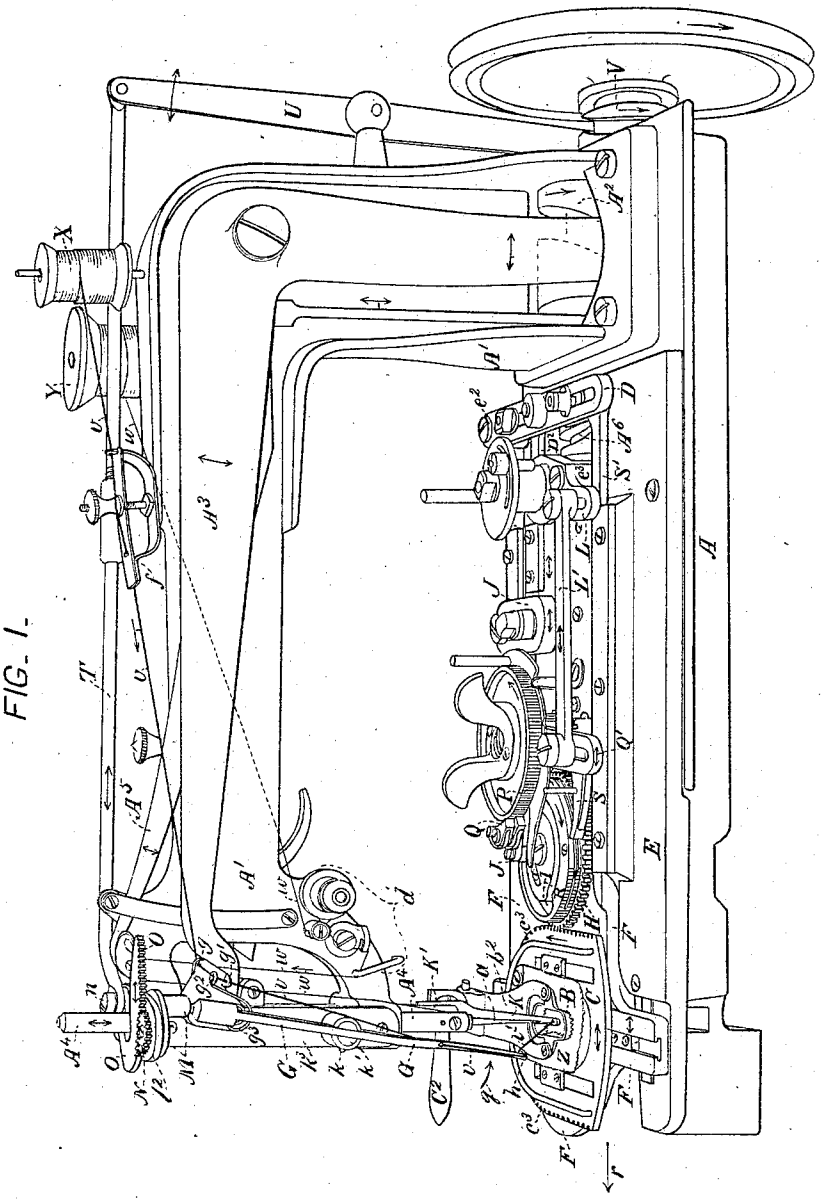
(No Model.) 4 Sheets—Sheet 1.

# J. P. HALLENBECK & H. L. PHELPS.

## SEWING MACHINE FOR STITCHING BUTTON HOLES, EYELET HOLES, &c.

No. 310,677. Patented Jan. 13, 1885.

FIG. 1.



WITNESSES:

Wm. H. Mowry

James T. Goodfellow

INVENTORS:

Joseph P. Hallenbeck.

Herbert L. Phelps.

by Austin F. Park, attorney

(No Model.)

