

(No Model.)

6 Sheets—Sheet 2.

R. M. MELHUISE.
SEWING MACHINE.

No. 568,624.

Patented Sept. 29, 1896.

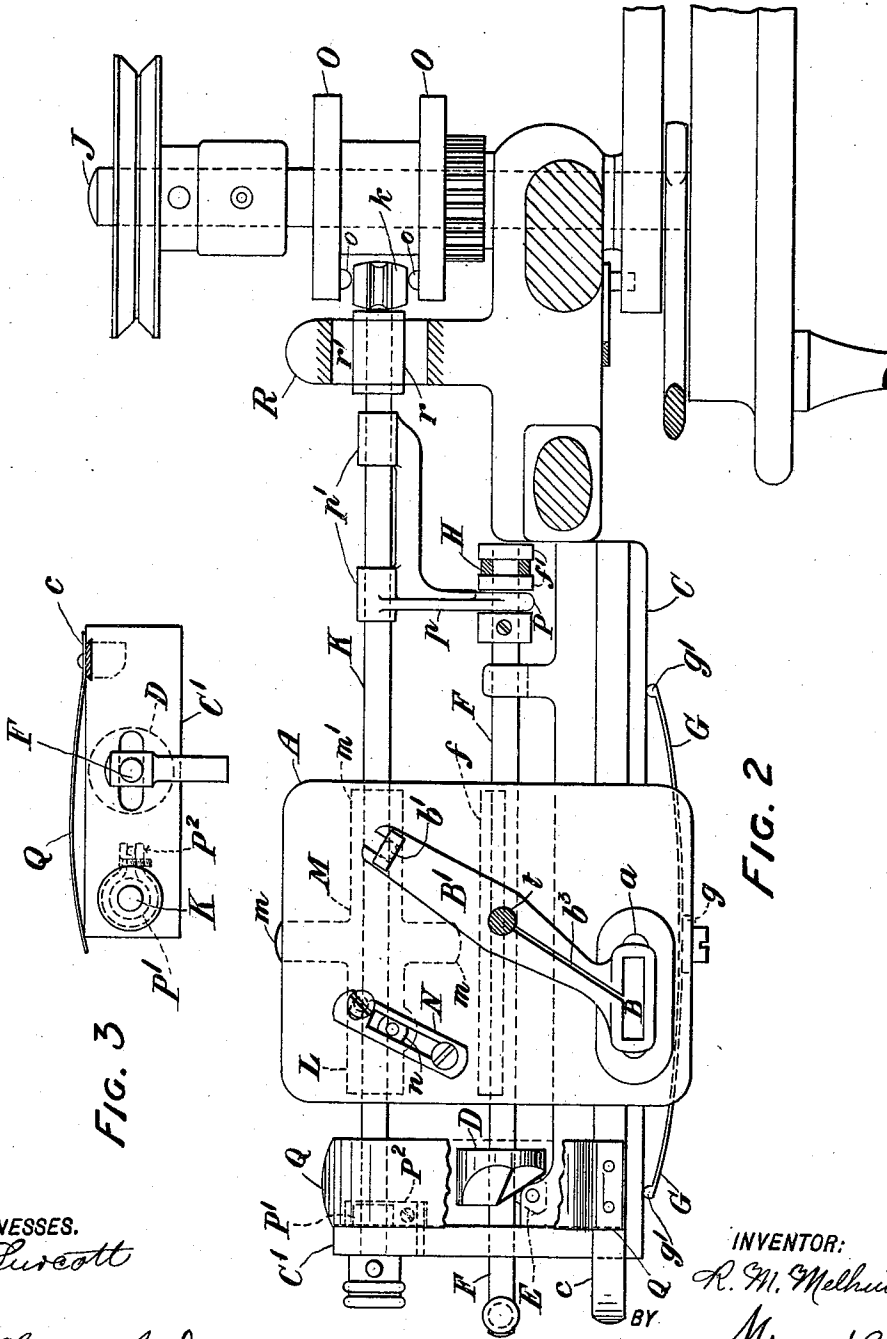


FIG. 3

FIG. 2

WITNESSES.
a. Lurecott
J. M. Hanford.

INVENTOR:
R. M. Melhuish
BY *Munn & Co*
ATTORNEYS.

