

(No Model.)

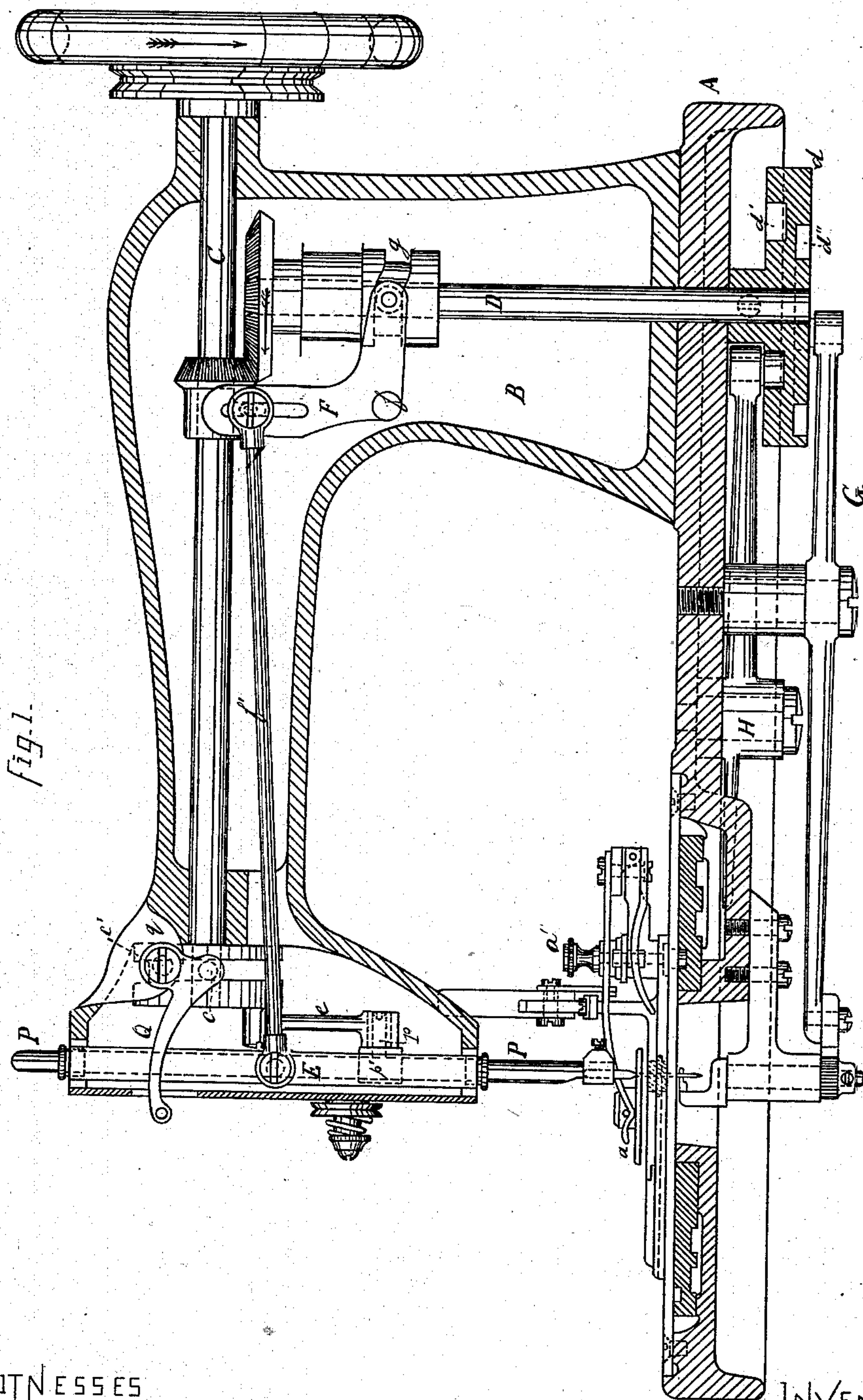
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P. DIEHL.

## BUTTON HOLE SEWING MACHINE.

No. 272,126.

Patented Feb. 13, 1883.



WITNESSES

Richard A. Morton  
Mark Tunnell

INVENTOR

Philip Diehl  
by his attorney  
Sydney A. Bennett



(No Model.)

