(Model.) 3 Sheets—Sheet 1.

H. WEEKS & H. D. STONE.

BUTTON HOLE ATTACHMENT FOR SEWING MACHINES.

No. 390,539. Patented Oct. 2, 1888.

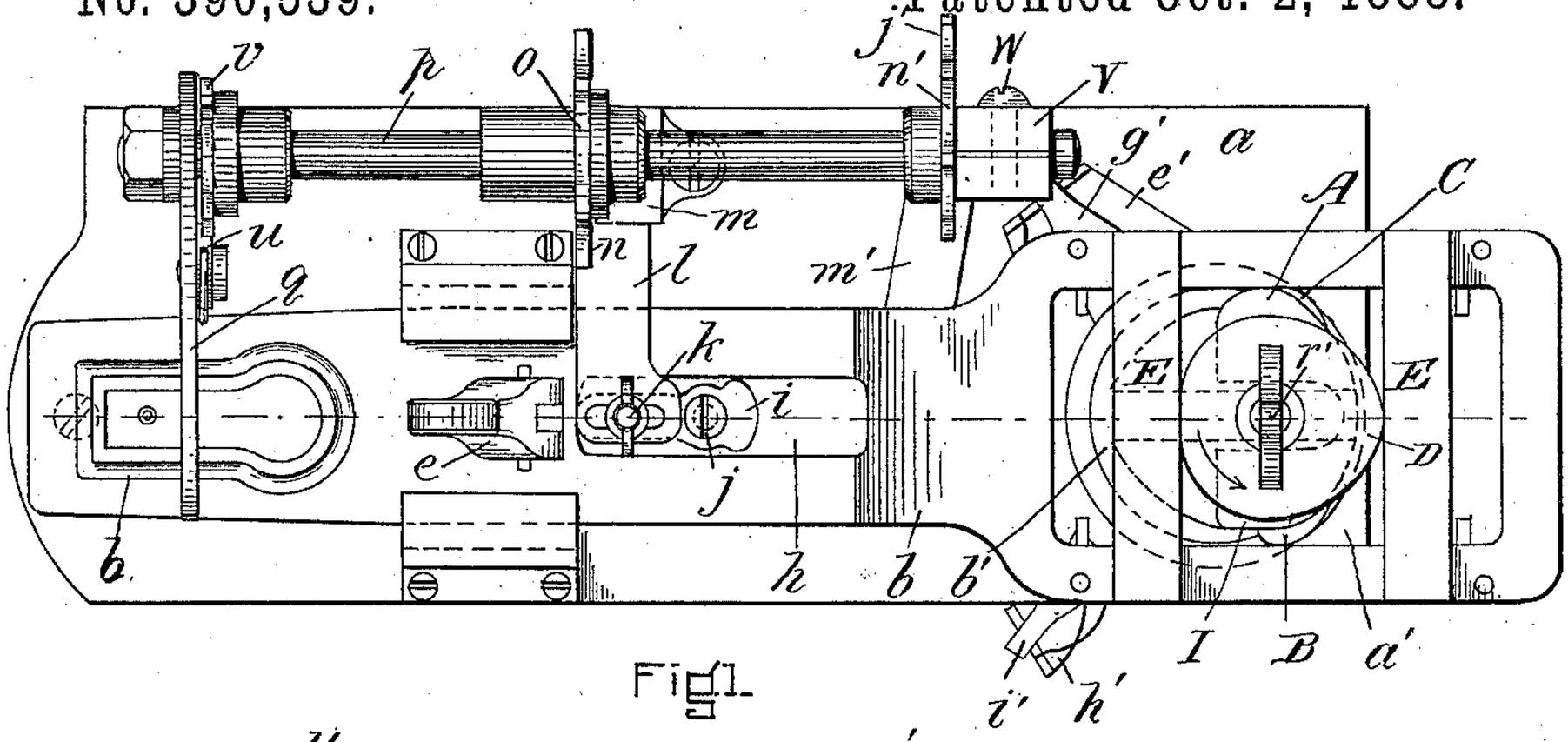

Fig1.