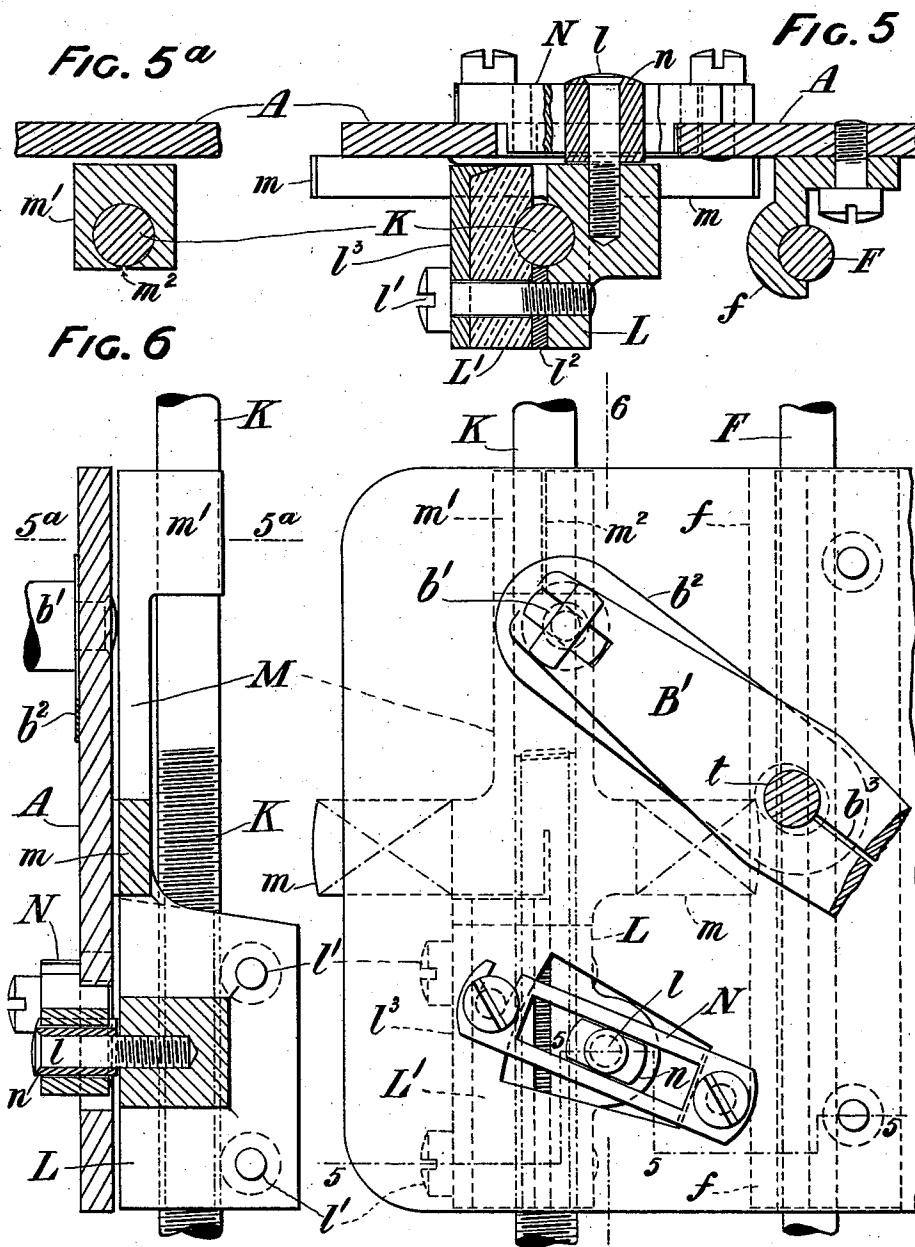
(No Model.)

6 Sheets—Sheet 3.

R. M. MELHUISE.
SEWING MACHINE.

No. 568,624.

Patented Sept. 29, 1896.



WITNESSES.
A. Luskott.
M. H. H. H. H.

FIG. 4

6

INVENTOR:
R. M. Melhuish
BY
Munn & Co
ATTORNEYS

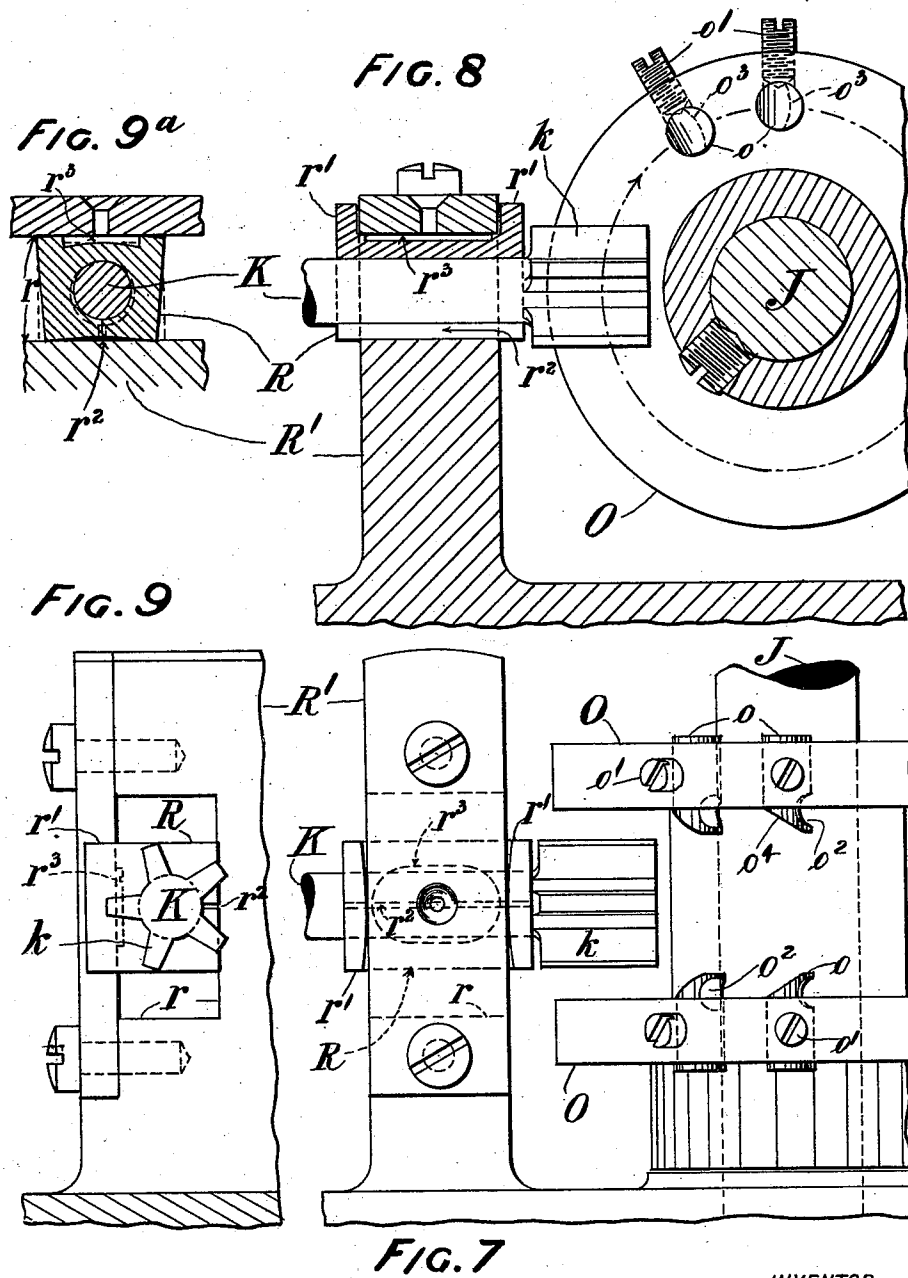
(No Model.)