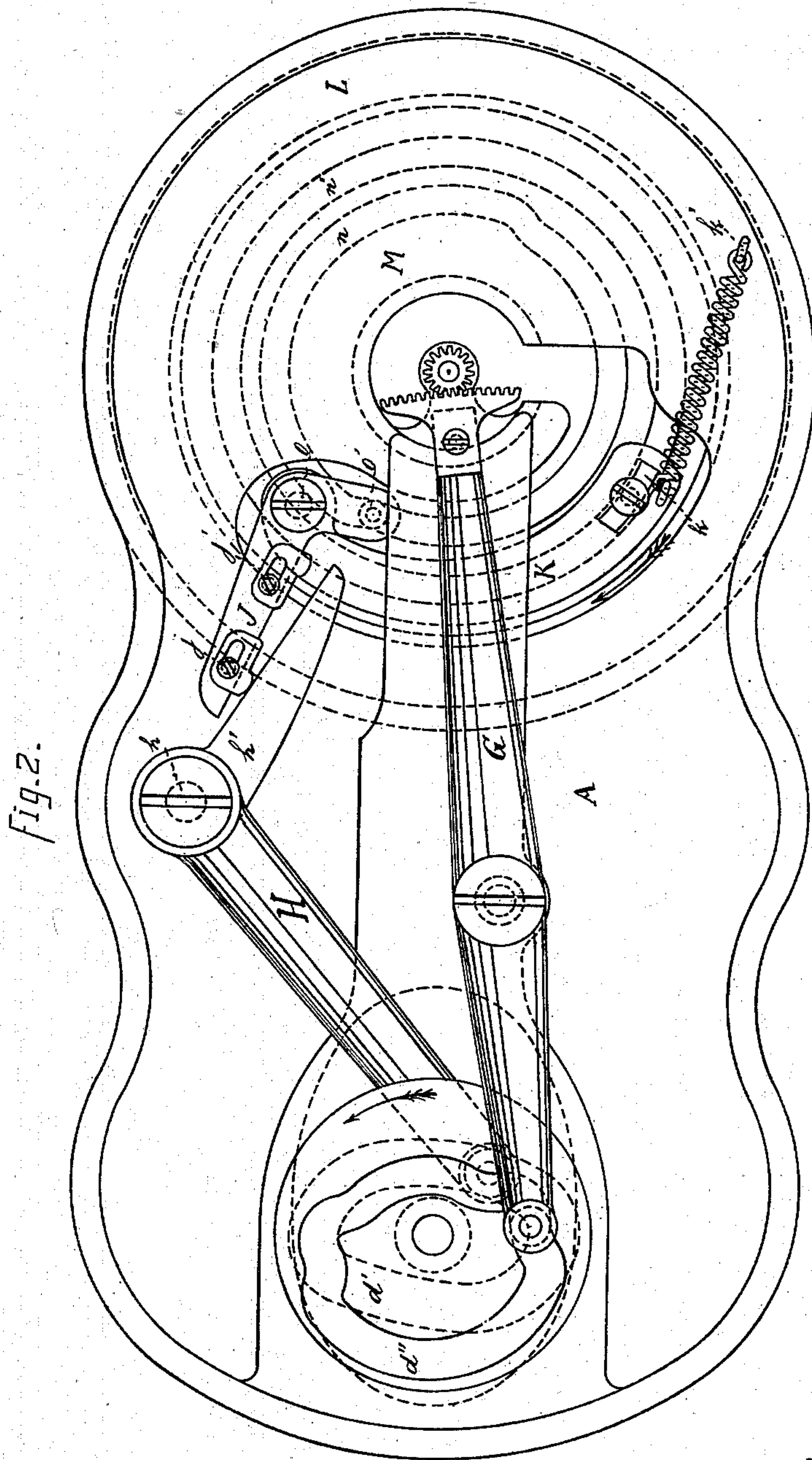
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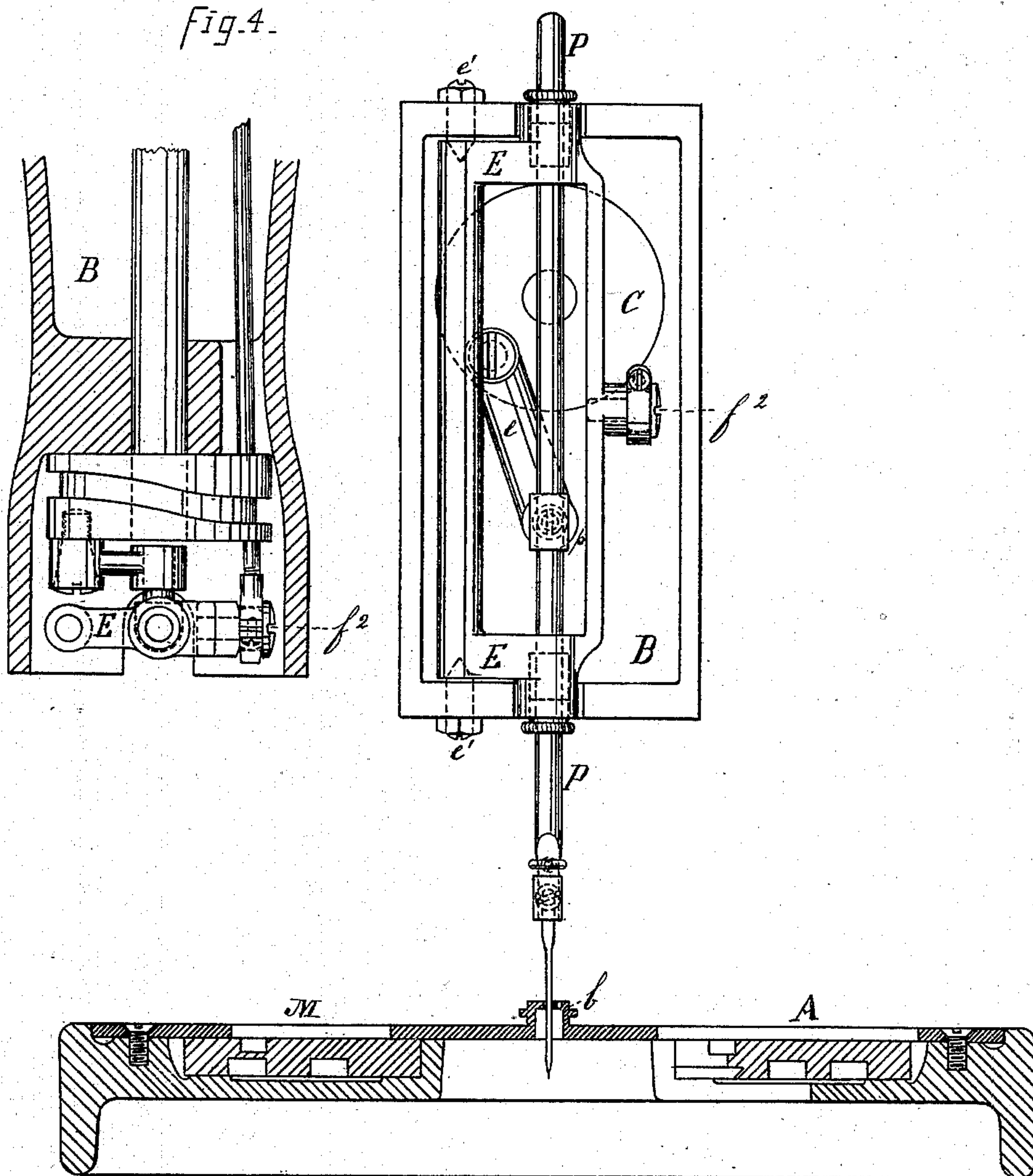
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*fig. 3.*