4 Sheets—Sheet 2.

# J. P. HALLENBECK & H. L. PHELPS.

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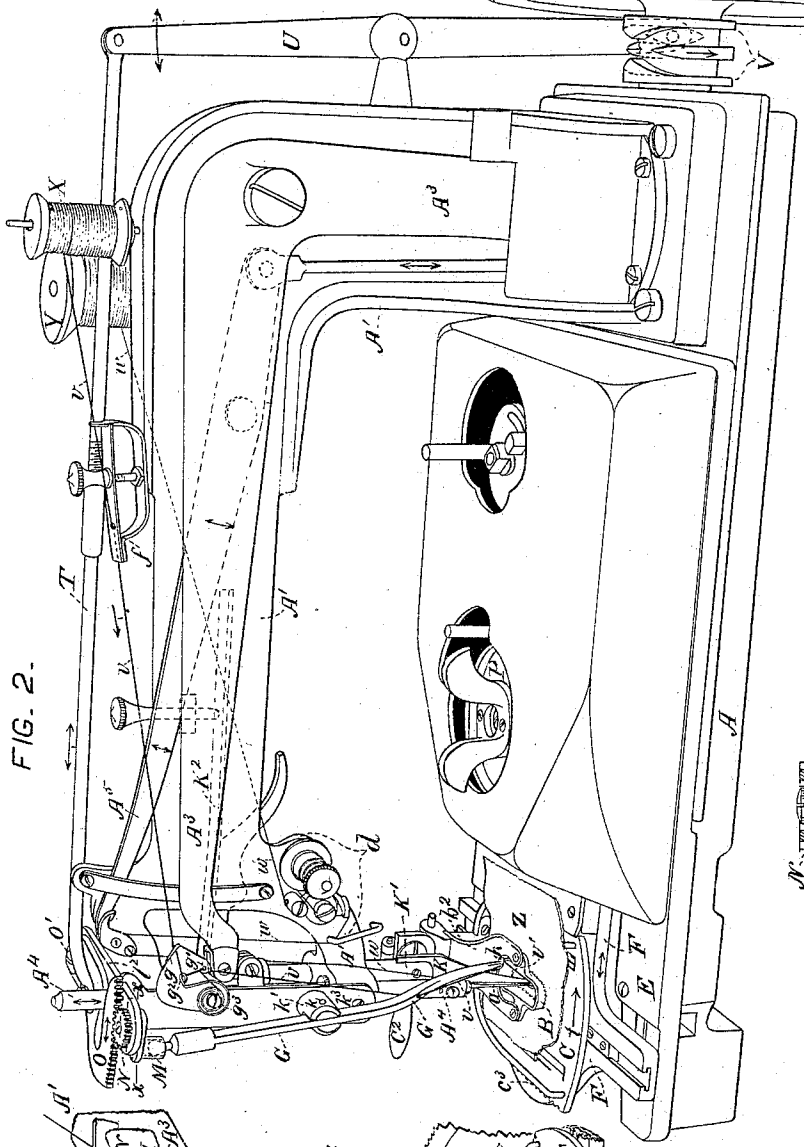

FIG. 2.

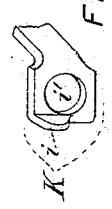

FIG. 7.

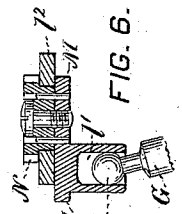

FIG. 6.

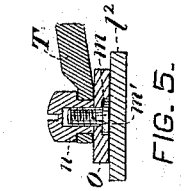

FIG. 5.

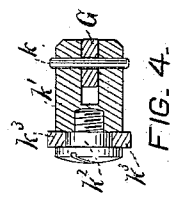

FIG. 4.

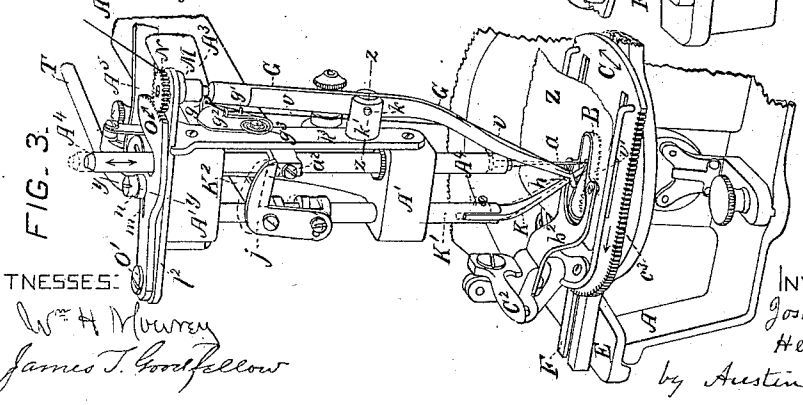

FIG. 3.

WITNESSES:
Wm. H. Mowrey
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by Austin F. Park, attorney.

(No Model.) 4 Sheets—Sheet 3.

