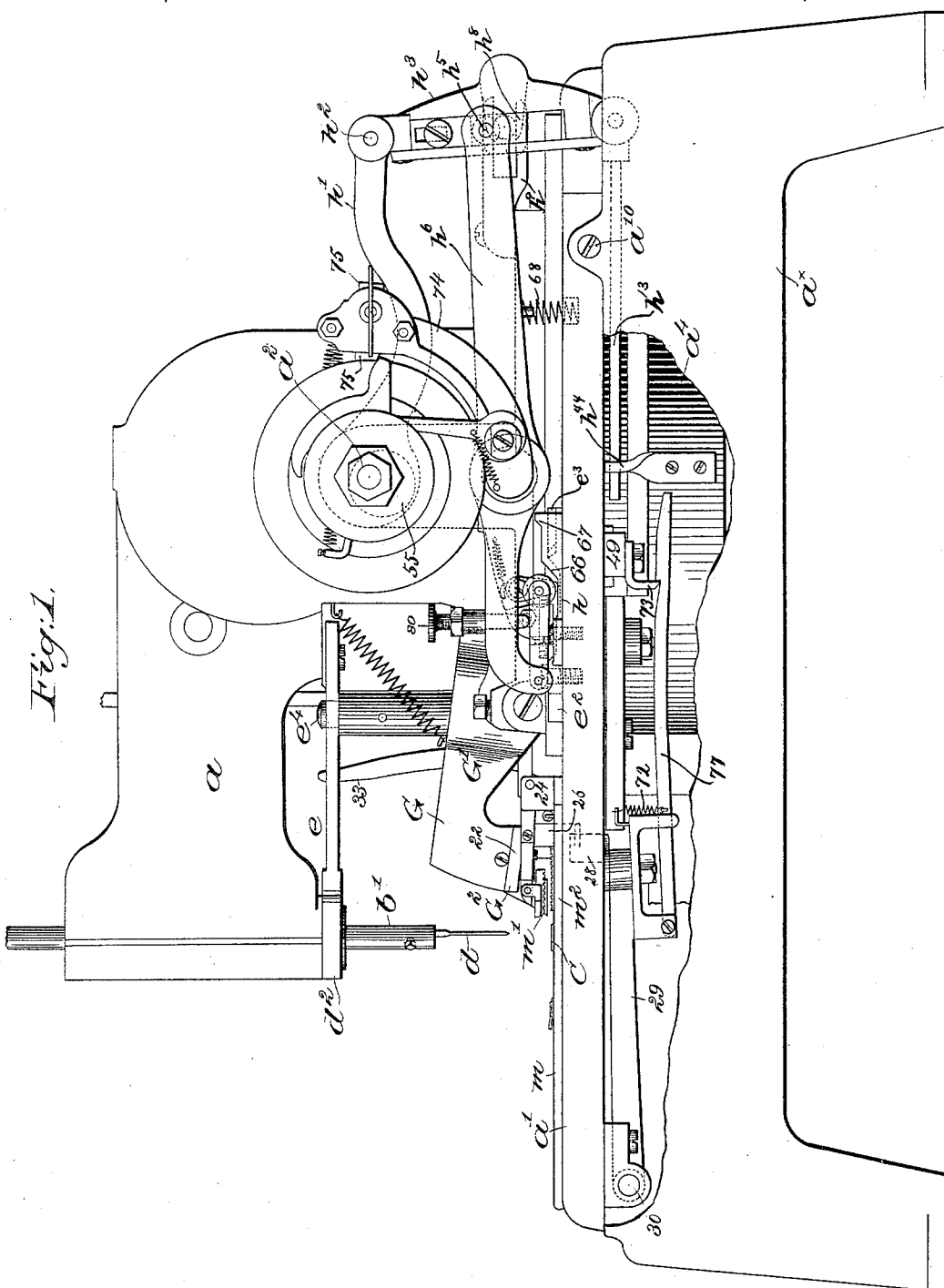


5 Sheets—Sheet 1.

Patented Nov. 10, 1891.



Inventor:
George S. Hill.
by Lemby & Augouy Attys.