*fig. 4.*



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(No Model.)

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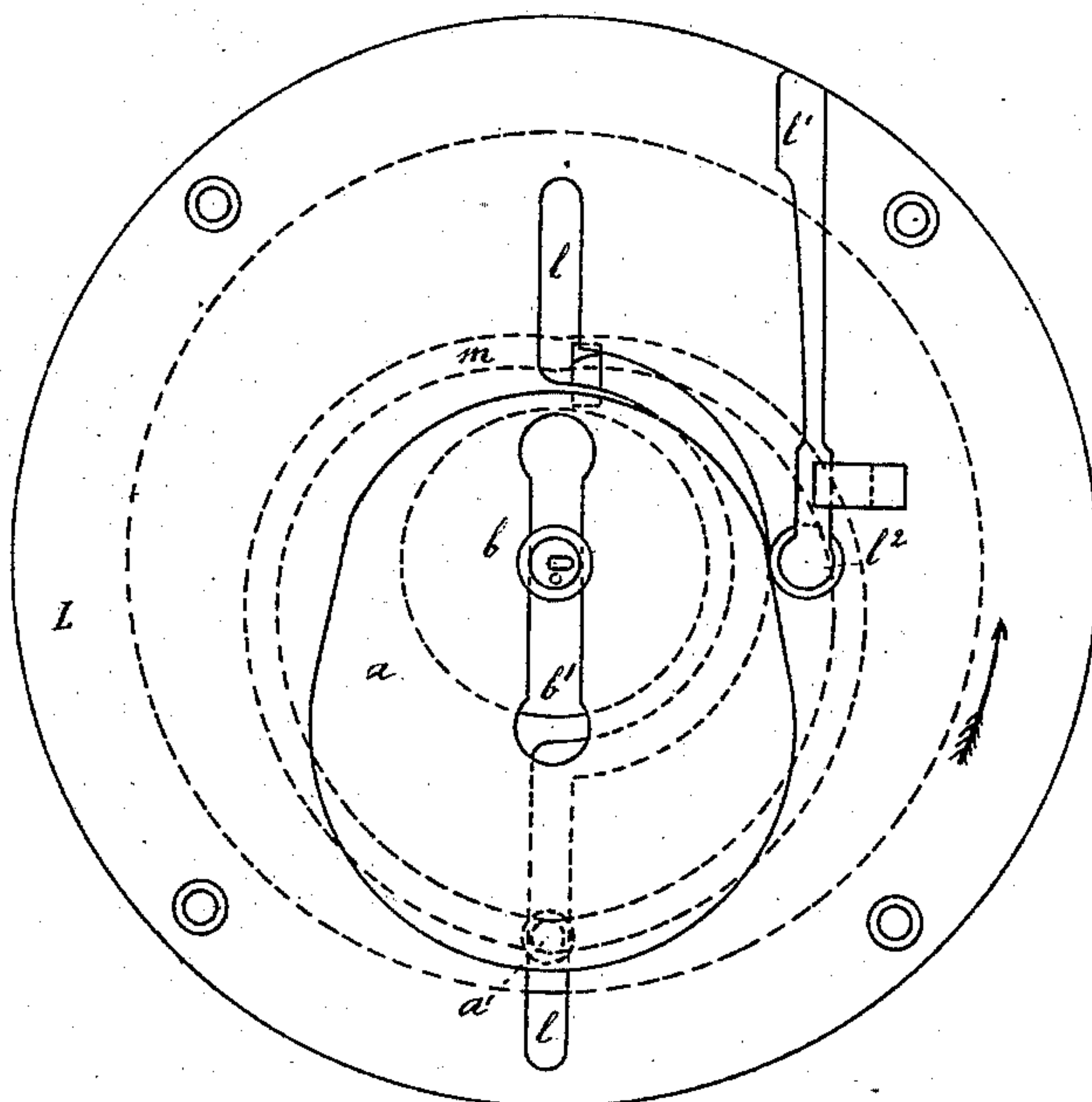
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BUTTON HOLE SEWING MACHINE.