6 Sheets—Sheet 4.

R. M. MELHUISH.
SEWING MACHINE.

No. 568,624.

Patented Sept. 29, 1896.



WITNESSES.
A. Lurcott.
J. M. Mansford.

INVENTOR:
R. M. Melhuish.
BY
Munn & Co.
ATTORNEYS

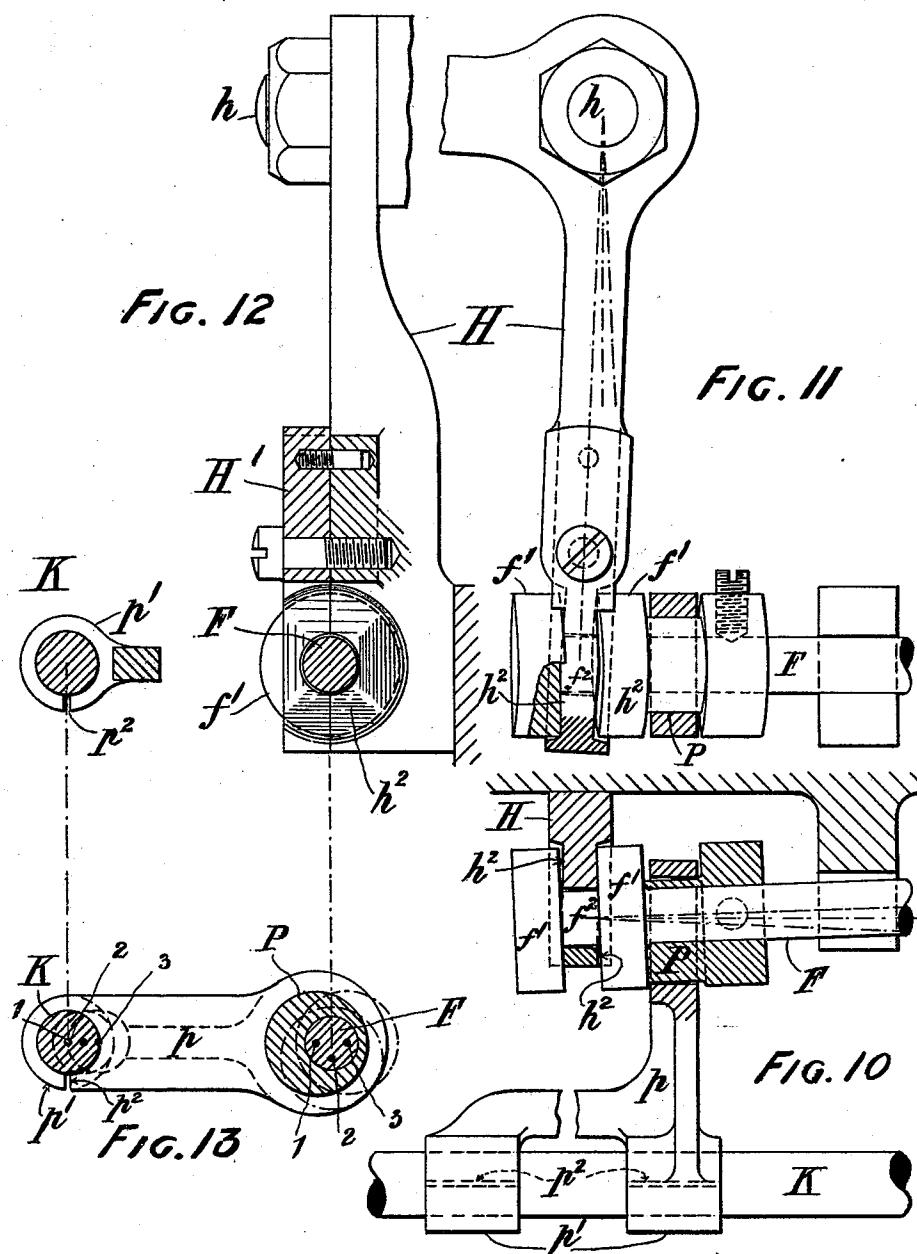
(No Model.)