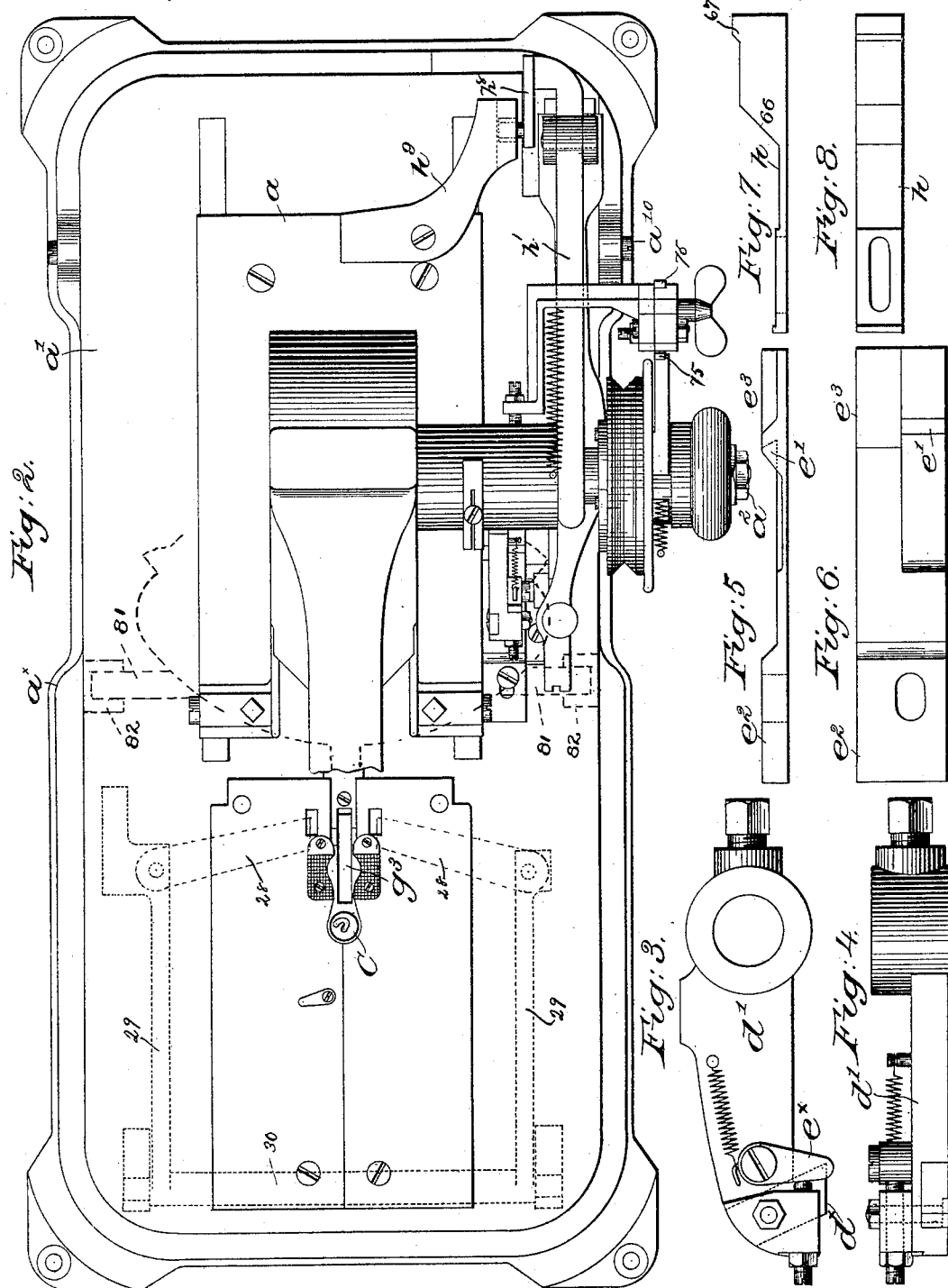
(No Model.)

5 Sheets—Sheet 2.

G. S. HILL.
BUTTON HOLE STITCHING MACHINE.

No. 462,865.

Patented Nov. 10, 1891.



Witnesses.

Fred. S. Grunkel
Edward F. Allen

Inventor.

George S. Hill.
by Lemby & Gregory Attys.