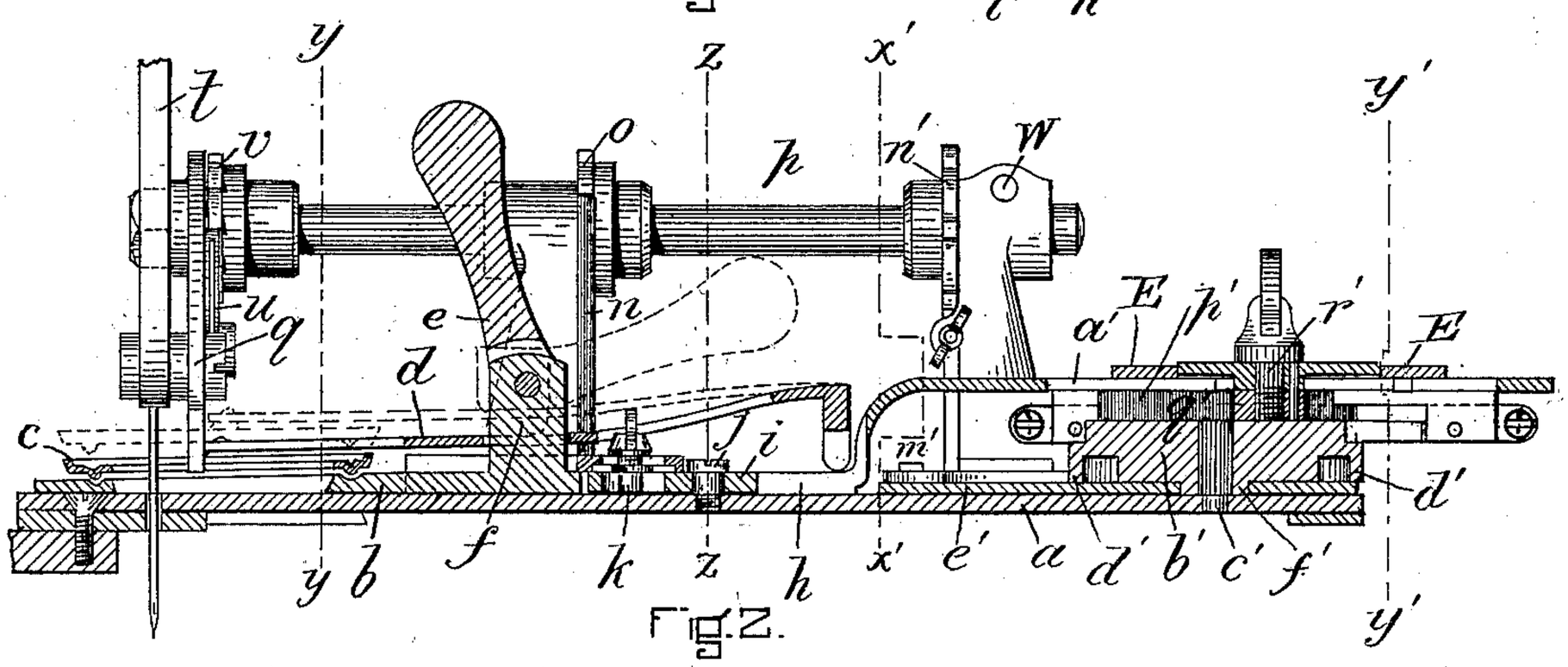

Fig2.

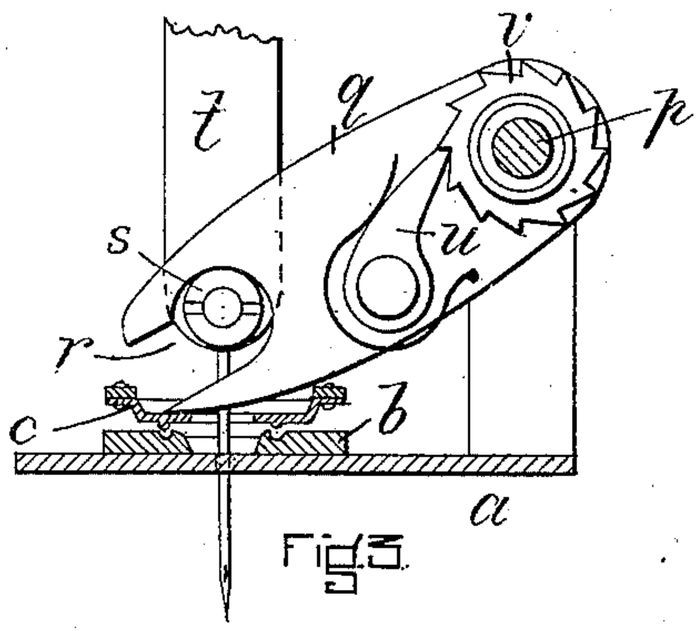

Fig3.

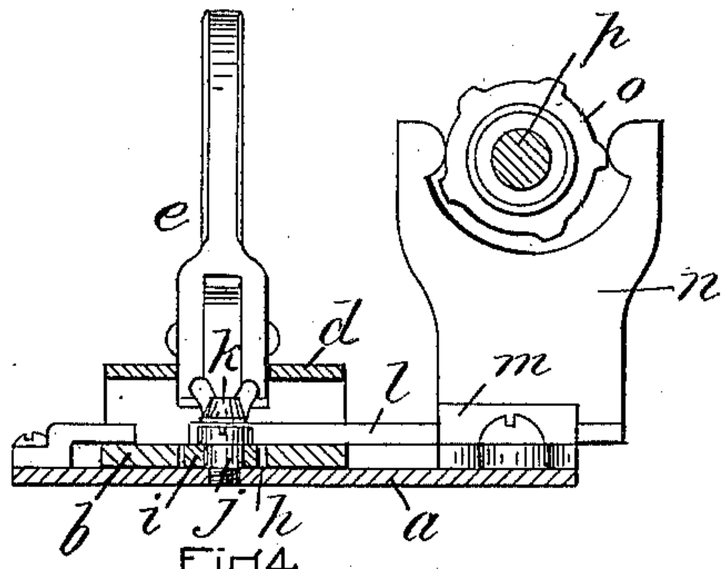

Fig4.

WITNESSES.

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(Model.) 3 Sheets—Sheet 2.

H. WEEKS & H. D. STONE.

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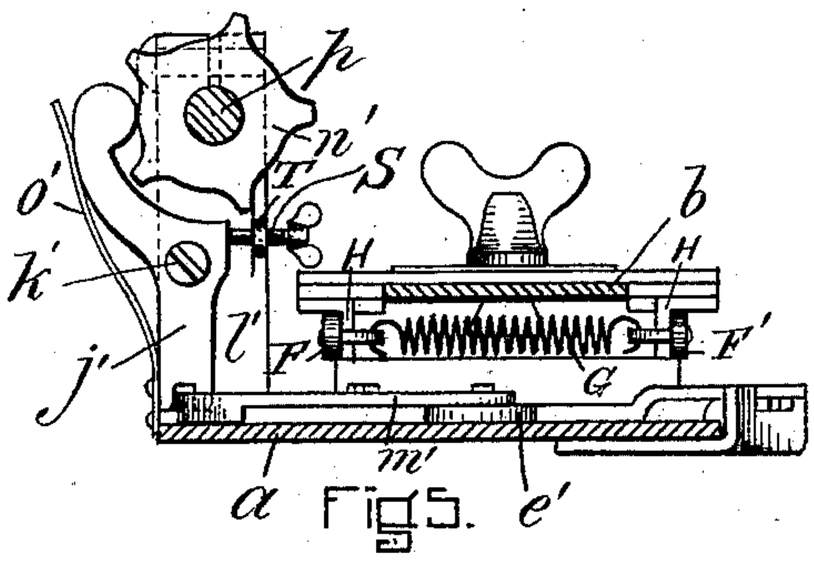

Fig. 5.

