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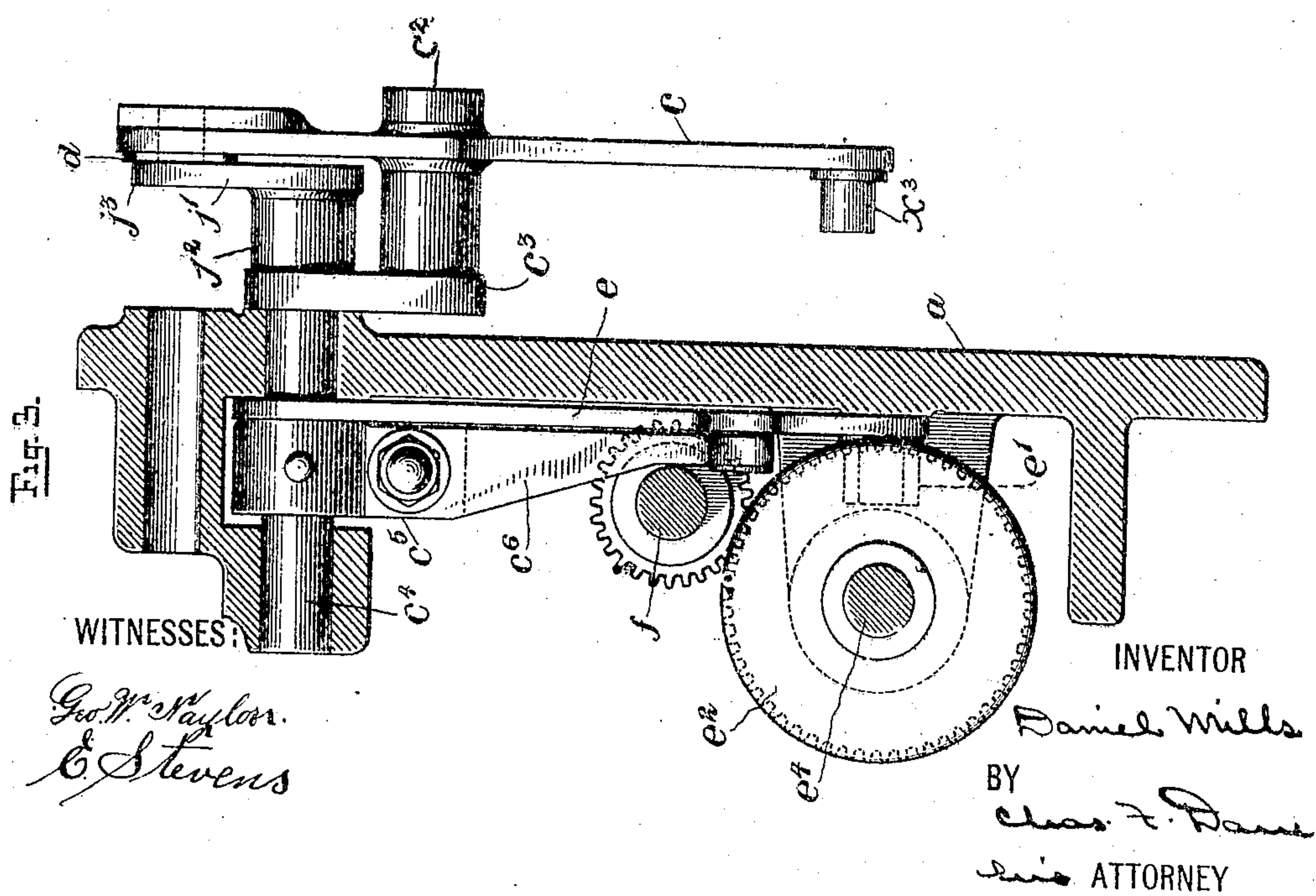