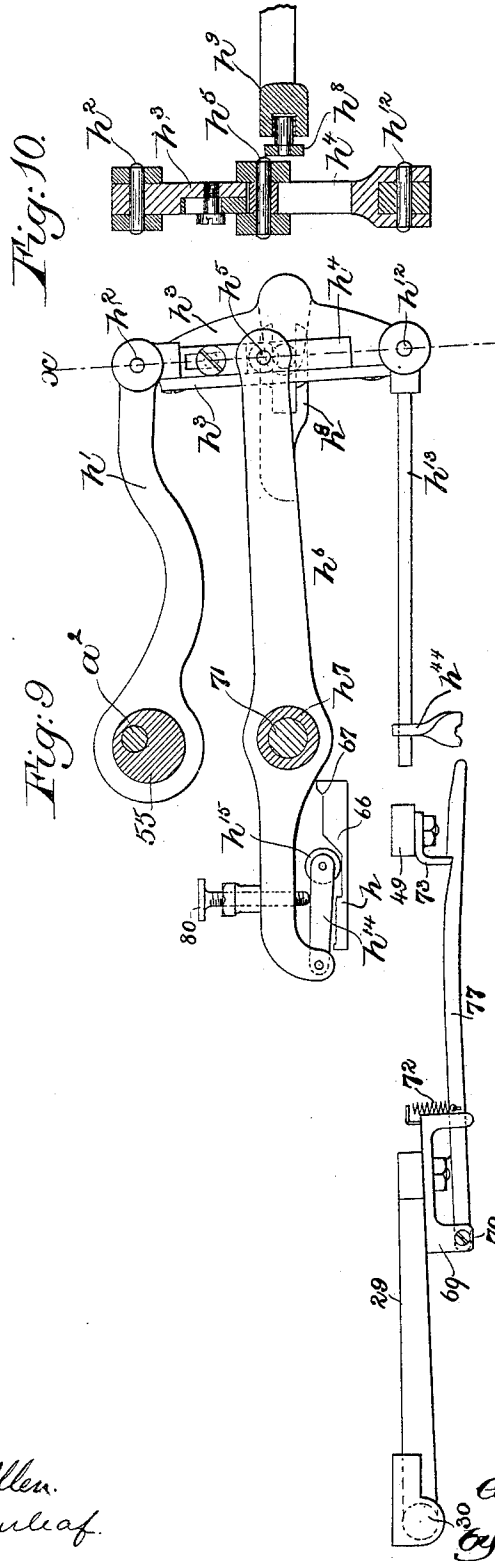
(No Model.)

5 Sheets—Sheet 3.

G. S. HILL.
BUTTON HOLE STITCHING MACHINE.

No. 462,865.

Patented Nov. 10, 1891.



Witnesses:
Edward F. Allen.
Fred. S. Greenleaf.

Inventor:
George S. Hill.
Crosby & Bishop
Attys

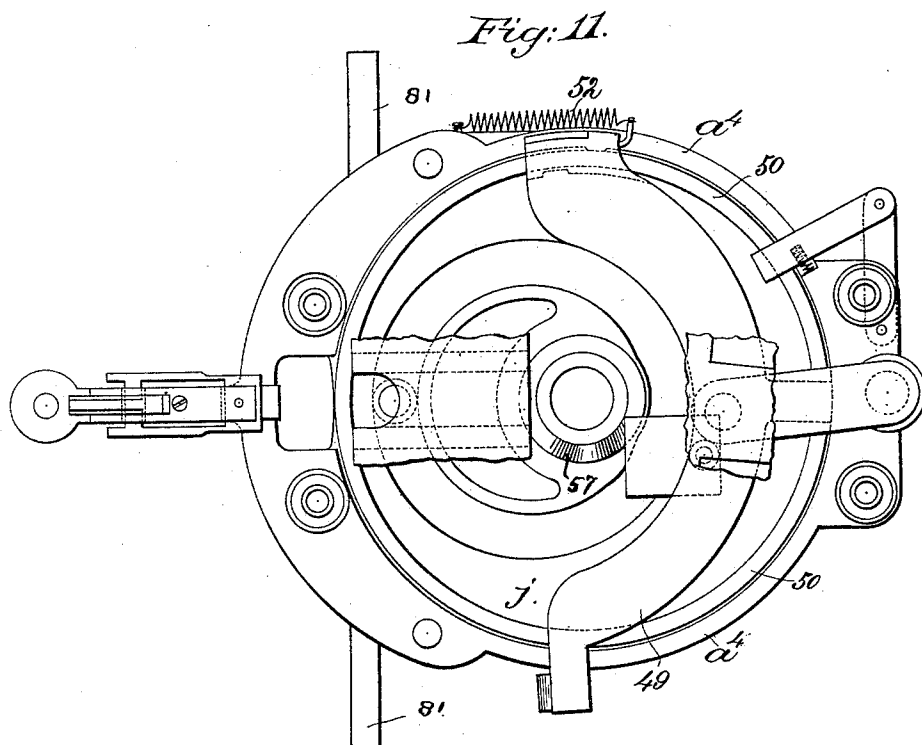
(No Model.)

5 Sheets—Sheet 4.

G. S. HILL.
BUTTON HOLE STITCHING MACHINE.

No. 462,865.

Patented Nov. 10, 1891.



Witnesses.

Fred S. Gummel.
Edward F. Allen.

Inventor.

George S. Hill.
by Lemby & Gregory attys.

(No Model.)