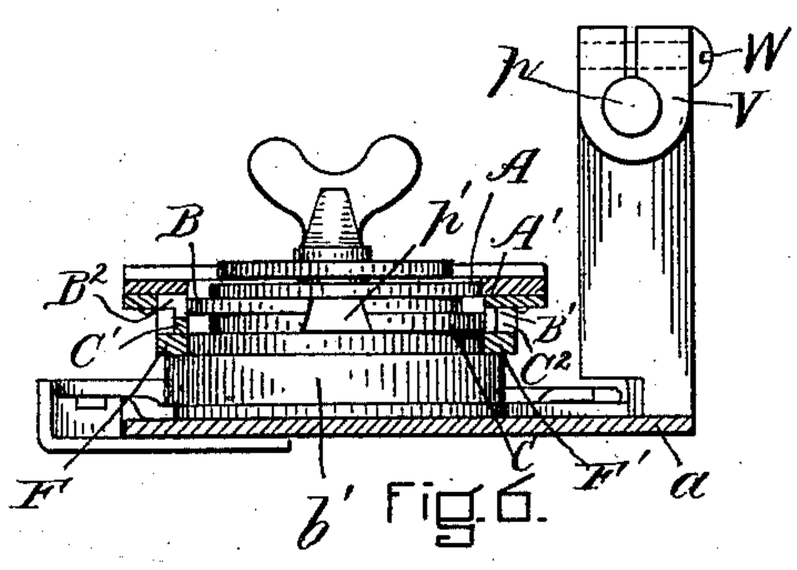

Fig. 6.

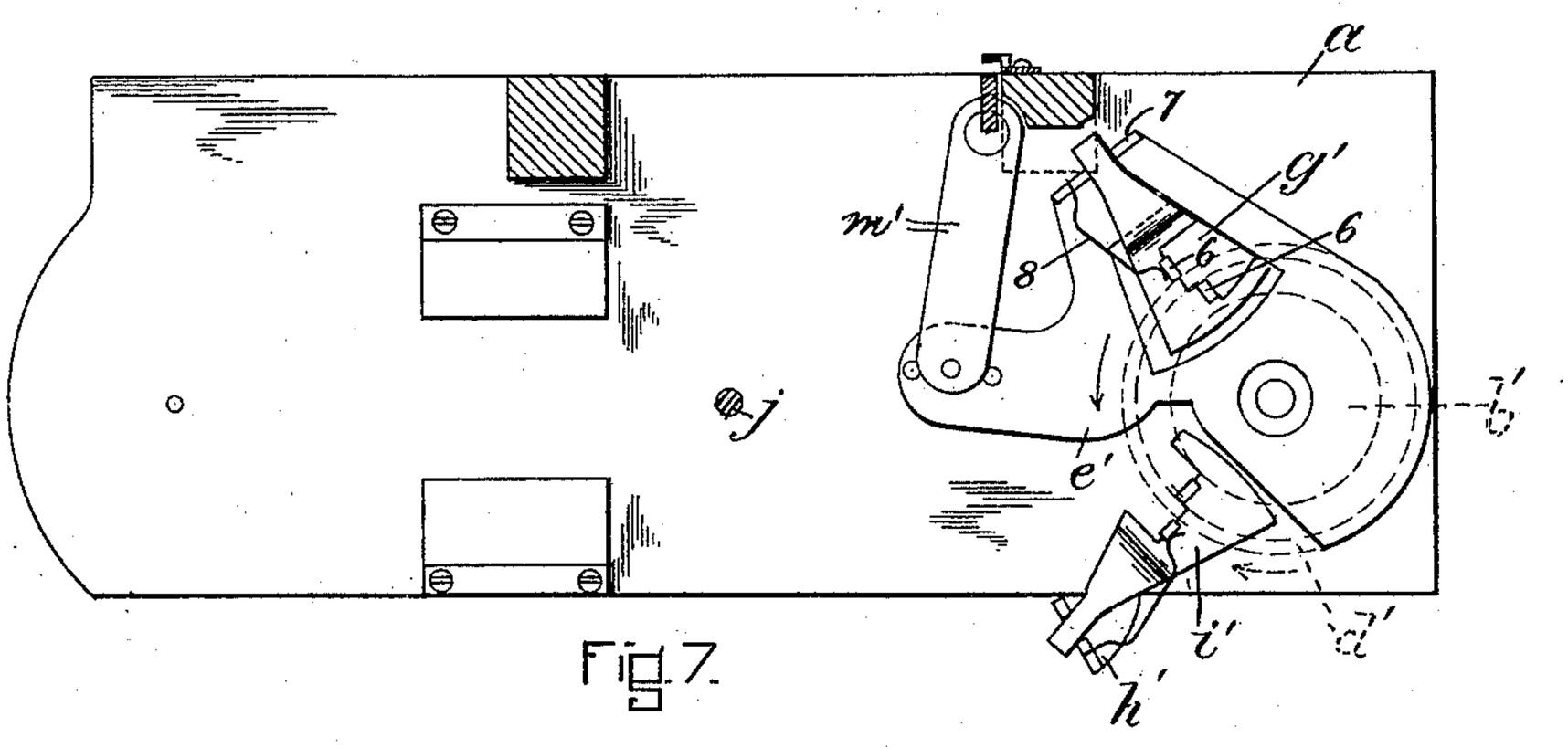

Fig. 7.