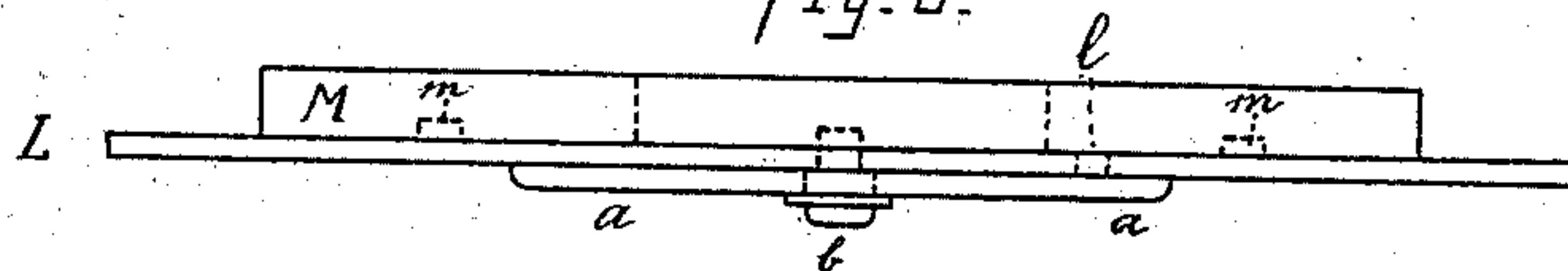
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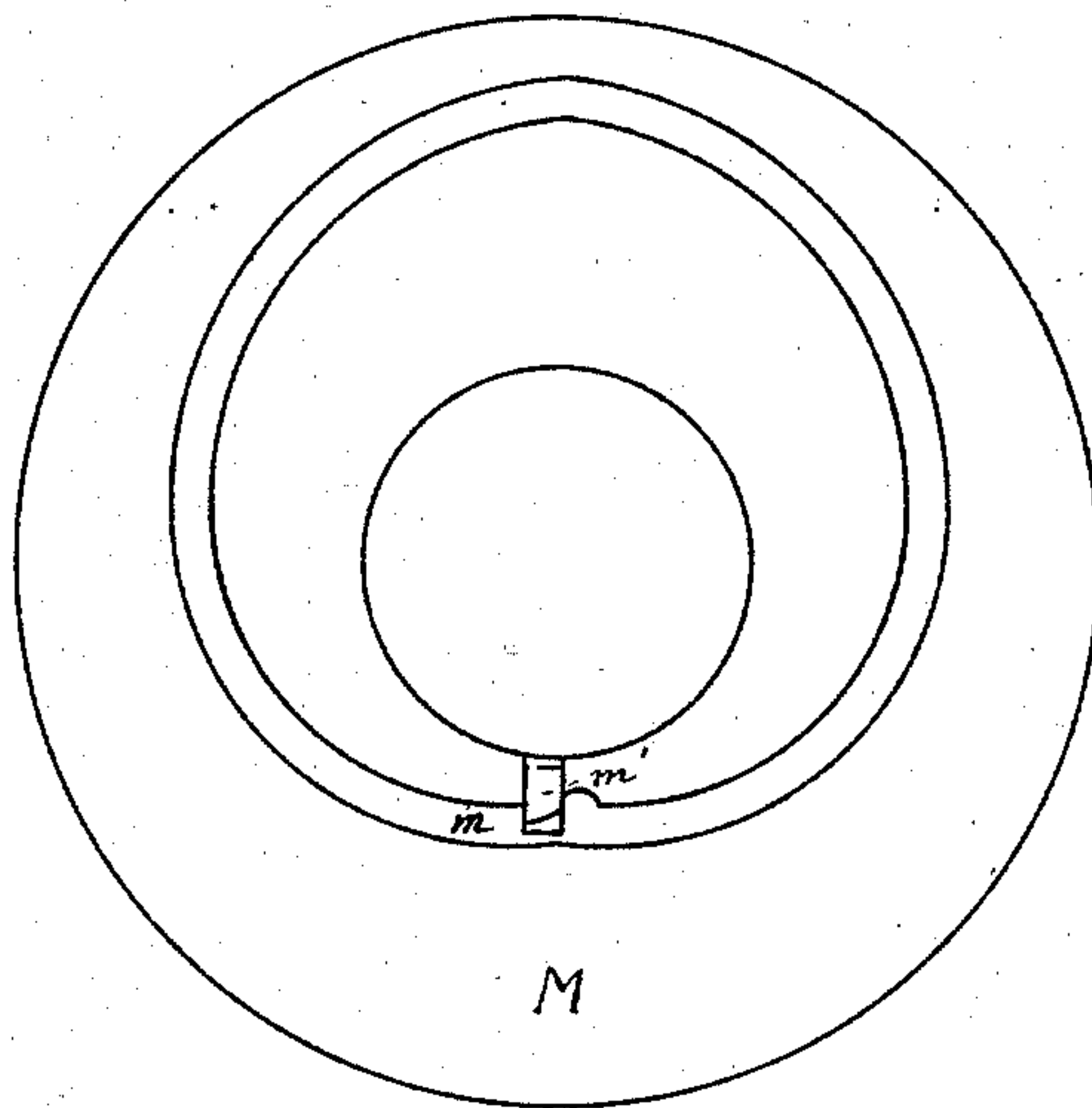
*Fig. 5.*