5 Sheets—Sheet 5.

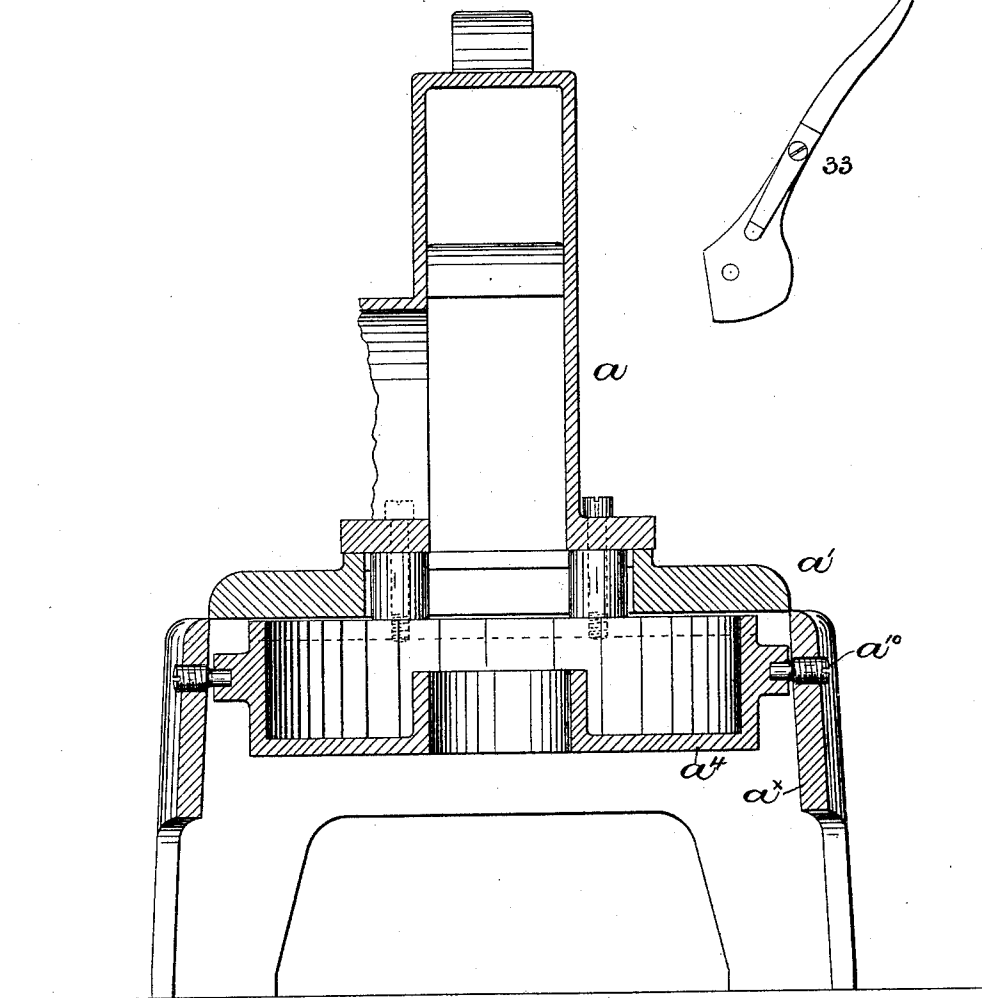
G. S. HILL.
BUTTON HOLE STITCHING MACHINE.

No. 462,865.

Patented Nov. 10, 1891.

Fig: 12.

Fig: 13.



Witnesses:
Edward T. Allen.
Fred S. Greenleaf

Inventor:
George S. Hill.
By Lemuel S. Gregory atty

UNITED STATES PATENT OFFICE.

GEORGE S. HILL, OF BRADFORD, MASSACHUSETTS, ASSIGNOR TO THE REECE
BUTTON-HOLE MACHINE COMPANY, OF PORTLAND, MAINE.

BUTTON-HOLE-STITCHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 462,865, dated November 10, 1891.

Application filed March 23, 1891. Serial No. 386,044. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. HILL, of
Bradford, county of Essex, State of Massa-
chusetts, have invented an Improvement in
5 Button-Hole-Stitching Machines, of which the
following description, in connection with the
accompanying drawings, is a specification, like
letters on the drawings representing like
parts.

10 United States Patent No. 349,359, dated
September 21, 1886, shows and describes a
machine for stitching button-holes, the said
machine containing the following elements,
viz: a work-clamp; a stitch-forming mechan-
15 ism and co-operating throat-palste, the latter
supporting the edges of the material while
the stitch-forming mechanism acts to over-
stitch one straight side of a button-hole slit,
the eye thereof, and along the other straight
20 side of the said slit; a button-hole-cutting
mechanism which at the proper time, as after
a button-hole has been finished, is put into
position with relation to the work-clamp so
that when the material in which a button-
25 hole has just been stitched has been removed
from the work-clamp and the material again
reclamped the cutter may be again operated
to cut the material for the next button-hole to
be overstitched, the cutting mechanism being
30 thereafter retracted until the stitch-forming
mechanism and work-clamp are again brought
into proper working position with relation to
the work in the work-clamp to stitch the said
slit, and feeding mechanism to effect the feed-
35 ing of the frame carrying the stitch-forming
mechanism to thus space the stitches.