6 Sheets—Sheet 5.

R. M. MELHUISH.
SEWING MACHINE.

No. 568,624.

Patented Sept. 29, 1896.



WITNESSES.

A. Luccatt

J. M. Mansford.

INVENTOR:

R. M. Melhuish.

BY

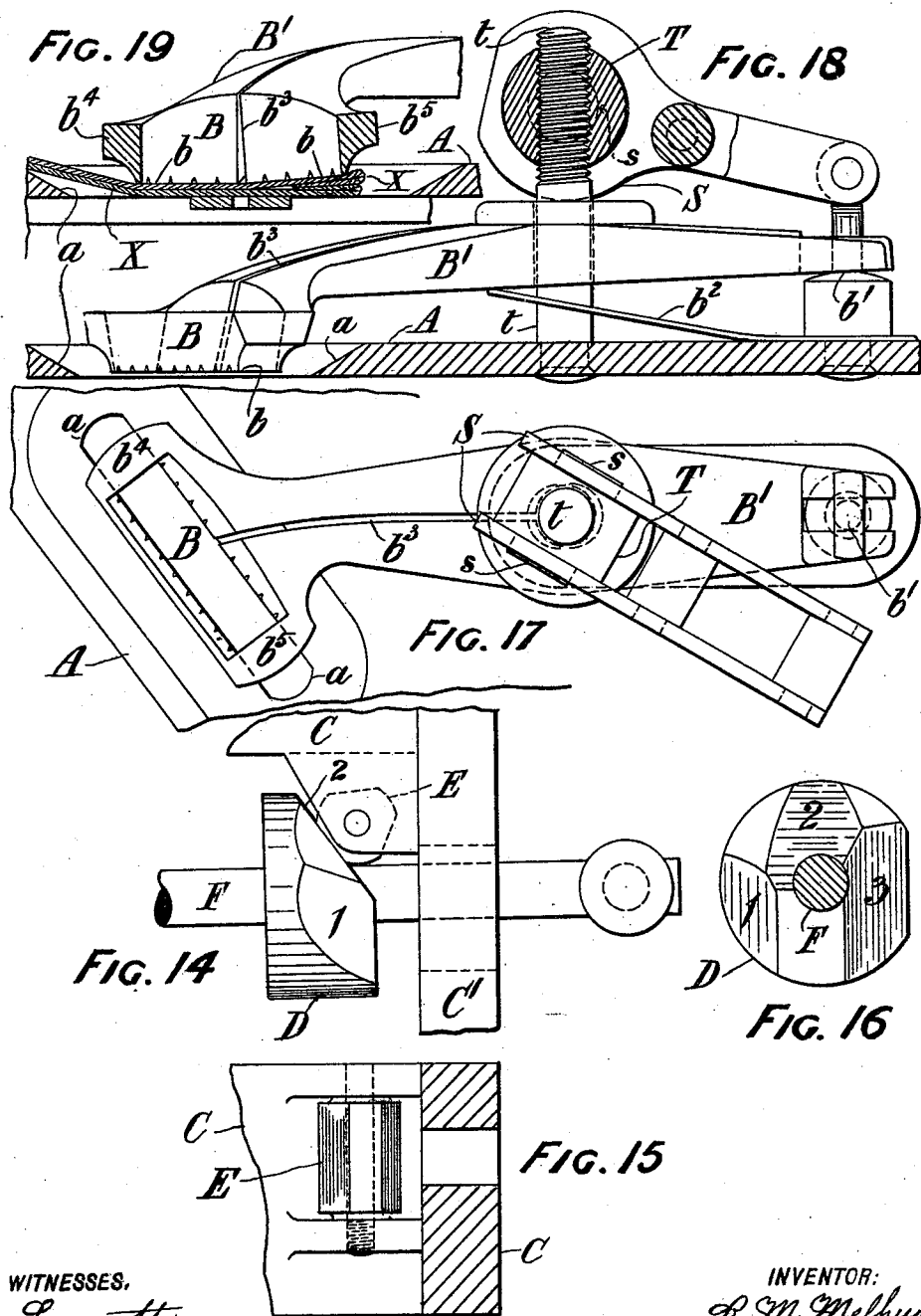
Munn & Co

ATTORNEYS

R. M. MELHUISH.
SEWING MACHINE

No. 568,624.

Patented Sept. 29, 1896.



WITNESSES,
a Lurcott
J. H. H. H. H. H.

INVENTOR:
R. M. Melhuish
BY *Mum & B*
ATTORNEYS

UNITED STATES PATENT OFFICE.

