspending the operation of the stitch-forming mechanism at a predetermined period comprising a driving-shaft, a disk moving with said shaft and having a protuberance upon one face, a stop adjacent to said face, means, comprising a spring-actuated reciprocating rod that has a projection, for operating said stop, and a spring-actuated lever, said lever being located to have a part move in the rear of said projection when the rod carrying the latter moves the stop to finally engage with the protuberance, thereby preventing the protuberance moving the stop, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES T. HOGAN.

Witnesses:
ERNEST HOPKINSON,
S. H. DILLONT.