*Fig. 6.*



*Fig. 7.*



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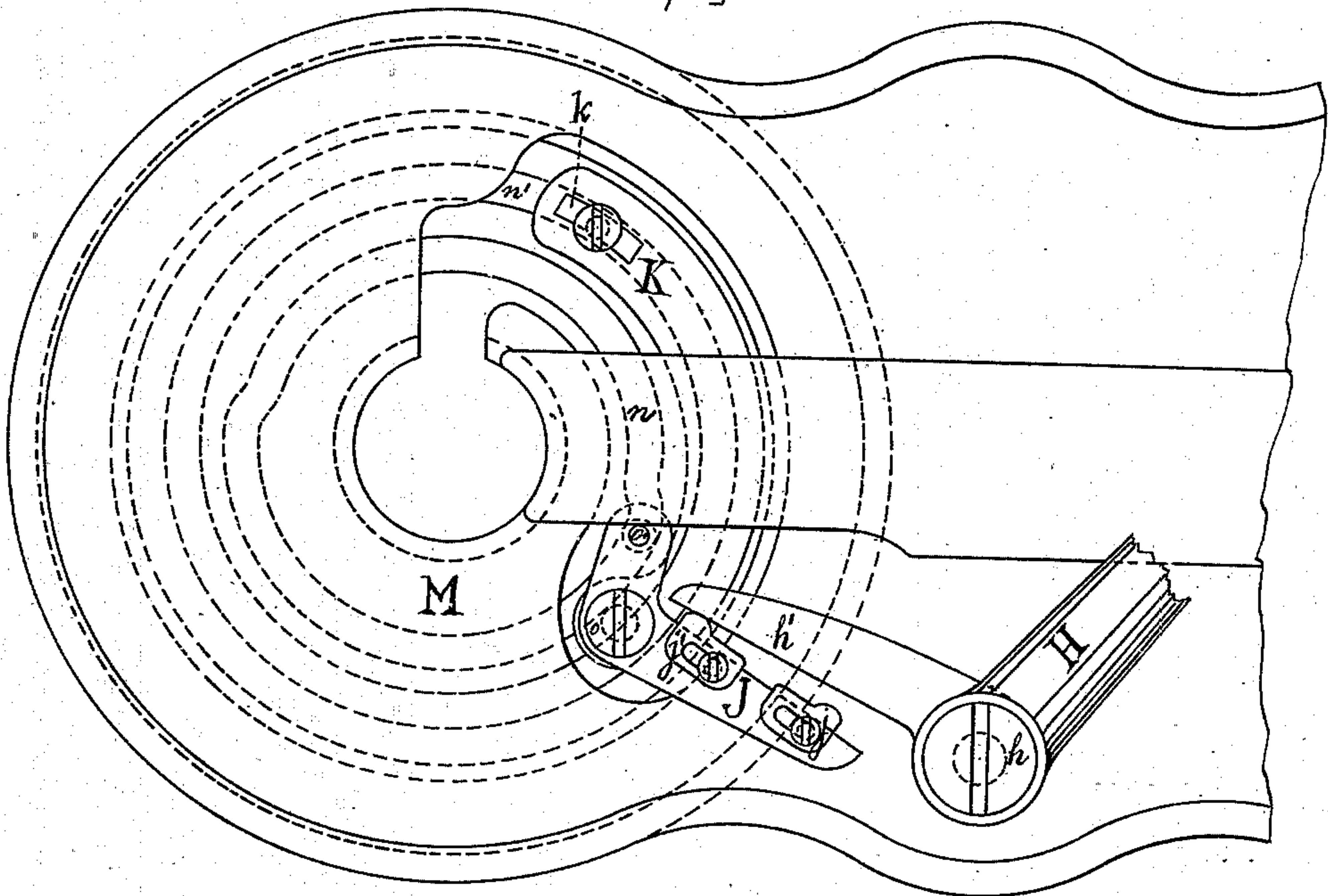
P. DIEHL.

BUTTON HOLE SEWING MACHINE.