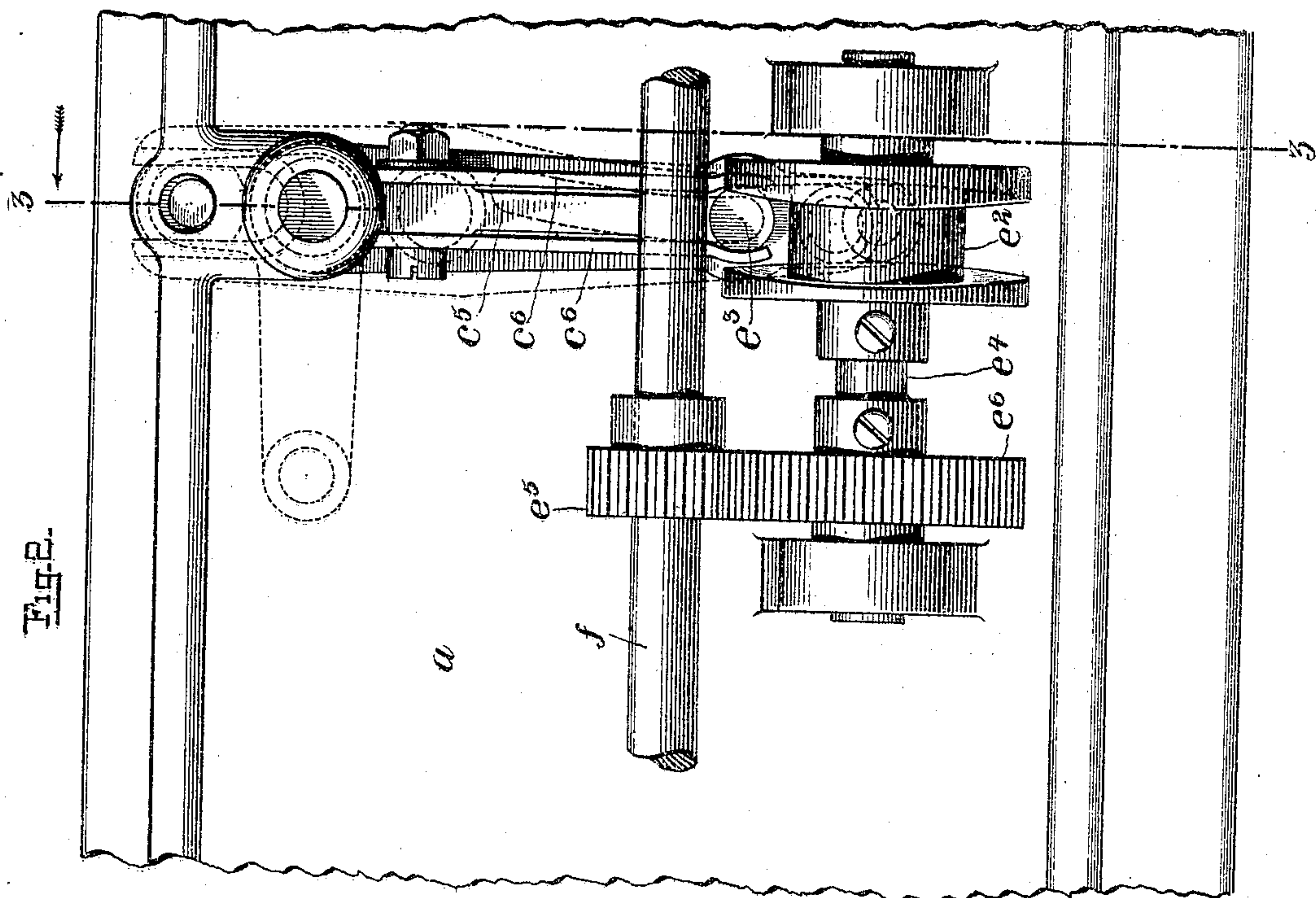
PATENTED JULY 12, 1904.