RICHARD MATTHEW MELHUISH, OF LONDON, ENGLAND.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 568,624, dated September 29, 1896.

Application filed October 9, 1895. Serial No. 565,151. (No model.)

To all whom it may concern:

Be it known that I, RICHARD MATTHEW MELHUISH, manufacturer, of 49 Fann Street, Aldersgate Street, in the city of London, England, have invented new and useful Improvements in Machines for Sewing Buttonholes and for Fancy Stitching, of which the following is a full, clear, and exact description.

My invention relates to improvements in machines for sewing straight buttonholes before cutting the same.

Such machines consist of a sewing-machine of any ordinary type using a straight needle and provided with a vibrating work-plate upon which the work is clamped, said plate being vibrated so as to bring the work into such positions as to cause the needle to enter the work at the edge of the intended buttonhole and at a distance therefrom alternately, and the plate being also fed to and fro so as to cause the stitching to be done along the two sides of the intended buttonhole, the extent of the vibration being increased and the feed being arrested on reaching the ends of the buttonhole, so as to cause "barring" stitches to be made completely across the ends of the hole.

The work-plate, when brought into proper positions to cause the stitching to be performed along the two sides of the buttonhole, is vibrated to the proper extent to produce such stitching or to produce the barring stitches through the medium of a three-faced cam carried by a rod which, being reciprocated in the longitudinal direction, is caused, by the action of the cam against a fixed abutment, to reciprocate also laterally and to impart such lateral motion to the work-plate, which takes a bearing against the rod. The traverse of the work-plate to and fro successively in opposite directions as the stitching of the two sides of the buttonhole progresses is produced by a feed-screw working through a nut connected to the work-plate and operated intermittently from the main shaft with which it is geared so as to be operated first in the one and then in the other direction, the throwing of the feed-screw into gear for motion in the one or other direction, or out of gear to arrest the feed when the barring operation is in progress, depending on which face of the cam already mentioned is in posi-

tion to impart vibratory motion to the feed-plate.

The present improvements relate more particularly to certain details of construction which, in so far as they relate to parts in motion, have for their principal object to insure such smoothness and certainty of action and absence of vibration at high speed as to enable the machine to satisfactorily stitch the hole after cutting as well as before cutting, which has not heretofore been possible in such machines, the improvements also greatly conducing to the durability of the machine. These improvements will be illustrated both as applied to the machine and also in detail in the accompanying drawings, forming part of this specification, wherein—

Figure 1 is a front elevation of the machine; and Fig. 2, a horizontal sectional plan of the same, the needle-arm being removed. Fig. 3 is an elevation of one end of the frame of the machine, showing the spring guard-plate and adjacent parts drawn to the same scale as Figs. 1 and 2—viz., about four-fifths of full size. Fig. 4 is a part plan, and Figs. 5, 5^a, and 6 are sectional elevations on lines 5 5, 5^a 5^a, and 6 6, respectively, of the work-plate, showing the feed-screw nut and its connection with the work-plate. Fig. 7 is a part plan; and Fig. 8 a part sectional elevation, showing the pinion on end of the feed-screw shaft, the crown-wheels which drive same, and the adjacent bearing for the end of the feed-screw shaft. Fig. 9 is an end elevation of the same shaft, showing the pinion and bearing already referred to. Fig. 9^a is a transverse sectional elevation of the same bearing, illustrating the method of taking up wear therein. Fig. 10 is a plan, and Fig. 11 a part rear elevation, both sectional, showing the elbow-lever which gives motion to the work-plate-vibrating cam-rod, the adjacent end of said rod, and its connection with the feed-screw shaft. Fig. 12 is a part sectional side elevation of the elbow-lever, and Fig. 13 illustrates the action of the eccentric and link connecting the aforesaid cam-rod with the feed-screw shaft. Fig. 14 is a plan of the work-plate-vibrating cam and its abutment. Fig. 15 is a rear elevation of said abutment, and Fig. 16 an end elevation of the cam itself. Fig. 17 is a plan, with presser-

cam lever displaced for the sake of clearness; and Fig. 18, a part sectional side elevation of the work-clamp in the closed position. Fig. 19 is a part longitudinal sectional elevation of the clamping-jaw, illustrating the action of the jaw in clamping work of irregular thickness. Figs. 4 to 19, inclusive, are drawn to a scale of about double full size.

The same letters of reference denote like parts in all the figures.

A is the vibrating work-plate, having an oblong beveled aperture *a*, in which the work is secured by the work-clamp member B, the plate A resting in front on the arm C of the machine-frame in which the shuttle works and receiving vibratory motion transversely to the length of the slot *a* through the medium of a three-faced cam D, acting against a fixed abutment E, the cam D being carried by a rod F, against which a bracket *f*, affixed by a flange to the underside of the plate A, is caused to bear. The bracket *f* is of semi-tubular section and embraces the rear side of the rod F, with which it is held in contact by a spring G, fixed to a lug *g* on the underside of the plate A, and bearing by its thickened ends *g'* against the front of the machine-arm C.