In the patent referred to the frame carry-
ing the stitch-forming mechanism, the throat-
plate, and the cutting mechanism is made
40 movable in the direction of the length of the
button-hole, while the work-clamp is held sta-
tionary, and it is only while the throat-plate
is between the members of the work-clamp
that the edge of the button-hole is being
45 stitched.

In the patent mentioned about one-half of
the time occupied by the movement in each
direction of the frame carrying the stitch-
forming mechanism is consumed for the stitch-
50 ing operation, the other half of the time be-
ing consumed in moving the cutting mechan-

ism into and out of operative position with
relation to the work-clamp to cut the mate-
rial held therein and then to retire.

I desire it to be understood that prior to 55
my invention it has also been common to
move the work-clamp longitudinally while
the straight sides of the button-hole are being
stitched, the frame carrying the stitch-form-
ing mechanism and throat-plate remaining 60
fixed, and consequently my invention would
not be departed from by simply moving the
work-clamp longitudinally or in the direction
of the length of the button-hole slit, instead
of moving the stitch-forming mechanism in 65
the direction of the straight sides of the but-
ton-hole slit, for one plan is a well-known
equivalent for the other; and by the term "to
change the relative positions of the work-
clamp on the one part and the stitch-forming 70
mechanism and throat-plate on the other
part" I mean and intend to cover moving
either the stitch-forming mechanism and
throat-plate along the edges of the button-
hole slit or moving the clamp to carry the 75
edges of the button-hole slit along the throat-
plate and between the members of the stitch-
forming mechanism, and in the machine here-
in to be described, with but very slight alter-
ations, which will be designated, it will be 80
seen that the work-clamp may be made to
travel longitudinally and the frame carry-
ing the stitch-forming mechanism be left sta-
tionary.

This present invention has for its object to 85
so improve the class of button-hole machines
in which the button-hole is both cut and
worked on the same machine that the said
machines may be made very much more pro-
ductive than heretofore. I have accom- 90
plished this by combining with the feeding
and spacing mechanism, which moves either
the frame carrying the stitch-forming mech-
anism and throat-plate or the work-clamp
longitudinally in the direction of the length 95
of the button-hole slit to space the stitches,
actuating mechanism for the said feeding and
spacing mechanism and devices to automati-
cally increase the effective movement of the
said actuating mechanism, so that when the 100
stitch-forming mechanism is not operating to
stitch a button-hole the feeding will be more

rapid than when the stitch-forming mechanism is operating to stitch. There is a limit beyond which the feeding speed during stitching cannot be increased, but the limit of the feeding speed during the time that the cutting mechanism is being put into and moved out of operative position with relation to the work-clamp may be as fast as the mechanism employed can perform its work.

Figure 1, in side elevation with the lower frame partially broken out, shows a sufficient portion of a well-known button-hole-stitching machine with my improvements added to enable my invention to be understood, the said figure showing the cutting mechanism in position to cut the material after the latter shall have been put into the work-holder and clamped therein. Fig. 2 is a partial plan view with the overhanging arm of the stitch-carrying frame and with the upper blade of the cutting mechanism and its carrier removed. Figs. 3 and 4 show details of an arm which co-operates with a controller-bar to stop and start the stitch-forming mechanism to over-stitch the edges of the button-hole. Figs. 5 and 6 are respectively an edge and top view of the controlling-bar detached. Figs. 7 and 8 are respectively an edge and plan view of the feed-controlling block. Fig. 9 is a detail chiefly to show the actuating mechanism for the feeding and spacing mechanism, the said actuating mechanism serving to increase the effective speed of the feeding while the stitch-forming mechanism is not acting to stitch a button-hole slit. Fig. 10 is a section in the dotted line x , Fig. 9. Fig. 11 is a detail showing parts of the feeding mechanism; Fig. 12, a modification to be described; and Fig. 13 shows the lever 33 detached.