D. MILLS.
BUTTONHOLE SEWING MACHINE.

APPLICATION FILED NOV. 8, 1898.

NO MODEL.

3 SHEETS—SHEET 2.



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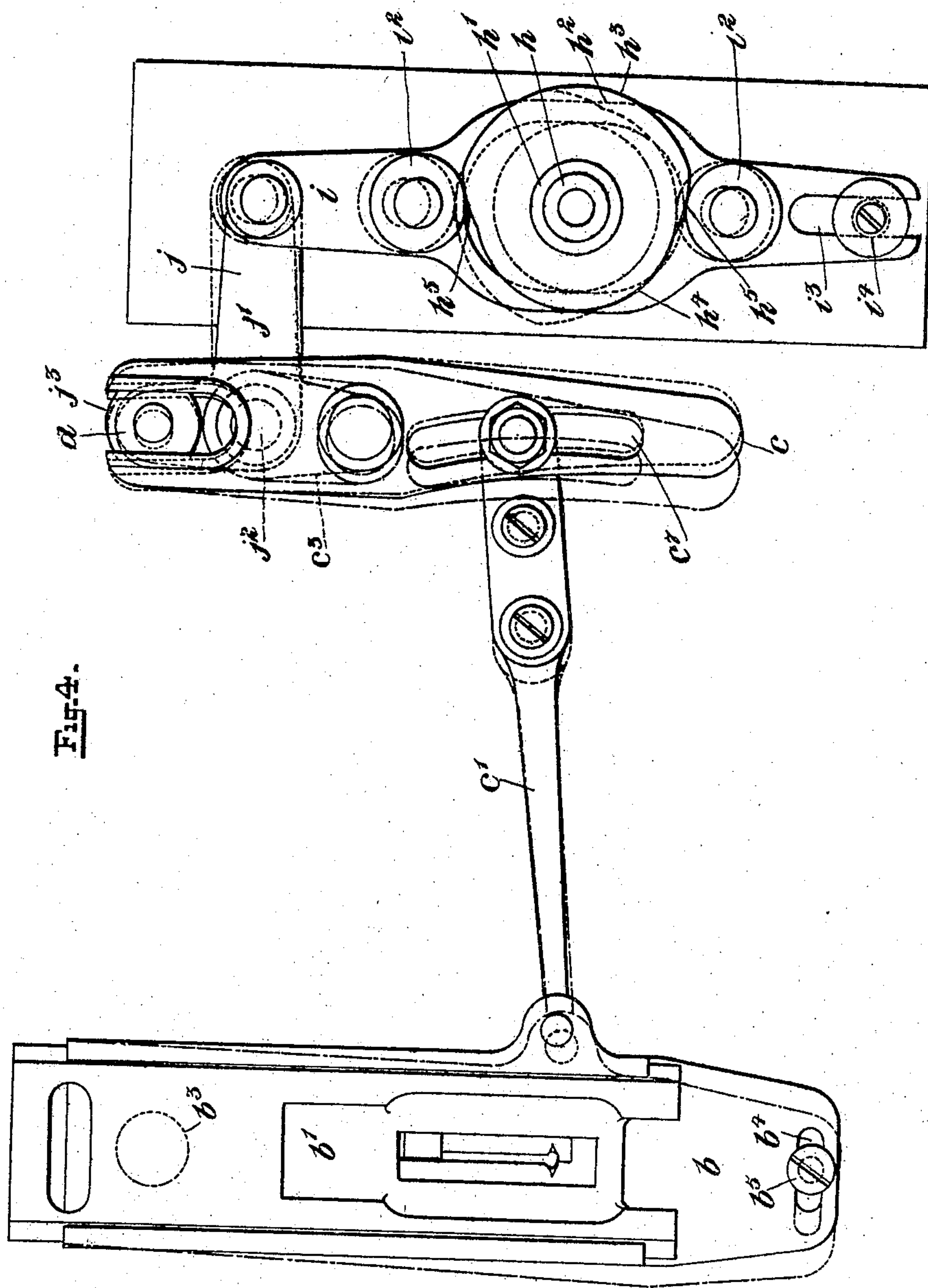
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NO MODEL.