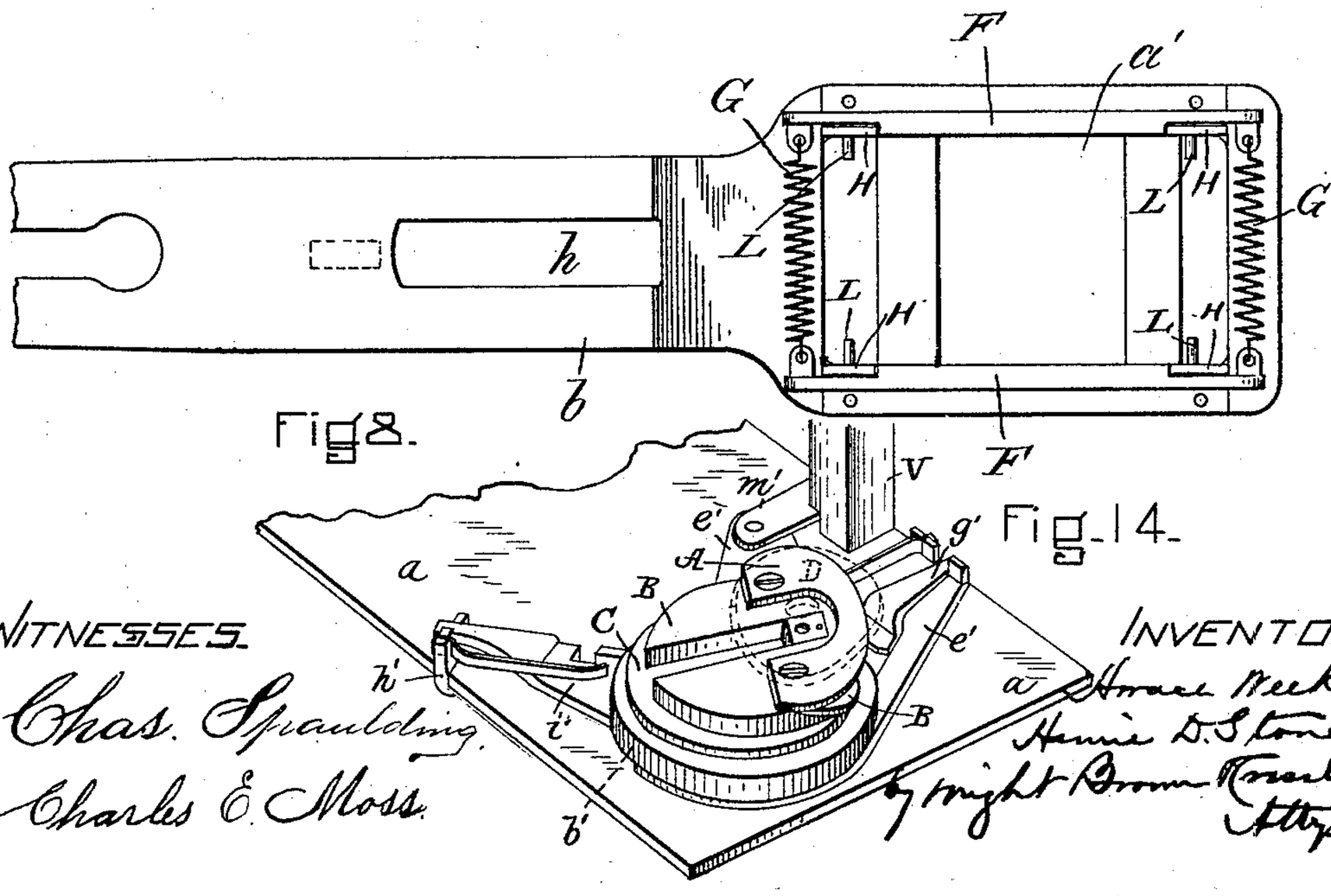

Fig. 8.

Fig. 14.

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(Model.) 3 Sheets—Sheet 3.

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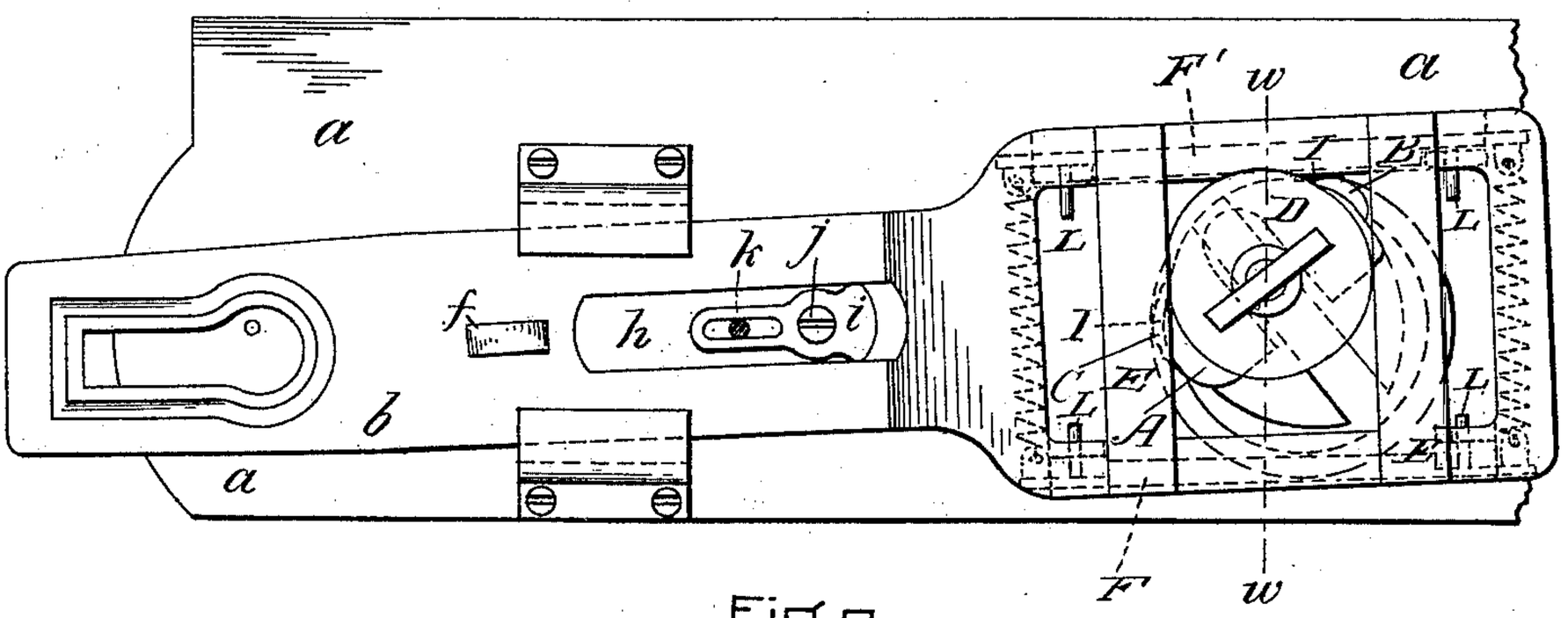

Fig. 9.