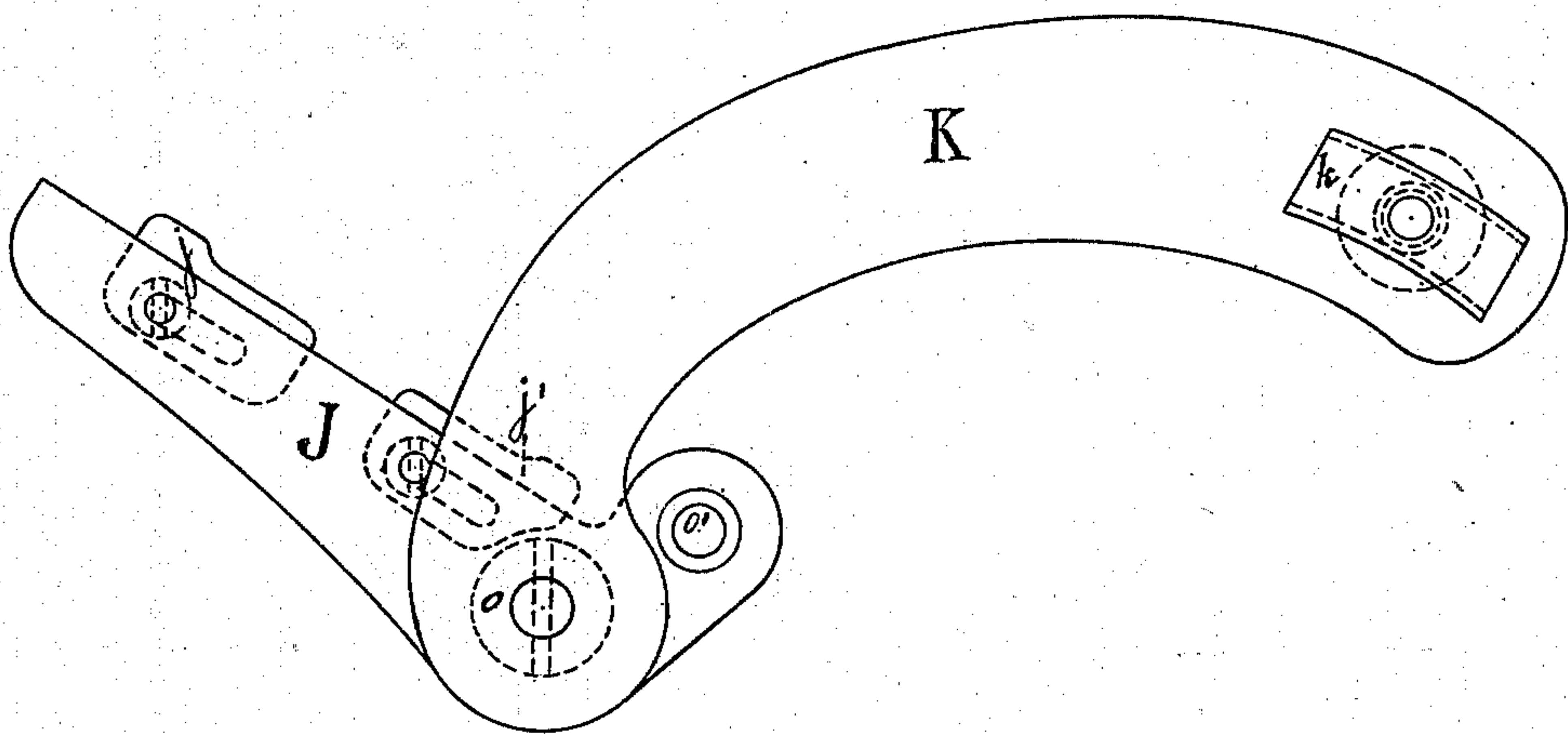
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*fig. 8*



*fig. 9*



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# UNITED STATES PATENT OFFICE.

PHILIP DIEHL, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO THE SINGER  
MANUFACTURING COMPANY OF NEW JERSEY.

## BUTTON-HOLE SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 272,126, dated February 13, 1883.

Application filed June 28, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, PHILIP DIEHL, of Elizabeth, county of Union, and State of New Jersey, have made an invention of certain new and useful Improvements in Sewing-Machines; and I hereby declare that the following is a full, clear, and exact description and specification of the same.

My invention has reference to that class of sewing-machines especially adapted for over-seaming and edge-stitching, and commonly used in the manufacture of button-holes; and it consists mainly in improvements in the construction and operation of the feeding mechanism and of the mechanism by which the required motions are communicated to the needle-bar, as fully set forth in this specification and the claims at the close thereof. All of the said features of invention need not be embodied in the same machine; but in order that the invention may be fully understood I have represented in the accompanying drawings, and will proceed to describe, some of the principal parts of a button-hole sewing-machine embodying all the said features in the best form in which I have embodied them at the present date.

In said drawings, Figure 1 represents a sectional view of such button-hole machine, showing especially the manner of vibrating and actuating the needle-bar. Fig. 2 is a view of the under side of the same machine, showing especially the improved method of conveying motion to the feed and the method of driving the looper. Figs. 3 and 4 illustrate details connected with the needle-bar vibrating and actuating mechanism; and Figs. 5 to 9, inclusive, show details of the cloth feeding mechanism.