The cam-rod F receives longitudinal to-and-fro motion from an elbow-lever H, pivoted at *h* to the machine-frame and actuated by a stud and friction-roller *h'* at its other end engaging in a cam-groove *i* in a spur-wheel I in gear with a pinion on the main shaft J. The cam D has three inclined faces 1 2 3, either of which may be brought into contact with the abutment E by turning the rod F and cam D about their longitudinal axis, the two opposite faces 1 and 3 of the cam being inclined at the same angle to the rod F, but situated at different distances from its center line, so that the work held by the clamp B will be shifted so as to bring the stitching at the one or other side of the buttonhole, according as face 1 or face 3 is in contact with the abutment E. The intermediate face 2 is inclined at such a greater angle than the other faces, 1 and 3, that the same amount of longitudinal motion of the rod F will cause the plate A to be vibrated to twice the extent of the vibration produced by either of the faces 1 and 2, and will thus result in stitches of double the length being made for barring the ends of the buttonhole. The cam-rod 55 thus receives longitudinal motion by the rocking of lever H, and also a slight angular motion about the end which is attached to said lever, the angular motion being in a horizontal plane and being produced by the inclined face of the cam sliding against its abutment E.

The feed motion of the plate A in two opposite directions, coinciding with the direction of length of the aperture *a*, is obtained by means of a feed-screw shaft K, mounted in the frame of the machine and working through a correspondingly-threaded nut L, forming part of a supporting-carriage M, upon

which the rear part of the work-plate A rests, the carriage M having oppositely-extending arms *m*, which, by bearing against the under side of the plate A, prevent the rotation of the nut with the feed-screw shaft K, while freely permitting the plate A to vibrate laterally. The plate A is connected to the nut L by means of a stud *l*, fixed thereto and carrying a die-block *n*, free to slide in a slotted link N, fixed upon the plate A over an aperture therein, the link N being secured in such an oblique position as to counteract the effect of the angular motion of the cam-rod F upon the direction of vibration of plate A and cause said plate to vibrate in straight lines approximately perpendicular to the length of the buttonhole, so that the barring stitches, when no feed takes place, will be as nearly as possible truly at right angles across the ends of the hole. By means of this stud die-block and link connection with the plate A the latter is caused to participate in the traverse of the nut L along the feed-screw shaft K, produced by the intermittent rotation of the latter in the one or other direction by a pinion *k* on the end of the screw-shaft being engaged by the teeth *o* of one or other of two opposed crown-wheels O, fast upon the main shaft J, with either or with neither of which the pinion *k* may be geared, according as it is required to feed the work-plate A in the one or other direction for working along the one or the other side of the buttonhole, or to interrupt the feed when barring the ends of the hole, as the case may be.

The gearing of the feed-screw pinion *k* with the one or other, or with neither, of the wheels O depends on which of the cam-faces 1, 2, or 3 is in operative position against the abutment, that end of the feed-screw shaft which carries the pinion *k* being (simultaneously with the alteration of the cam-face) shifted laterally by an eccentric P on the cam-rod F, acting on a link *p*, attached to a pair of sleeve-bearings *p'*, through which the plain part of the screw-shaft K passes. The action of the eccentric P is illustrated more particularly in Fig. 13, which is self-explanatory, the three positions 1 2 3 of the centers being the positions occupied when the three similarly-numbered faces 1 2 3 of the cam are in operative position.

It being necessary that the feed of the work in the direction of the length of the buttonhole should be intermittent, taking place only between the formation of two successive stitches, each of the wheels O is provided, not with the full possible number of teeth around its circumference, but only with so many as may be necessary to produce between two successive stitches the required amount of rotation of the feed-screw shaft, the pinion *k* being driven so long as the teeth *o* continue to engage with it, but remaining stationary during the pause due to the passage of the toothless, and therefore inactive, portion of the wheel O. As the partial rotation of the

feed-screw shaft necessarily takes place very suddenly it is important to insure the accuracy of position of the pinion k with regard to the crown-wheels O and to guard against any want of accuracy due to slackness caused by wear of the sleeves p' about the shaft K . With this object the sleeves p' are made self-gripping by being bored out of the solid to a rather smaller diameter than that of the shaft K and then split longitudinally at p^2 to enable them to open out sufficiently to beslipped onto the shaft.

The wheels O are crown-wheels, that is to say, each consists of a disk from the face of which the teeth o project so as to be capable of engaging with the spur-teeth of the feed-screw-shaft pinion k . The teeth o (of which in the example shown in the figures there are two to each crown-wheel) preferably consist each of a stud passing through the disk of the wheel O and secured in position by a binding-screw o' . The projecting point of each stud is hollowed out, as at o^2 , upon the side which engages with the pinion k , so that the acting flank of the tooth thus formed is approximately parallel to the flank of the pinion-tooth at the moment of striking it, whereby a sufficient amount of wearing-surface of the tooth is insured. This acting flank of the tooth is rounded convexly, as shown by the dotted lines o^3 , Fig. 8, so as to act with a rolling motion on the tooth of the pinion k as the two change their relative positions by their rotation in planes at right angles to each other. The rear flank of the tooth o is also beveled, as at o^4 , so as in working to clear the next following tooth of the pinion k , the shape thus given to the point of the tooth o being approximately that of a hook.