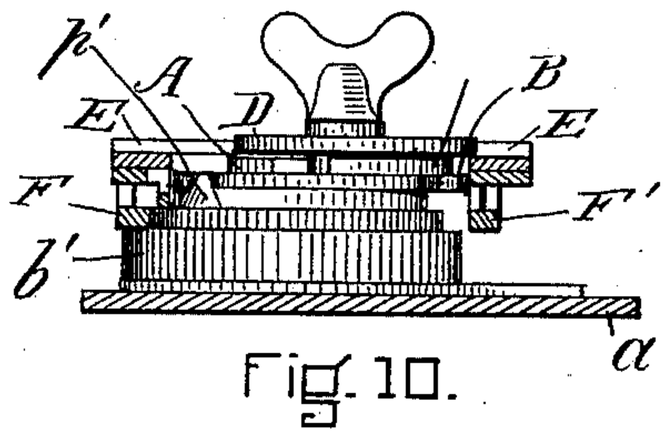

Fig. 10.

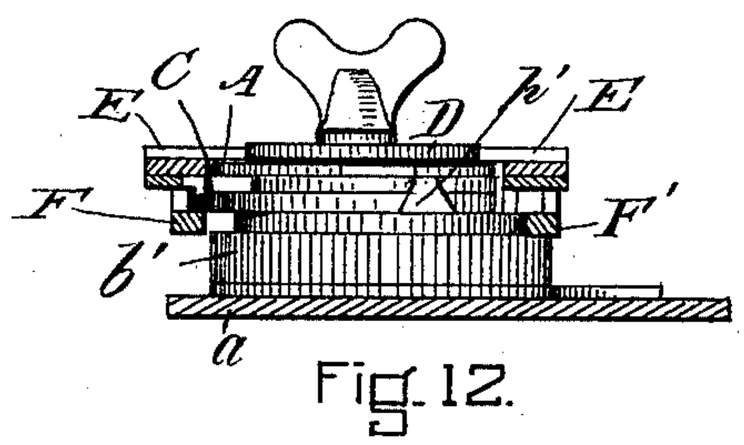

Fig. 12.

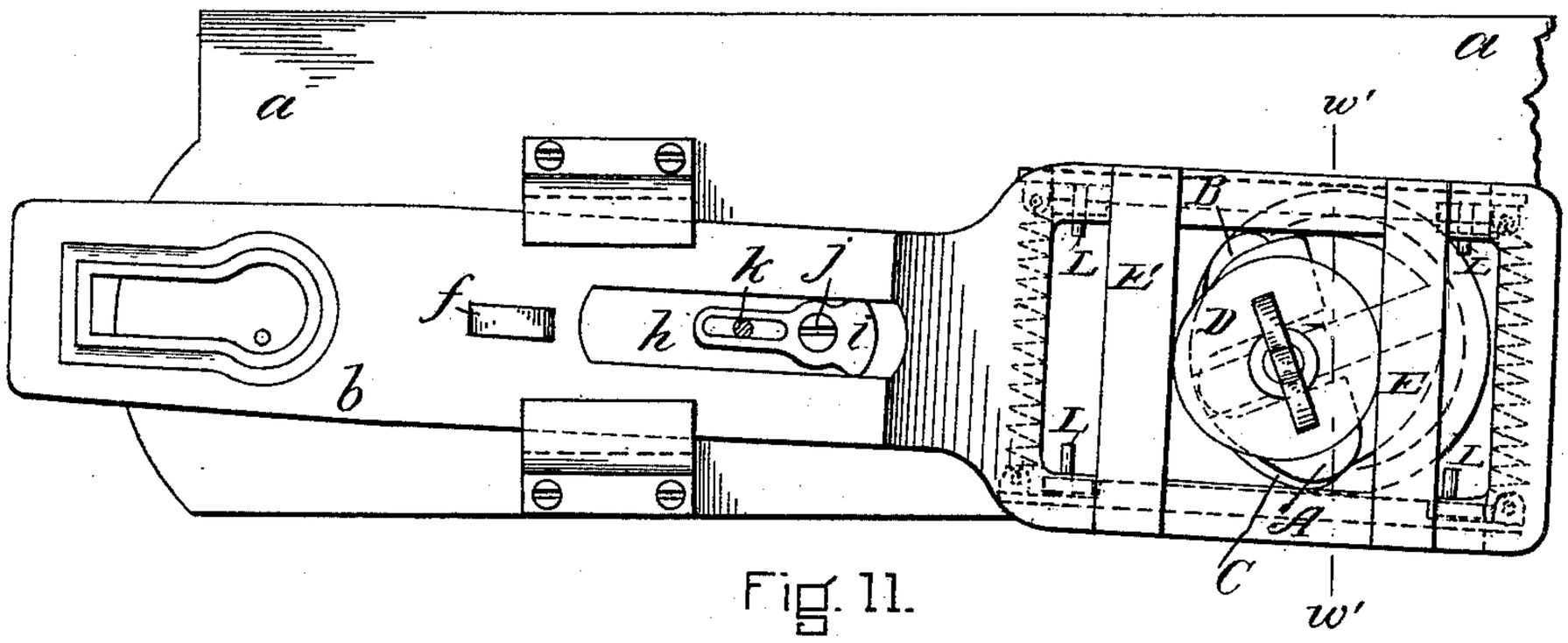

Fig. 11.