The machine in connection with which I have shown and will describe my improvements, and to which in their present form they are especially adapted, belongs to the class of machines in which the needle is rocked or vibrated, so as to descend alternately through and over the edge of the button-hole or goods to be sewed, and which are provided with two oscillating loopers, one of which carries a thread, and which loopers operate, in connection with the said needle, to form an ordinary

single chain-stitch when it passes through the goods, and a double chain stitch or "pearl" when it passes over the edge of the goods.

Motion is given from the main driving-shaft C to the needle-bar by means of a crank-and-link connection, and to the upright shaft D by means of beveled gears so constructed that the shaft D will make but one revolution while the driving-shaft C makes two. To the lower end of this shaft D is rigidly attached the cam-wheel *d*, provided with the cam-grooves *d'* and *d''*, adapted respectively to operate the feed and looper levers by means of rollers placed on the ends of such levers and working in said grooves.

In making a button-hole the goods are cut and confined in a clamp, which must then be moved automatically to present them in the proper position for each successive stitch. This clamp is secured to the table, during the operation of the machine, by the button *b* working in the slot *b'*, and is held in position against said button by the action of the roller *l*<sup>2</sup>, carried and caused to press against it by the spring *l'*. The clamp is driven by means of a pin, *a'*, which projects from its lower surface, passes through the groove *l* in the cloth-plate L, and enters a driving-groove, *m*, in the upper surface of the feed-wheel M.

In commencing to stitch a button-hole, the clamp with its pin *a'* is placed in the position indicated in Fig. 5. As the feed-wheel M revolves (from left to right, in the direction indicated by the arrow) the pin *a'*, carrying with it the clamp, is compelled to move intermittently in the direction of the straight part of the slot *l* in the cloth-plate L until it reaches the curved part of said slot, when one straight side of the button-hole is stitched. At this point it is encountered by the dog *m'*, and carried with it around the curve of said slot until it reaches the end of such curve. During this time the eyelet of the button-hole has been stitched. The dog *m'* now leaves the groove *m*, and said groove acting on the pin forces it to travel along the other straight portion of the slot *l*, when the other straight side is stitched and the button-hole is completed.

In order to produce a properly-made button-hole by this mechanism it is necessary to com-



communicate to the clamp-pin  $a'$  as it travels along the straight portion of said slot a regular intermittent motion of the same extent as the space required between the stitches. Upon entering the curved part of the groove, however, the diameter of such curve being so much greater than that of the eyelet to be stitched, it is obvious that the extent of these intermittent movements of the pin must be very greatly increased. For this purpose it is necessary to communicate to the feed-wheel, by which said pin is driven, a regular intermittent rotary motion, which, at the proper point and during the period required for stitching the eyelet, shall be automatically increased, and which shall automatically return to a slower speed when it commences to stitch the straight part of the button-hole.

By the revolution of the cam  $d$ , provided with the groove  $d'$ , a regular rocking motion is communicated to the driving-lever H, which is pivoted to the bed of the machine at  $h$ , and provided with the arm  $h'$ . This arm  $h'$  operates against one or the other of the adjustable blocks  $j$  and  $j'$ , which are attached to one arm of the shipper-lever J. Said shipper-lever J is provided with a roller,  $o'$ , which works in the groove  $n$  of the feed-wheel M, and is also pivoted, as shown, at the point  $o$  to the feed-lever K. This feed-lever K is provided with the block  $k$ , which fits and works in the feed-groove  $n'$  of the feed-wheel M. When the arm  $h'$  of the driving-lever rocks against one of the said blocks attached to the shipper-lever J, this roller  $o'$  will act for the moment as a fulcrum-point for said shipper-lever, and the feed-lever K will be so moved as to first cramp the block  $k$  in the groove  $n$  of the feed-wheel M and then to move it, and with it the feed-wheel, making one forward step of the feed. On the return movement of the driving-lever H, when its arm  $h'$  moves away from the arm of the shipper-lever, the block  $k$  is no longer cramped in the groove, but as soon as it is relieved is drawn back (carrying with it the feed and shipper levers, so as to be ready for the next movement) by the action of the spiral spring  $k'$ , one end of which is attached to said block and the other end to a point outside of the feed-wheel.

In order to vary at the proper points the extent of the feed-motion thus communicated to the feed-wheel, the shipper-lever J is provided with the two adjustable blocks  $j$  and  $j'$ , and the cam-groove  $n$ , in which the roller  $o'$  of the shipper-lever works, is made of such a form that during that portion of the revolution of the feed-wheel when the small movement is required the block  $j$  will be thrown in contact with the driving-lever; but as soon as the point is reached where the larger movement is required, the position of the point  $o'$  will be changed relatively to that of the point  $o$ , and the shipper-lever will be so shifted that the block  $j'$  only will come in contact with the driving-lever. As the point  $j$  is nearer the

fulcrum of the driving-lever and farther from the point where the shipper-lever is pivoted to the feed-lever, it is obvious that during its contact a relatively small motion will be communicated to the feed, and it is also evident that when the block  $j'$  is thrown into action, its point of contact being farther from the fulcrum of the driving-lever and nearer said pivot connecting the shipper and feed levers, the amount of motion communicated to the feed-wheel will be very largely increased. Each of these blocks is attached to the shipper-lever by a set-screw passing through a slot, and they can therefore be adjusted so as to still farther vary the extent of both the greater and the smaller motions or to vary either without affecting the other. If preferred, said blocks can be attached to the arm  $h'$  of the driving-lever instead of to the shipper-lever.