The frame-work a , the stationary plate a' , having ways upon which the said frame a travels, the lower frame a^x , to which in Figs. 1 and 2 the plate a' is shown as pivoted by pivots a^{10} , the main shaft a^2 having upon it within the frame a suitable eccentrics and cams to actuate the stitch-forming mechanism, including a needle-bar b' , having a needle d and a gear d^2 , engaged by a segment-lever e , pivoted at e^1 , the eccentric 55, the rock-shaft 71, having an arm 74, provided with a stud 75, the curb a^4 , connected to or forming part of the frame a , the cutting-blade g^3 , attached to the curb a^4 , the cutting-blade G^2 , carried by the lever G , pivoted at G' , the ears 24, rising from the lower members m of the work-clamp attached to the plate a' , the pivoted fingers 22, carrying the upper serrated members m' of the work-clamp, the L-shaped blocks 26, pivoted thereto, the arms 29, the rock-shaft 30, to which they are connected, the spring-plates 28, carried by the arms 29 and engaging the hooked lower ends of the blocks 26 when depressed by the cam-lever 33 to close the work-clamp, the throat-plate C , which supports the edges of the material to be stitched while held in the clamp, and the feeding and spacing mechanism

composed, essentially, of the cam-wheel j , having a rim 50, engaged by a clutch-dog 49, the dog in its movements engaging and rotating the said wheel intermittently, the cam 57, to close the cutting mechanism and the stationary stud, are and may be all substantially as in United States Patent No. 349,359, to which reference may be had, wherein the said parts are designated by like letters, and herein all the said parts will be operated as provided for in the said patent, with the exception of the dog 49, forming part of the feeding and spacing mechanism, which dog, in accordance with my invention, is operated by novel devices which I have added to the machine.

The patent referred to had a belt-pulley loose on the shaft a^2 , and co-operating with it was a clutch, which was controlled by the stud 75 of the lever 74 when the rock-shaft 71 was moved, so as to start in operation the stitch-forming mechanism at the proper time and to stop the operation of the stitch-forming mechanism after the stitching of the second straight side of the button-hole.

Herein I have shown as applied to the shaft a^2 a belt-pulley and clutch such as contained in United States Patent No. 367,063, dated July 26, 1887, which patent is an improvement upon the clutch-pulley contrivance represented in Patent No. 349,359.

The rock-shaft 71 has an arm d' , provided with a toe d^x , and upon this arm is loosely pivoted a toe e^x , the said toe serving, in connection with the cam projection e' , (see Figs. 5 and 6 on the controller-bar e^2 .) to lift the arm d' and place the toe d^x upon the shelf e^3 , forming part of the controller-bar, the said arm, when turned to place the toe upon the shelf, effecting the release of the clutch used, so that the belt-pulley is made fast to and will rotate the shaft a^2 and start in operation the stitch-forming mechanism, the said shaft continuing to rotate and actuate the stitch-forming mechanism, while the latter stitches along one side of and about the end and along the second side of the button-hole, at which time the toe drops from the abrupt end of the shelf, causing the stud 75 to come in the path of and effect the disengagement of the clutch fast with relation to the shaft a^2 from the loose belt-pulley, thus stopping the stitch-forming mechanism.

The devices thus far described and referred to specifically by letter are not of my invention.

I have applied to the frame a' a feed-regulating cam-block h , and about the eccentric 55, near the outer end of the shaft a^2 , I have applied an eccentric-strap and connecting-rod h' . The rod h' is jointed by the pin h^2 to the upper end of the lever h^3 , provided at its lower end with a rod h^{13} , adapted to strike and move a clutch-dog 49, common to the said patent. To enable the lever h^3 to reciprocate the rod h^{13} for a greater or less distance and consequently move the dog 49 more

or less to increase or lessen, as desired, the feed-speed, the said lever h^3 has been slotted at h^4 , and the slot receives a movable fulcrum h^5 , mounted on an adjustable fulcrum-carrier h^6 , pivoted on a hub h^7 , extended laterally from the frame a , and through which hub is extended the rock-shaft 71. The lever h^3 at its rear side, as best shown in Fig. 10, has an arm h^8 , provided with a pin or projection, which enters a guide-slot in an arm h^9 , forming part of a bracket extended from the plate a' , the sole purpose of the arm h^9 referred to and of the projection entering therein being to prevent vertical movement of the lever h^3 , but yet not interfere with the positive vibrations to be imparted to it by or through the connecting rod or link h' . This being the case, the particular shape of the projection h^9 or the particular part of the mechanism which supports it is immaterial.