Fig. 13.

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UNITED STATES PATENT OFFICE.

HORACE WEEKS AND HENRIE D. STONE, OF BOSTON, MASSACHUSETTS;
SAID STONE ASSIGNOR TO SAID WEEKS.

BUTTON-HOLE ATTACHMENT FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 390,539, dated October 2, 1888.

Application filed February 4, 1888. Serial No. 263,056. (Model.)

To all whom it may concern:

Be it known that we, HORACE WEEKS and HENRIE D. STONE, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Button-Hole Attachments for Sewing-Machines, of which the following is a specification.

This invention relates to button-hole-sewing attachments for sewing-machines, in which a clamp carrying the cloth is vibrated laterally to cause the formation of stitches of suitable length, and is moved progressively lengthwise, first in one direction and then in the opposite direction, to cause said stitches to be laid in two rows, forming the boundary of a button-hole, the carrier being also moved laterally while near and at one end of its lengthwise movement to enlarge one end of said boundary.

Our invention has for its object to provide an attachment of this class of more simple construction than any heretofore produced and one not liable to derangement and requiring but little power to operate it.

To these ends our invention consists in the improvements which we will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a top view of our improved button-hole attachment. Fig. 2 represents a longitudinal section of the same on line *x x*, Fig. 1. Fig. 3 represents a section on line *y y*, Fig. 2, looking toward the left. Fig. 4 represents a section on line *z z*, Fig. 2, looking toward the left. Fig. 5 represents a section on line *x' x'*, Fig. 2, looking toward the right. Fig. 6 represents a section on line *y' y'*, Fig. 2, looking toward the left. Fig. 7 represents a top view of the base-plate with the carrier removed. Fig. 8 represents a bottom view of the carrier. Figs. 9 and 11 represent top views of the attachment, showing the cams and carrier in different positions. Figs. 10 and 12 represent, respectively, sections on lines *w w* and *w' w'*, Figs. 9 and 11. Fig. 13 represents a view of a button-hole made by our attachment. Fig. 14 represents a perspective view of a portion of the attachment.

The same letters of reference indicate the same parts in all the figures.

In the drawings, *a* represents a base-plate adapted to be attached to the bed of a sewing-machine and constituting the support for the mechanism of our invention.

b represents the cloth carrier or arm on which the cloth is placed and to which it is secured by the clamp *c*, said clamp being composed of an elongated frame secured to a flexible metal plate or shank, *d*. Said shank is controlled by a cam-lever, *e*, pivoted to a stud, *f*, attached to the cloth-carrier and passing upwardly through a slot in the shank. When said lever is raised, as shown in full lines in Fig. 2, it depresses the shank *d* and presses the clamp secured thereto upon the cloth on the carrier, the latter having an orifice which coincides with that of the clamp. When the lever *e* is depressed, as shown in dotted lines in Fig. 2, its pressure on the clamp ceases and the cloth is released. The cloth-carrier is provided with a longitudinal slot, *h*, which receives a short lever, *i*, pivoted at *j* to the base-plate.

To the lever *i* is connected by a bolt, *k*, a slide, *l*, which extends at right-angles to the length of the carrier, and is adapted to slide in a horizontal guide, *m*, affixed to the base-plate. A vertical arm, *n*, affixed to the slide *l*, projects upwardly, and is forked at its upper end, its forks or branches standing at opposite sides of a wheel, *o*, having a series of cams or projections, Fig. 4, said wheel being formed to reciprocate by its rotation the arm *n* and slide *l*, and thus oscillate the lever *i* in a horizontal plane. Said lever is enlarged at its rear end to bear against the edges of the slot *h* in the carrier, so that its oscillations will oscillate the carrier laterally, and thus give the carrier the movements which determine the length of the stitches, the enlarged end of the lever *i* constituting a fulcrum on which the carrier oscillates laterally when actuated by the cams A B C hereinafter described. The carrier is enabled by the slot *h* to move lengthwise on said lever. The wheel *o* is attached to a shaft, *p*, which is journaled in bearings on the bed-plate *a*, and is rotated step by step by a lever, *q*, mounted to oscillate on said

shaft, and engaged by a slot, *r'*, in its end, with a stud, *s*, on the needle-bar *t*, a pawl, *u*, pivoted to said lever, and a ratchet, *v*, affixed to the shaft *p* and engaged by said pawl, the arrangement being such that each upward movement of the lever *q*, caused by the ascent of the needle-bar, causes the pawl *u* to give the shaft *p* a partial rotation.

The rear portion of the cloth-carrier is formed as a rectangular frame, inclosing a rectangular opening, *a'*, which receives a rotary disk, *b'*, and a series of cams thereon, whereby progressive longitudinal and lateral movements are imparted to the carrier, as hereinafter described. Said disk is connected by a stud or pivot, *c'*, with the base-plate *a*, and rotates on said stud without lateral movement in any direction. The under side of the disk is grooved to form an annular flange, *d'*. (Shown in section in Fig. 2 and by dotted lines in Fig. 7.)

e' represents a plate or lever, which rests on the bed-plate under the disk *b'*, and is adapted to oscillate on a center or journal, *f'*, Fig. 2, which is in this case formed on the disk *b'*. In the lever *e'* is an opening which receives a dog or clutch, *g'*, on which are formed two upwardly-projecting lugs, 6 6, formed to bear on the opposite sides of the annular flange *d'* of the disk *b'*. The lever *e'* has a lug, which, when the lever *e'* is moved in the direction indicated by the full arrow in Fig. 7, bears on the outer end of the clutch *g'* and causes its lugs 6 6 to bind on the flange *d'* of the disk, and thus rotate the latter. When, however, the lever *e'* is moved in the opposite direction, a spring, 8, secured to the lever and bearing on one of the lugs 6 of the clutch *g'*, moves the clutch sufficiently to cause its lugs to slip on the flange *d'* without moving the latter.