The feed-screw shaft K is pivoted at the one end in the arm C' of the frame and is mounted at the other end (which carries the pinion k) in a brass bearing-block R , fitted to slide in a horizontal slot r in the small standard R' , so that the screw-shaft itself will not be liable to have flats worn upon it through being shifted laterally, as would otherwise be the case, and by this means more equal and steady running is insured.

The bearing-block R , which is confined within the slot r by the upwardly-projecting end flanges r' , is split lengthwise on the under side, as at r^2 , and has a shallow depression r^3 formed upon its upper surface for the reception of oil, which thus forms a cushion to deaden the shocks caused by the lifting tendency due to the direction of rotation of the crown-wheel O . When the journal wears, as illustrated in an exaggerated form in Fig. 9^a, the wear is taken up as there shown by merely pinching together the slightly-separated edges of the slit r^2 . The effect of this is to provide a ready means of correcting not only the internal wear of the journal, but also the external wear of the block R , due to its lateral movement in the slot r , as is also illustrated in Fig. 9^a, where it will be seen that

the pinching together of the edges of the slit r^2 depresses the outer lower edges of the block R , causing them to take a fresh and steady bearing against the bottom of the slot r , the efficiency of the top bearing-surfaces, consisting of the raised edges of the depression r^3 and the inclosed oil-cushion, remaining unimpaired.

In order to prevent irregularity of feed by reason of acquired momentum of the screw-shaft, the latter has a collar P' upon it, which is encircled by an adjustable brake-strap P^2 , affixed to the machine-frame C' .

In order to prevent the fabric being soiled by contact with the cam D or the feed-screw K , a guard-plate Q is provided which serves also as a means of preventing the sliding cover c of the shuttle-race from gradually sliding out, which it is liable to do by the unavoidable jarring of the parts when the machine is at work. To adapt it to answer this double purpose, the guard-plate is formed by an upwardly-curved strip of spring-steel riveted by one end to the shuttle-race cover c and extending rearward so as to lie over the cam D and the part of the feed-screw K at which the brake P is situated, the downwardly-directed free end of the spring-plate Q bearing against the inner side of the return end C' of the machine-frame, so as to oppose (by spring-pressure thereon) any tendency of the cover c to slide out of its grooves, while admitting of said cover being easily withdrawn by hand to give access to the shuttle.

The abutment E of the cam D is a roller of preferably triangular section pivoted on a pin mounted in the part of the machine-frame immediately in rear of the arm C . Being pivoted it is self-adjustable to suit the inclinations and movements of the different faces of the cam, and having several flat faces it presents a series of easily-changeable wearing-surfaces, so that its durability is much greater than would be that of a fixed abutment or even of a cylindrical roller.

The feed-nut L is of peculiar construction, being formed one half of metal and the other half of gutta-percha, leather, wood, horn, or other material capable of being softened, so as to admit of the counterpart of the thread of the screw-spindle K being formed by pressure. The mode of making the nut is as follows, and the object to be attained thereby is to avoid shake, enable slack to be taken up, and insure such "deadness" of motion of the feed-screw shaft as to prevent liability of the latter overrunning its actuating-gear by its acquired momentum, even although no brake were provided.

The nut is forged solid and drilled and tapped in the usual way. It is then divided or slotted longitudinally, so as to remove about one-half the circumference of the nut for its full length, and the part so removed is replaced by a grooved piece of gutta-percha or other material L' , which is capable of being softened by hot water, so that when clamped

in place against the liner l^2 by the clamping-screws l' and angled backing-plate l^3 it will be caused to receive the impression of the thread of the screw-shaft K. The impressible part of the nut is thus capable of being tightened up by said screws l' as the nut wears, so that slack can always be taken up and deadness of action insured, while renewal is easily effected by softening the material in water and impressing a fresh thread when required.

In order to afford in addition a long and steady bearing for the nut L upon the feed-screw shaft K, the former is provided with a sleeve m' , formed upon an extension of the carriage M, and adapted to embrace and slide upon the plain portion of the screw-shaft. This sleeve is first bored out to a rather smaller diameter than that of the plain part of the screw-shaft K, and then slit lengthwise, as at m^2 , (shown in Fig. 5^a,) the sleeve being thus rendered capable of sufficient spring to permit of its being slipped over the shaft, whose plain portion it will grasp forcibly enough to steady the motion of the nut upon the screw. Any wear in this sleeve can be readily taken up by squeezing together its divided sides.

As the traverse of the feed-screw nut generally takes place upon the same portion of the threaded part of the feed-screw there is liability of shoulders being formed on the feed-screw at the extremities of the traverse, so that when a greater traverse than usual is required (as for working an extra-long buttonhole) there is danger of the nut becoming jammed against the shoulders thus formed on the screw. To avoid this, I make the middle part of the screw which is most subject to wear of slightly larger diameter than the extremities which are tapered, the nut being of such length relatively to that of the cylindrical middle portion of the screw that the minimum traverse of the nut along the screw must necessarily cause it to overlap the tapered end portion of the screw and thus avoid liability of a shoulder being worn either on the nut or the screw.