8 SHEETS—SHEET 3.



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BUTTONHOLE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 764,859, dated July 12, 1904.

Application filed November 8, 1898. Serial No. 695,837. (No model.)

To all whom it may concern:

Be it known that I, DANIEL MILLS, a citizen of the United States, and a resident of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Buttonhole-Sewing Machines, of which the following description, taken in connection with the drawings herewith accompanying, is a specification.

This invention relates to buttonhole-sewing machines. This class of machines are usually provided with a so-called "buttonhole" mechanism arranged on the upper surface of the bed-plate thereof, which is actuated from the driving-shaft of the machine to communicate the necessary movements to the work-holder, whereby it will properly present the sides of the buttonhole to the stitching mechanism of the machine. In the operation of the machine such mechanism communicates a vibrating movement to the work-holder in a direction transversely to the length of the buttonhole, whereby the sides of the latter may be stitched as the work-holder is moved in a direction lengthwise of the same, and in the machines as heretofore usually constructed the whole or greater portion of such buttonhole mechanism is automatically moved or shifted at each stitch, thereby producing an undue strain on the machine and also tending to greatly limit its speed.

Having in mind the above, it has been the object of my present invention to secure the necessary movement of the work-holder without movement of the entire buttonhole mechanism, whereby the machine may be run at a greatly-increased speed and without undue strain or jar to the same. This object I secure by means of the novel construction and combination of parts, as hereinafter set forth in detail and pointed out in the claims.

Referring to the drawings, Figure 1 is a plan view of a portion of the bed-plate and supported mechanism of a buttonhole-sewing machine embodying my invention. Fig. 2 is a bottom view of a portion of the bed-plate shown in Fig. 1. Fig. 3 is a cross-section taken through line 3 3 of Fig. 2, and Fig. 4

is a detail view showing the different relative positions assumed by the work-holder and a portion of its operating mechanism at different times during the sewing of a buttonhole.

To explain in detail, a represents the bed-plate of a sewing-machine. Upon this bed-plate, at the front end thereof, I have located a plate b , upon which the work-holder is supported and operated to properly guide the work relative to the stitching mechanism for the sewing of a buttonhole. The work-holder, for the purposes of this invention, may be of any suitable construction, the same, as herein shown, consisting of a lower plate b' , which is supported to slide upon the plate b between the undercut side walls of the latter and an upper plate b'' , adapted to have a downward pressure upon the plate b' , so as to clamp and hold the work placed between the same. The means for holding the upper plate b'' against the lower plate b' of the work-holder is omitted from the drawings as not forming part of my present invention, the same being clearly shown and described in another application of mine now pending bearing Serial No. 599,804. The work-holder is operated to receive its transverse or to-and-fro movement across the path of the needle and at right angles to the length of the buttonhole by its supporting-plate b , which latter to receive such movement is pivotally secured at one end upon the bed-plate at b^3 and at its opposite end is transversely slotted, as at b^4 , to receive a headed screw b^5 , by which latter the plate is guided and held from vertical movement.

The mechanism for vibrating the plate b and thereby the supported work-holder, is as follows: A lever c , arranged substantially parallel with the vibrator-plate b and having connection therewith through the medium of a pitman c' , is forked at one end to engage with a fulcrum-block d and is pivotally connected at a point between its ends with a pin c^2 , which is located on the arm c^3 of a vertically-arranged rock-shaft c^4 , which latter is journaled in suitable bearings in the bed-plate of the machine, as more clearly shown in Fig.

3. This rock-shaft c^4 is operated from the driving-shaft f of the machine through the medium of suitable mechanism to receive an oscillating movement, whereby the end of its arm c^3 will be caused to vibrate and communicate a like movement to the lever c and connected vibrator-plate b .