i' represents a brake clutch, constructed like the clutch *g'*, but arranged to engage the flange to prevent rotation of the disk in the direction indicated by the dotted arrow in Fig. 7. Said brake-clutch is supported by a fixed arm or bracket, *h'*, on the base-plate, and acts to prevent accidental backward rotation of the disk *b'* when the clutch *g'* is moving backwardly. The lever *e'* and clutch *g'* are oscillated, and caused thereby to rotate the disk *b'* and its cams progressively step by step by a lever, *j'*, pivoted at *k'* to a standard, *l'*, on the base-plate, a link, *m'*, connecting the lower end of said lever to the lever *e'*, a star or cam wheel, *n'*, on the shaft *p*, and a spring, *o'*, which holds the lever *j'* against the star-wheel *n'*. The lever *j'* is oscillated by the wheel *n'* and spring *o'* and imparts its oscillations through the link *m'* to the lever *e* and clutch *g'*, causing the latter to rotate the disk *b'* step by step.

The construction and mode of operation of the clutch *g'* and brake *i'* are not new with us, but are well known in treadle and other mechanisms, particularly in the "Hall" treadle. We have selected these devices as the most noiseless, simple, and convenient for imparting step-by-step rotation from the step-by-step-rotated shaft *p* to the disk *b'*.

In the upper portion of the disk *b'* is formed a transverse dovetail groove, *p'*, in which is fitted a block, *q'*, Fig. 2, which is movable in said groove, and receives a clamping-screw, *r'*, whereby a heart-shaped cam, D, is attached to the disk *b'*. Said block is clamped against the dovetail sides of the groove by the entrance of the screw *r'* into it, and is thus secured in any desired part of the groove, so as to give the cam D any desired eccentricity. The cam bears against bars E E, extending across the opening *a'* of the carrier, and when rotated imparts a progressive longitudinal motion to the carrier, first in one direction and then in the opposite direction, the extent of movement in each direction governing the length of the button-hole, and being determined by the position of the cam D relatively to the axis of the disk *b'*.

On the disk *b'*, below the adjustable cam D, are formed a series of three cams, A, B, and C, arranged at different heights. A cam, A, is the highest of the series. The cam B is at a lower plane than the cam A and at the opposite side of the disk from the latter. The cam C is the lowest of the series, and is located under the cam A.

The carrier is provided at one side of the opening *a'* with bearings A' B', arranged to coincide, respectively, with the cams A and B, so that when the cam A comes in contact with the bearing A' it will swing the carrier on its fulcrum, thus giving it a lateral movement in the direction indicated by the arrow in Fig. 9. This movement takes place simultaneously with the reversal of the longitudinal movement of the carrier after the completion of the last side, 4 5, of the button-hole, Fig. 13, so that the next longitudinal movement of the carrier will cause the formation of the first side, 2 3, of another button-hole. When the cam B comes in contact with the bearing B', it gives a movement to the carrier in the same direction as that imparted by the cam A, this movement taking place after the formation of the first straight side, 2 3, of the button-hole, and causing the work to move in a curved path while the first half of the curved end 3 4 of the button-hole is being formed.

The carrier is provided at the opposite side of the opening *a'* from the bearings A' B' with a bearing, C', arranged to coincided with the cam C, and said cam, acting on the said bearing, gives the carrier a lateral movement in the direction indicated by the arrow in Fig. 11, thus causing the work to move in a path of the curvature required to complete the curved end 3 4 of the button-hole. The carrier is provided with a slot, C^2, arranged to receive the cam C when the latter is at the side of the carrier opposite the bearing C', and the opposite side of the carrier is provided with a slot, B^2, arranged to receive the cam B when it is at the side of the carrier opposite the bearing

B′. Each of the cams B C is therefore alternately operative and inoperative, the cam B being operative when at one side of the carrier and the cam C when at the opposite side.

F F′ represent parallel metal bars arranged at opposite sides of the disk *b′* below the series of cams, and connected by springs G G, extending crosswise of the carrier, Figs. 5 and 8. Said springs hold the bars F F′ in yielding contact with downwardly-projecting ears or lugs H H on the carrier, and permit said bars to yield or be forced back from said lugs by the disk *b′* when the carrier is moved laterally by the cams, as above described—that is to say, when the carrier is moved laterally in either direction the bar that is moved toward the disk by said movement is arrested by contact with the disk and yields from its lugs H H, the other bar being at the same time carried from the disk by its lugs H H. The springs G G are thus put under increased tension, and are caused to hold the carrier-bearings in close contact with their respective cams, so long as each cam is in contact with its bearing, the carrier being therefore oscillated by the co-operation of the springs G G and bars F F′ with each of the cams A B C in succession.

In making a button-hole the operation is preferably commenced at the point 2, Fig. 13, which is at one side of the narrower end of the button-hole, the carrier being at one end of its longitudinal movement. The rotation of the cam D first moves the carrier until the straight series of stitches 2 3 have been formed. Then the cams B and C act successively, and, in conjunction with the cam D, move the carrier to form the curved series of stitches from 3 to 4. Then the cam D acts alone to move the carrier in the opposite direction, forming the straight series of stitches from 4 to 5, and finally the cam A gives the carrier a short lateral motion until the ends 5 2 are connected and the needle is in the proper position relatively to the carrier to form the straight series of stitches 2 3 of the next button-hole. When the cam B is moving the carrier laterally, the bar F yields, as indicated in Figs. 9 and 10, and when the cam C is moving the carrier laterally in the opposite direction the bar F′ yields, as shown in Figs. 11 and 12.

When the straight portions 2 3 4 5 of the botton-hole are being formed, the carrier is guided by a curved shoulder or guide, I I, which is a continuation of the cam A, and is concentric with the axis of the disk *b′*, said shoulder bearing against one side of the carrier when the side 2 3 is being formed, and against the opposite side of the carrier when the side 4 5 is being formed, the springs G G and bars F F′ holding the carrier against the shoulder I in both cases.