The eccentric 55, the connecting-rod h' , lever h^3 , and rod h^{13} , constitute what I denominate the "actuating" mechanism for feeding or changing the relative positions of the stitch forming and cutting mechanism on the one part with relation to the work-clamp on the other part, while the adjustable fulcrum-carrier and cam-block h constitute the mechanism by which to automatically increase the movement of the rod h^{13} , and consequently the speed of the frame a during the time that the said frame is being moved to put the cutting mechanism into and out of operative position with relation to the work-clamp; but this invention is not intended to be limited to the exact devices shown for producing the feeding and spacing movements or to the exact actuating devices, as the said devices may be variously modified without departing from my invention—as, for instance, instead I may use any suitable devices for engaging and rotating the wheel j , or for varying the fulcrum of the lever h^3 between the time of completing the stitching of one button-hole and the time of commencing the stitching of the next button-hole. The inner end of the rod h^{13} plays through a suitable guide h^{14} , connected preferably with the lower frame a^x , and strikes the dog 49, fully described in the said Patent No. 349,359 referred to, the dog biting upon or engaging the cylindrical curb 50, rising from the plate or wheel j , the said wheel in its step-by-step rotation causing the frame a and stitch-forming mechanism carried thereby to travel on the usual ways of the plate a' , so that the throat-plate C' may be made to travel longitudinally between the spread or open members of the work-clamp, while the stitch-forming mechanism is operated to stitch along one straight side of and about the eye, and back along the other straight side of a button-hole slit, all as provided for in the said Patent No. 349,359.

It will be understood that the eccentric 55, working through the eccentric-strap h' , will actuate it and the lever h^3 positively, uniformly, and silently, or without blows or

shocks, as would be the case if the eccentric struck a lever, as in said Patent No. 349,359, and as the fulcrum h^5 for the lever h^3 is varied, the throw of the rod h^{13} will be greater or less, and consequently the dog 49 will have a greater or less throw and move the frame a faster or slower.

There is a maximum speed for good work while the stitch-forming mechanism is acting to overstretch the edges of the button-hole; but at all other times during the movement of the frame a , in order to increase the productiveness of the machine, it is desirable to move the said frame a , it carrying the stitch-forming mechanism, and also the button-hole-cutting mechanism, as rapidly as possible, in order that the button-hole-cutting mechanism may be put into position between the open jaws of the work-clamp to cut a slit in the work held by its jaws and to retire from such position to enable the stitch-forming mechanism to be again started as quickly as possible to stitch the button-hole slit.

In accordance with my invention, as herein represented, one of the arms 29 of the rock-shaft 30, common to the latter patent, is provided with a stand 69, upon which is pivoted at 70 a locking-bar 77, normally held up by a spring 72, so as to engage a toe 73, connected to the dog 49. As the frame a and the dog 49 complete their movement toward the left, viewing Figs. 1 and 2, to put the cutting mechanism into cutting position with relation to the work-clamp, the toe 73 rides up over the inclined outer end of the locking-bar 77 until just about as the cloth-cutting devices come into correct working position, when the locking-bar 77 moves upwardly and engages the toe 73, thus locking the feed-dog and preventing its further movement, and consequently any further movement of the frame a until after the locking device is released.

Viewing the drawings, let it be assumed that a piece of material to be cut and stitched has just been laid between the upper and lower members of the work-clamp. If the cam-lever 33, common to the said patent, is now turned so that its cam part strikes one of the arms 29 of the rock-shaft 30, the other arm in its movement will depress the locking device and disengage the toe 73, thus permitting the dog 49 to be struck by the constantly-reciprocating rod h^{13} , which immediately starts the machine and causes cam 57, common to Patent No. 349,359, to immediately actuate the cutter. As shown in the drawings, the fulcrum h^5 is nearest the pivot h^2 of the lever as the feeding mechanism starts or is put in touch with the rod h^{13} , and at this time the speed of the feeding movement is the faster, for the arm of the lever h^3 to which the rod h^{13} is connected is the longer. The lever h^6 has a finger h^{14} , provided with a roll h^{15} , which meets the incline 66 of the feed-regulating cam-block h as the frame a is being moved to the right, viewing Figs. 1 and 2, and just at the time that the rock-shaft 71 is turned to start

the stitch-forming mechanism in operation. This movement imparted to the lever h^6 as the roll h^{15} goes up the incline 66 is such as to shorten the stroke of the rod h^{13} and decrease the speed of the feeding or spacing movement of the frame a . When the frame a is near the end of its stroke to the right, viewing Figs. 1 and 2, the stitch-forming mechanism, as provided for in said Patent No. 349,359, stitches about the eye of the button-hole, and at this time it is desirable to yet further shorten the stroke of the rod h^{13} and the stitch, and to do this I have provided the block referred to with a second incline 67, (see Fig. 9,) against which the roll h^{15} strikes. As the roll h^{15} leaves the upper end of the incline 66 the usual cam-grooves in the cam or wheel referred to, which is moved by the dog 49, as provided for in said Patent No. 349,359, reverse the movement of the frame a , carrying the stitch-forming mechanism, to cause the second part or straight side of the button-hole to be stitched, the throat-plate traveling along under that side of the button-hole and between the jaws of the work-clamp. As soon as the second part of the button-hole has been stitched the roller h^{15} travels down the incline 66 and a suitable spring 68, acting upon the lever h^6 , aids in moving the fulcrum h^5 upwardly in the slot h^4 to thus increase the stroke of the rod h^{13} to quickly increase the speed of movement of the feeding mechanism and frame while the cutting mechanism carried by the said frame is being moved forward into correct position with relation to the work-clamp to receive between its members the work which is to be next clamped between the jaws thereof. The frame a having been moved far enough to place the cutting mechanism into position with relation to the work-clamp, the locking-bar 77 again engages the toe 73 and stops the mechanism, it remaining stopped while the piece of material having a button-hole properly stitched is taken out from the work-clamp and the material is again put into the work-clamp to be again cut for a new button-hole to be stitched.