As herein illustrated, the means for operating the rock-shaft c^4 from the driving-shaft f consists of a lever e , which is loosely connected at one end with the shaft c^4 and at its opposite end provided with an antifriction-roll e' , the latter being engaged by a rotating grooved cam e^2 , which communicates a positive vibrating movement to said lever e . A fixed arm c^5 , secured on the rock-shaft c^4 at a point below the lever e , is provided with two yielding or spring arms c^6 c^6 , secured thereto with their free ends engaging the opposite sides of a pin e^3 , located on the under side of the vibrating lever e . These springs c^6 c^6 are of sufficient strength when acted upon by the lever e to communicate a rocking movement to the shaft c^4 , and thereby cause the plate b to receive a vibrating movement through the intermediate connections, as described; but when the work-holder is automatically arrested at the completion of a buttonhole by the engagement with the lever c of a stop-lever x in a manner to be hereinafter referred to the said springs will yield under the action of the lever e without causing undue strain to any of the operating parts. The cam e^2 is carried upon a short shaft e^4 , which latter is journaled in suitable bearings on the under side of the bed-plate and operated from the driving-shaft f , through the medium of gearing e^5 and e^6 , to cause movement of the work-holder in proper time relative to the stitching mechanism.

I will now describe the mechanism by which the position of the work-holder is automatically changed or adjusted after one side of a buttonhole has been stitched to bring the opposite side of the buttonhole into position to be stitched.

Upon a fixed vertical stud h , located on the bed-plate of the machine, is a loose sleeve h' , on which is secured a former-cam h^2 . This former-cam is in two concentric diameters, one portion being in one radius, h^3 , and the other portion in another radius, h^4 , the two portions, as herein shown, each being united by a tapering step h^5 . A bar or yoke i , which I will term the "former-yoke," is provided with an elongated slot i' to receive the stud h and be capable of a longitudinal sliding movement relative thereto and is also provided with two antifriction-rolls i^2 i^2 thereon, which closely engage with the opposite sides of the former-cam h^2 , whereby the yoke i will be operated and controlled by the latter. The yoke i is provided with a slot i^3 at one end to receive a post i^4 and be supported and guided at that end thereby and at its opposite end is

pivotaly connected with one arm, j , of an elbow-lever j' , which latter is journaled on the upper end j^2 of the shaft c^4 at a point above the lever-arm c^3 , and at the end of its second arm, j^3 , carries the said block d , which forms the fulcrum for the lever c .

In the operation of the machine the lever c is operated by the lever-arm c^3 to receive a vibrating movement, as indicated by the dot-and-dash lines in Fig. 4, so as to communicate a like movement to the vibrator-plate b and supported work-holder during the stitching of the sides of the buttonhole, it being understood that the work-holder is also being moved at the same time in a lengthwise direction on the plate b by means as will hereinafter be described. During such vibrating movement of the lever c , while the sides of the buttonhole are being stitched, the former-cam h^2 is being rotated, but without causing movement to the former-yoke i , the rolls i^2 i^2 on the latter being in engagement with the concentric surfaces h^3 and h^4 of the cam at such time. After one side of the buttonhole has been stitched, however, and the end of the same is reached the former-cam has been moved to a position to bring its tapering step portions h^5 h^5 into engagement with the rolls i^2 i^2 on the yoke i and gradually move the latter in a lengthwise direction, as shown in the drawings, until the said rolls are engaged by the opposite concentric portions of the former-cam. Such lengthwise movement of the yoke i causes the connected elbow-lever j to turn on its fulcrum and move the supported fulcrum-block d laterally, thereby shifting the position of the lever c and moving the connected work-holder relative to the stitching mechanism so as to change the stitching from one side of the buttonhole to the other, it being understood that during such gradual lateral movement of the work-holder the buttonhole is being stitched across its end. After such change in position of the fulcrum-block d the same is held stationary during the stitching of the opposite side of the buttonhole. It will thus be obvious from the foregoing that the stitching is changed from one side of the buttonhole to the other simply by shifting the position of the fulcrum-block d and without strain or jar to any of the operating parts. Upon the completion of the sewing of a buttonhole the work-holder is automatically arrested by the engagement of the lever c of the stop-lever x . This stop-lever, which is operative independent of the rock-shaft c^4 , is pivoted at one end upon the bed-plate of the machine at x' and adjacent to its opposite end is formed with a recess x^2 in one side thereof to receive a pin x^3 on the under side of the lever c when cooperating with the latter to arrest its movement. The means for automatically operating the said stop-lever to cause it to cooperate with the lever c upon the completion of the sewing of