It will be seen that the yielding connection between the carrier and the disk *b′* and its cams enables each of said cams to act with the same precision on the carrier as if it were a grooved cam receiving a stud on the carrier, and at the same time enables all the cams to be mounted on a single disk—a thing that would be impossible without said yielding connection. The construction of the attachment is therefore greatly simplified over that of all other attachments for the same purpose of which we are aware, and its cost is correspondingly reduced. The yielding-bars F F′ are supported by guide-pins L L, affixed to the lugs H, the bars being adapted to slide on said pins.

The length of the stitches may be varied by adjusting the screw *k* in a slot in the lever *i*, the lateral throw of the carrier being shortened or lengthened and the stitches made shorter or longer by moving said screw toward or from the pivot *j*.

The extent of each step or partial rotation of the disk *b′* is regulated by a screw, S, in a tapped lug, T, on the standard *l′*, said screw constituting an adjustable stop for the lever *j*, and limiting the throw of the latter by the spring *o′*, the feed movements of the work determining the distance between the stitches may thus be regulated.

To prevent the shaft *p* from being rotated by the backward or downward movement of the pawl *u* over the ratchet *v* when the needle-bar is descending, we provide a split bearing, V, for said shaft, and connect the divisions of said bearing by a screw, W, which may be adjusted to compress the bearing V and cause it to exert sufficient friction on the shaft *p* to prevent backward rotation thereof by the pawl *u*.

We do not limit ourselves to the details of construction here shown, but may variously modify the same without departing from the spirit of our invention. For example, instead of employing the bars F F′, we may connect one end of each spring G to the carrier and extend the springs in opposite directions from the carrier and attach their opposite ends to the bed-plate *a*, so that one spring will be extended by a lateral movement of the carrier in one direction and the other by a lateral movement in the opposite direction.

We claim—

1. In a button-hole attachment for sewing-machines, the combination of a cloth-carrier, a rotary disk located in an opening at one end of said carrier, mechanism for rotating said disk step by step from the needle-bar of the machine, a series of cams affixed to said disk and acting at different points on the walls of said opening, oppositely-acting springs, whereby the carrier is constantly held in contact with the acting cam, said cams and springs co-operating, as described, in giving the carrier progressive lateral movements in opposite directions to form the enlarged end of a button-hole, a cam, D, adjustably secured to the disk and acting to reciprocate the carrier lengthwise, and mechanism operated from the needle-bar of the machine, whereby the carrier is continuously oscillated in short arcs

which determine the length of the stitches, as set forth.

2. In a button-hole attachment for sewing-machines, the combination of a cloth-carrier, a shaft, *p*, and means for oscillating it from the needle-bar of a sewing-machine, means for continuously vibrating said carrier laterally from the shaft *p*, a disk, *b'*, and means for rotating it step by step from the shaft *p*, a series of cams on said disk arranged to act at different points on the carrier to impart progressive lateral movements thereto, means for holding the carrier with a yielding pressure against each of said cams while it is acting on the carrier, and an adjustable cam on said disk arranged to impart progressive lengthwise movements to the carrier in opposite directions, as set forth.

3. The combination of the cloth-carrier having cloth-clamping devices, a rotary disk, a cam carried by said disk arranged to impart progressive longitudinal movements to the carrier, a series of cams, as B C, on said disk, arranged to impart lateral movements to the carrier when the latter is at and near one extreme of its longitudinal movement, bearings for said cams on the carrier in separate planes, so that each cam is alternately operative and inoperative, each alternating with the other in its operation, another cam, as A, on said disk arranged to give the frame a lateral movement to complete the smaller end of the button-hole, a concentric shoulder on the disk, which guides the carrier during the formation of the straight portions of the button-hole, and means for holding the carrier with a yielding pressure against each of the cams B C A while it is acting on the carrier, as set forth.

4. The combination of the carrier having cloth-clamping devices at its forward end and the opening *a'* at its rear end, one side of said opening having the bearings A' B' and the other side the bearing C', each in a different horizontal plane, the rotary disk located in said opening, the cams A B C on said disk arranged in horizontal planes corresponding with the said bearings, the cam D, co-operating with bearings E E on the carrier, whereby the latter is reciprocated longitudinally, the bars F F' and springs G G, whereby the carrier is held with a yielding pressure against said cams A B C, mechanism, substantially as described, for vibrating the carrier laterally, and mechanism, substantially as described, for rotating the disk and its cams step by step to impart progressive longitudinal and lateral movements to the carrier, as set forth.

5. The combination of the carrier having the slot *h*, the shaft *p*, means for oscillating said shaft from the needle-bar of a sewing-machine, the lever *i*, pivoted to a fixed support and located in the slot *h*, the slide *l*, pivoted to said lever *i* and provided with the bifurcated arm *n*, the cam-wheel *o* on the shaft *p*, arranged to act on said arm and vibrate the carrier, and mechanism, substantially as described, for imparting progressive longitudinal and lateral movements from the shaft *p* to the carrier, as set forth.

6. The combination of the carrier having bearings arranged in different horizontal planes, the shaft *p*, the lever *q*, pawl *u*, and ratchet *v*, whereby said shaft is operated from the needle bar, the means described, whereby the carrier is continuously oscillated laterally from the shaft *p* to form the stitches, the disk *b'*, having the cams A, B, C, and D, arranged in horizontal planes corresponding to the said bearings and operating, as described, to arrange the stitches in the form of a button-hole with one enlarged end, the springs G and bars F, for holding the carrier with a yielding pressure in opposite directions against the cams, which move it laterally, the lever *e'* and means for oscillating it from the shaft *p*, the clutch *g'*, carried by said lever and alternately engaging and releasing the disk *b'*, and the friction-brake *i'*, whereby backward rotation of the disk is prevented, as set forth.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 31st day of January, A. D. 1888.

HORACE WEEKS.
HENRIE D. STONE.

Witnesses:
C. F. BROWN,
A. D. HARRISON.