The necessary rocking or vibrating motion required to enable the needle to descend alternately through and over the edge of the goods is communicated from a cam,  $g$ , on the upright shaft D, which receives a roller attached to one arm of the elbow-lever F, pivoted to the arm of the machine at the point  $f$ . To the other arm of this lever is pivoted the connecting-rod  $f'$ , the other end of which is hinged to the needle-bar frame E at the point  $f^2$ . The opposite side of this needle-bar frame is connected to the head of the bracket-arm of the machine by the hinge-pivots  $e'$   $e'$ . These pivots are cone-pointed screws, tapped into said bracket-arm, so that any wear may be readily taken up.

As the shaft D revolves the form of the cam  $d$  is such that the elbow-lever F will receive a regular intermittent rocking motion, which will be communicated through the connecting-rod  $f'$  to the needle-bar frame E, and said frame, turning on its hinge-pivots, will be rocked or vibrated, carrying with it the needle-bar P.

The needle-bar receives its vertical motion from the crank-wheel  $c$ , with which it is connected by the link  $e$ , and in order that its rocking may not interfere with its vertical motion and that the needle may always present its thread in the proper position for the action of the loopers, said needle-bar is fitted so as to turn easily in the frame E, and is provided with a bracket,  $p'$ , having an arm,  $p$ , projecting at right angles from said bar, which enters and slides freely during the rocking motion in a sleeve at the lower end of the link  $e$ , in a direction parallel with the main shaft of the machine. Thus the needle-bar and, consequently, the needle are prevented from twisting or turning during the operation of the machine.

In order that the amount of this rocking motion can be varied, the upper arm of the elbow-lever F is slotted and the pivot by which it is connected to the connecting-rod  $f'$  is made adjustable in said slot, so that it can be brought



nearer to or moved farther from the fulcrum of said lever, and can be fastened in any desired position by a set-screw.

In the periphery of the crank-wheel *c*, which  
5 revolves with the main shaft and gives vertical motion to the needle-bar, I cut a cam-groove, *c'*, to receive the roller of the bent lever *Q*, which is pivoted at *q* to the bracket-arm of the machine, and has an eyelet at its outer end,  
10 through which the upper thread must pass. This groove is so formed as to communicate positively to such lever the motions required for a thread take-up, and of course must be "timed," so as to draw up and tighten the  
15 thread at the proper moment.

I claim as my invention—

1. A shipper-lever for a button-hole machine, one arm of which is adapted to receive motion from a driving-lever, the other arm of which  
20 is provided with a roller fitting and working in a guiding-groove of the feed-wheel, and to which shipper-lever is pivoted, between said arms, mechanism for communicating motion to said feed-wheel, in combination with a feed-  
25 wheel having such guiding-groove formed to automatically shift said shipper-lever, and thereby to change its points of contact with the driving-lever, substantially as and for the purposes described.

30 2. A shipper-lever for a button-hole machine having two arms, one carrying a roller, which is received in a guiding-groove of the feed-wheel, and the other adapted to be operated by contact with a vibrating driving-lever, in combination with a feed-lever, to which it is pivoted  
35 between said arms, such feed-lever having a cramping-block working in the feeding-groove of said feed-wheel, and a retracting-spring, and with a feed-wheel provided with such guiding and feeding grooves, substantially as and for  
40 the purposes described.

3. The combination, in a button-hole machine, of the cam *d*, having the groove *d'*, the driving-lever *H*, the shipper-lever *J*, with its roller *o'*, the feed-lever *K*, pivoted to said shipper-lever at *o*, and provided with the block *k* and  
45 the spiral retracting-spring *k'*, with the feed-wheel *M*, having the guiding and feed grooves *n* and *n'*, substantially as and for the purposes described. 50

4. The combination, with a feed-wheel having a guiding-groove, a shipper-lever provided with a roller adapted to enter and work in such groove, and also provided with mechanism for conveying motion to said feed-wheel, of adjustable blocks adapted to form points of contact  
55 between said shipper-lever and a driving-lever, substantially as and for the purposes described.

5. In a button-hole or overseaming machine, the combination of an arm attached to the needle-bar and projecting from it at right angles,  
60 a link, one end of which is pivoted to a crank on the main driving-shaft and the other end provided with a sleeve adapted to receive said arm, with the said main driving-shaft and crank, 65 substantially as and for the purposes set forth.

6. In a button-hole or overseaming machine, the combination, with the main driving-shaft *C*, crank-wheel *c*, provided with the cam-groove *c'*, link *e*, provided with a sleeve at its lower  
70 end, needle-bar *P*, provided with the arm *p*, adapted to enter and slide in said sleeve, and rocking-frame *E*, provided with mechanism to rock it, of the positive take-up lever *Q*, provided with a pivot and roller, and adapted to  
75 be operated by the action of said cam-groove *c'* on such roller, substantially as described.

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Witnesses:

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