a buttonhole comprises a rotating cam x^4 , carried by the sleeve h' , against which a finger x^5 on the stop-lever is yieldingly held by a spring x^6 , the said cam operating to hold
 5 the stop-lever in an inoperative position away from engagement with the lever c during the operation of the machine in sewing a buttonhole, but being provided with a notch x^7 therein, which is moved to a position to receive the finger x^5 and permit the stop-lever
 10 being moved under the action of the spring x^6 into operative locking or holding engagement with the lever c , as shown in Fig. 1, upon the completion of the buttonhole. The
 15 operation of this stop-lever is more fully described in my said pending application, Serial No. 611,486.

To regulate the length of vibrations of the plate b and supported work-holder, so as to
 20 vary the width or depth of bight of the stitch, I have provided the lever c with a curved slot c^7 for the adjustable connection therewith of the pitman c' . In this manner it will be understood that as the adjustable stud c^8 ,
 25 with which the pitman is connected, is adjusted in the slot c^7 a greater or less distance from the fulcrum of the lever c the length of vibration of the plate b will be increased or diminished accordingly, and thereby enable
 30 the operator to produce buttonholes of any desired width of bight.

The former-cam h^2 may be rotated by any suitable means, the means as herein shown being the same as that illustrated and described in my pending application bearing
 35 Serial No. 611,485 and in brief is as follows: A gear h , made fast upon the sleeve h' , which carries said former-cam, meshes with a second gear h' , which is loosely mounted to rotate
 40 upon a fixed stud h^2 on the bed-plate of the machine and connected with a ratchet-disk h^3 , also mounted upon said stud so as to rotate therewith. A lever h^4 , loosely pivoted upon
 45 said stud h^2 and provided with a pawl h^5 for engaging with the ratchet h^3 , is also provided with a stud h^6 , located on its under side in a position to engage with one side of an operating-lever h^7 , which latter is pivoted at one
 50 end upon the bed-plate at h^8 and at its opposite end is provided with a stud h^9 , projecting downward through an opening in the bed-plate to a position to be engaged by a cam h^{10} on the driving-shaft f . A spring h^{11} , bearing
 55 against the lever h^4 , holds the same in operative engagement with the lever h^7 and also thereby holds the latter lever in operative engagement with the rotating cam h^{10} . By this arrangement of parts it will be understood that as the lever h^7 is vibrated by the rotating
 60 cam h^{10} the lever h^4 will also be vibrated thereby and cause its pawl h^5 to engage with the ratchet h^3 and give the same a partial rotation and then recede to engage with a succeeding tooth of said ratchet. The ratchet h^3
 65 being thus rotated communicates a like move-

ment to the sleeve h' and the former-cam thereon through the medium of the gears h and h' .

The work-holder may be operated to slide upon the vibrator-plate b and receive its longitudinal movement in a direction lengthwise of the buttonhole by any suitable means. The means as employed herein also being the same as that more fully illustrated and described in my said pending application bearing
 75 Serial No. 611,485 consists of a cam (not shown in the drawings) which is carried on the rotating sleeve h' and engages with two pins or studs on a sliding plate m , so as to communicate a longitudinal forward and
 80 backward movement to the latter. This movement of the slide-plate m is communicated to the work-holder through the medium of connecting-levers n and o , which latter are pivotally supported upon the bed-plate at a point
 85 between their ends, with their outer ends having a slot-and-pin or equivalent sliding connection with the slide-plate m and the lower plate b' of the work-holder, respectively, so
 90 as to allow for their movement in an arc, and their inner ends each having a slot and connected by an adjustable sliding stud p . By adjusting the position of this stud p in the slot of the lever o the throw of the latter will
 95 be varied, and thereby adjust the movement of the work-holder accordingly to make buttonholes of different lengths, as may be desired.