I desire it to be understood that the locking device 77 might be applied to advantage to the machine shown in United States Patent No. 349,359, the said locking device engaging a suitable pin or projection at the lower end of the lever which actuates the dog 49, to thus hold locked the lower end of the said lever to keep its upper end out of the range of movement of the rod h^{13} . By turning down the screw 80, carried by the lever h^6 , the said screw acting upon the finger h^{14} , the fulcrum h^5 of the lever h^3 will be moved toward the lower end of the said lever, and consequently the number of stitches put into the button-hole will be increased, and vice versa.

Having described my invention as applied to a machine wherein the frame carrying the stitch-forming mechanism and throat-plate

are moved longitudinally with relation to a stationary work-clamp to travel along both sides of a button-hole slit, I will now describe one form of my invention wherein the work-clamp may be moved longitudinally while the frame carrying the stitch-forming mechanism and throat-plate remain stationary.

In Fig. 1 the plate a' is shown as united by suitable usual pivot-screws a^{10} to the lower frame a^x ; but in the plan last proposed these pivot-pins a^{10} would enter suitable holes in the curb a^4 , and the curb may have lugs 81 to rest upon ears 82, projected inwardly from the lower frame a^x . In Fig. 2 I have shown by dotted lines the front portion of the curb and have added to it the lugs 81 to rest on the ears 82. With this change of the pivots a^{10} the rotation of the main shaft a^2 would result in causing the plate a' , having the work-clamp, to travel longitudinally or in the direction of the length of the button-hole slit.

I claim—

1. A button-hole-stitching machine containing the following instrumentalities, viz: a frame provided with a throat-plate, cloth-cutting mechanism and stitch-forming mechanism, a work-clamp, feeding and spacing mechanism, and actuating mechanism for the said feeding and spacing mechanism, and devices to automatically increase the effective speed of the feeding and spacing mechanism after the stitching of the button-hole and while the cutting mechanism is being put into and removed from position with relation to the work-clamp, or between the times of operating the stitch-forming mechanism for the production of two button-holes in succession, substantially as described.

2. A button-hole-stitching machine containing the following instrumentalities, viz: a frame provided with a throat-plate, cloth-cutting mechanism and stitch-forming mechanism, a work-clamp, feeding and spacing mechanism, and actuating mechanism for the said feeding and spacing mechanism, and devices to automatically increase the effective speed of the feeding and spacing mechanism after the stitching of a button-hole and while the cutting mechanism is being put into and removed from position with relation to the work-clamp, or between the times of operating the stitch-forming mechanism for the production of two button-holes in succession, and devices to automatically start and stop the stitch-forming mechanism to stitch the material, the feeding and spacing mechanism at such time moving at a slower speed, substantially as described.

3. A button-hole-stitching machine containing the following instrumentalities, viz: a feeding mechanism containing a feed-lever, an eccentric, a connecting-rod actuated thereby to move the feed-lever, a cam and a dog, and means between the said lever and dog to actuate the latter, a movable fulcrum and fulcrum-carrier, and a cam-block to automati-

cally change the position of the said fulcrum-carrier to lengthen the effective stroke of the lever and consequently the speed of the machine in order that the speed of the feeding movement may be automatically increased at the desired time, substantially as described.

4. In a sewing-machine, the following instrumentalities, viz: a frame carrying the stitch-forming mechanism, and a cam-wheel for effecting the feeding motion, a bed-plate, a work-clamp, cutting mechanism to cut the work held in the clamp, an actuating-dog for the feeding mechanism, a locking device for

the said dog, and a device comprising the rock-shaft 30 and arms 29, connected with and actuated by the work-clamp, to release the said dog as the material to be stitched is being confined in the work-clamp, to operate substantially as described.

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

GEORGE S. HILL.

Witnesses:

GEO. W. GREGORY,
EDWARD F. ALLEN.