The work-clamp is made of spring-steel and consists of an open rectangular clamping-jaw B, the lower edges b of which press the fabric X, Fig. 19, into the beveled or flaring aperture a of the work-plate A, and this jaw is formed on the end of a lever B', having its fulcrum at the opposite end b' , and pressed upward by a spring b^2 , and downward by a cam-lever S, pivoted at s upon a nut T, screwing upon a screw-stud t , passing through the lever B' and fixed to the plate A.

In order to enable the clamping-jaw to grip the work uniformly, notwithstanding that the latter may be of unequal thickness, as, for instance, when the buttonhole is to be made near a hem, where the inturned edges of the fabric increase the thickness toward one end of the buttonhole, the part of the

lever-arm B' between the point of application of the presser-lever cam S and the clamping-jaw B is slit in the longitudinal vertical plane, as shown at b^3 , the slit extending through the adjacent side of the clamping-jaw, the opposite ends $b^4 b^5$ of which are thus to a certain extent independent, so that, together with the separate members of the split lever, to which they are immediately attached, each is free to yield slightly to suit any irregularity in the thickness of the fabric X, as illustrated in the detail view, Fig. 19.

The thread-tension-regulating mechanism is of the type consisting of a leather strap U, encircling a pulley U' on the thread-reel spindle u , and attached to a screw V, passing through a nut v , fixed to the frame of the machine, as shown in Fig. 1. Instead, however, of the lock-nut usually employed for securing the screw V in a position corresponding to any required tension, I make use of a half-nut V', pressed against one side of the screw V by means of a spring v' . This arrangement, while preventing any alteration of the thread-tension through jarring due to the running of the machine, enables the tension to be altered or adjusted when required, without the necessity of unclamping and the risk of omitting to reclamp the lock-nut.

The work-plate-vibrating cam-rod F receives its reciprocating movement in the longitudinal direction from the elbow-lever II, already described, through two collars f' upon said rod bearing against the opposite faces h^2 of the lever, wherein the end of the rod is supported by the portion f^2 thereof, situated between the collars f' , passing through an aperture of corresponding size in the lever, as shown. The collars f' being preferably of flat disk shape it is necessary, in order that they may maintain a constant bearing against the faces h^2 of the lever during the combined angular movements of the cam-rod F in a horizontal plane and of the lever II in a vertical plane, that the said faces should be specially shaped to accommodate these movements.

In order that the cam-rod F, or the substituted shaft which carries the milling cutters, may be more readily inserted in or removed from its position in the lever II, the bearing in the latter is divided and furnished with a removable cap II', as shown more particularly in Fig. 12.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. A buttonhole-sewing machine, comprising a vibrating work-plate, a carriage on which said plate is mounted, an internally-threaded nut on said carriage, a feed-screw engaging in said nut, means for adjusting the friction between the nut and the shaft, a longitudinally-movable shaft, an adjustable cam on said shaft, an adjustable abutment

for said cam, and an engagement between said shaft and the feed-screw shaft, substantially as specified.

2. A buttonhole-sewing machine, comprising a vibrating plate, a carriage on which said plate is mounted, a nut secured to said carriage, a feed-screw having engagement with said nut, means for adjusting the friction between said nut and feed-screw, and a resilient sleeve supported by the carriage and engaging with the plain portion of the feed-screw, substantially as specified.

3. A buttonhole-sewing machine, comprising a movable work-plate, a carriage on which said plate is mounted and a feed-screw engaging the said nut and having its threaded portion slightly tapered in both directions from a point intermediate of the ends of the threaded portion, substantially as specified.

4. A buttonhole-sewing machine, comprising a vibrating work-plate, a carriage supporting said plate, a nut on the carriage, a feed-screw engaging in said nut, the threaded portion of the feed-screw being tapered in both directions, a slotted link on the work-plate, a stud extended from the carriage, and a die-block on said stud engaging in the link, substantially as specified.

5. In a buttonhole-sewing machine, a vibratory work-plate comprising a section of a work-clamp, a feed-screw for causing a movement of said plate, a pinion on one end of said feed-screw, rotary wheels and teeth extended laterally from said rotary wheels, and

having hook-shaped ends to engage the pinion on the feed-shaft, substantially as specified.

6. In a buttonhole-sewing machine, a work-plate having an opening therein, means for imparting a vibratory motion to the work-plate, and a work-clamp section consisting of spring metal and having a rectangular clamping-jaw engaging in the opening in said work-plate, the said jaw being slit in a longitudinal and vertical plane, a spring for moving said work-clamp upward and a cam for pressing said clamp downward upon the work, substantially as specified.

7. In a buttonhole-sewing machine, a work-plate having an opening therein, the said plate forming one section of a work-clamp, means for imparting a vibratory motion to the work-plate, a work-clamp section consisting of spring metal and having a rectangular clamping-jaw, said jaw being slit in a longitudinal vertical plane, whereby one end of said jaw may yield relatively to the other end, substantially as specified.

8. In a sewing-machine, the thread tension comprising a screw engaging with the tension device, and a locking device for said screw, consisting of a half-nut mounted on one end of the spring, the other end of said spring being attached to the frame of the machine, substantially as specified.

RICHARD MATTHEW MELHUISE.

In presence of—

FRED C. HARRIS,
W. J. NORWOOD.