Having thus illustrated and described one practical embodiment of my invention, I do
 100 not wish to be understood as confining myself to the particular details of construction and arrangement of parts set forth, as it will be obvious that various modifications may be made without departure from my invention.

Having thus set forth my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a buttonhole-sewing machine, the combination, with the work-holder, of a lever having operative connection with said work-holder, actuating means for imparting a vibrating movement to said lever, a second lever carrying the fulcrum for said vibrating lever, means independent of the vibrating-lever-actuating means for changing the position of the fulcrum-carrying lever at certain
 115 predetermined times, and means for communicating a longitudinal movement to the work-holder.
 120

2. In a buttonhole-sewing machine, the combination, with the work-holder, of a lever having operative connection with said work-holder, a rock-shaft having connection with said lever to impart a vibrating movement
 125 thereto, means, embodying yielding connections, for actuating said rock-shaft, an adjustable fulcrum for said vibrating lever, means for automatically changing the position of said fulcrum at certain predetermined
 130

times, and means for communicating a longitudinal movement to the work-holder.

3. In a buttonhole-sewing machine, the combination, with the work-holder, of a lever having operative connection with said work-holder, a rock-shaft having connection with said lever to impart a vibrating movement thereto, means for actuating said rock-shaft, a pivoted lever carrying the fulcrum for said vibrating lever, means, embodying a rotary cam, for operating said pivoted lever to change the position of the fulcrum carried thereby at certain predetermined times, and means for communicating a longitudinal movement to the work-holder.

4. In a buttonhole-sewing machine, the combination, with the work-holder, of a lever having operative connection with said work-holder, a rock-shaft having connection with said lever to impart a vibrating movement thereto, means, embodying yielding connections, for operating said rock-shaft, means operative independent of the rock-shaft for stopping movement of the said lever, and means for imparting longitudinal movement to the work-holder.

5. In a buttonhole-sewing machine, the combination, with the work-holder, of a lever having operative connection with said work-holder, a rock-shaft having connection with said lever to impart a vibrating movement thereto, a driving-cam, yielding connections for imparting movement from said cam to the rock-shaft, means operative independent of the rock-shaft for stopping movement of the said lever, and means for imparting longitudinal movement to the work-holder.

6. In a buttonhole-machine, the combination, with the work-holder, of a lever having

operative connection with said work-holder, a rock-shaft having connection with said lever to impart vibrating movement thereto and being provided with yielding arms, means engaging with said arms to operate the rock-shaft, means operative independent of the rock-shaft for stopping movement of the said lever, and means for imparting longitudinal movement to the work-holder.

7. In a buttonhole-sewing machine, the combination, with the work-holder, of a lever having operative connection with said work-holder, a rock-shaft having connection with said lever to impart vibrating movement thereto and being provided with yielding arms, a driving-cam, a lever operated by said cam and engaging with said yielding arms to operate the connected rock-shaft, and means for imparting longitudinal movement to the work-holder.

8. In a buttonhole-sewing machine, the combination, with the work-holder, of a lever arranged above the bed-plate of the machine and having operative connection with said work-holder, a vertically-arranged rock-shaft extending through the bed-plate and having connection with said lever to impart a vibrating movement thereto, means located beneath the bed-plate for actuating said rock-shaft, an adjustable fulcrum for said vibrating lever, means for automatically changing the position of said fulcrum at certain predetermined times, and means for communicating a longitudinal movement to the work-holder.

DANL. MILLS.

Witnesses:

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