# J. P. HALLENBECK & H. L. PHELPS.

## SEWING MACHINE FOR STITCHING BUTTON HOLES, EYELET HOLES, &c.

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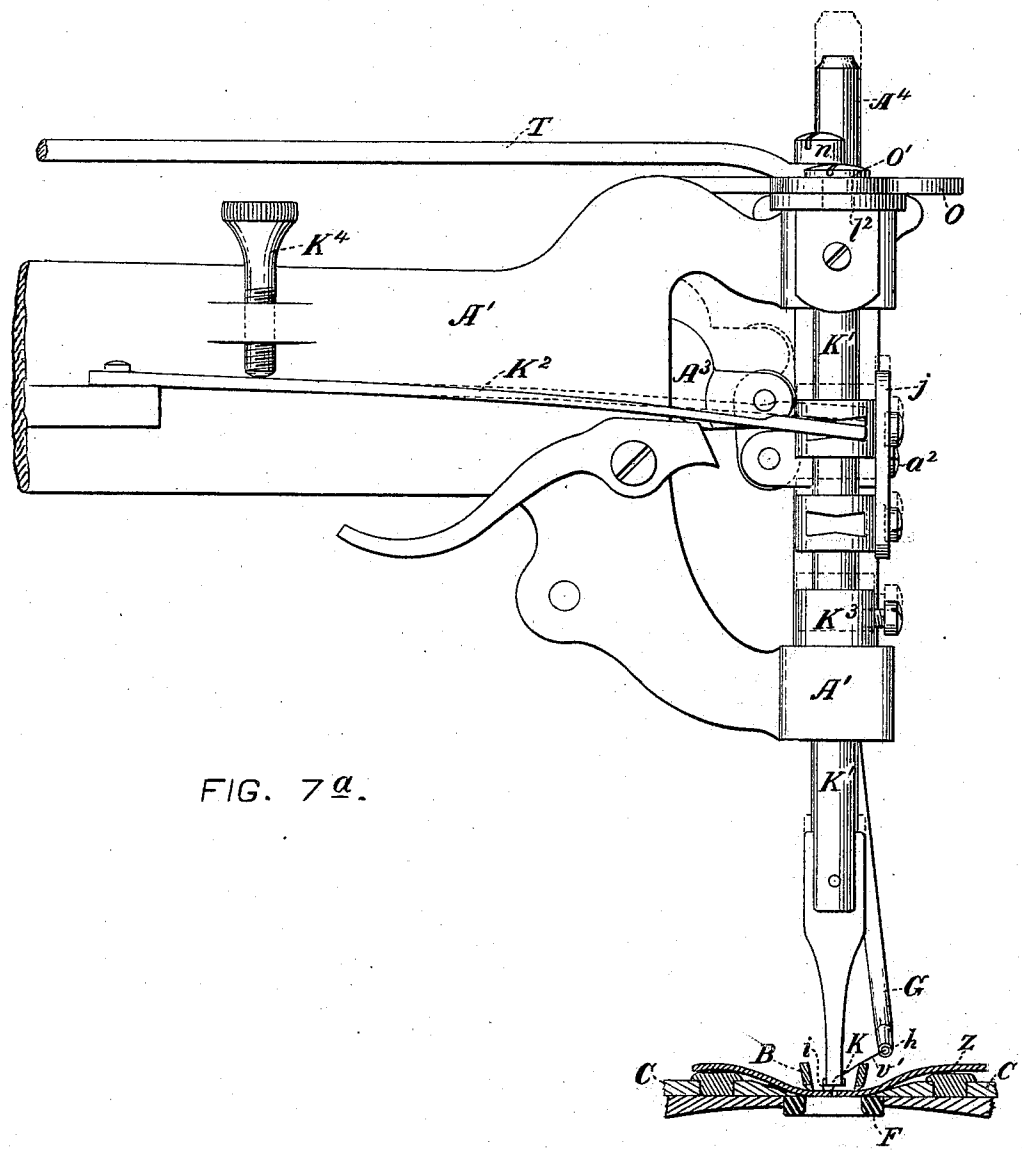


FIG. 7a.

WITNESSES:

Wm. H. Howey

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by Austin F. Park,
attorney

(No Model.) 4 Sheets—Sheet 4.

# J. P. HALLENBECK & H. L. PHELPS.

## SEWING MACHINE FOR STITCHING BUTTON HOLES, EYELET HOLES, &c.

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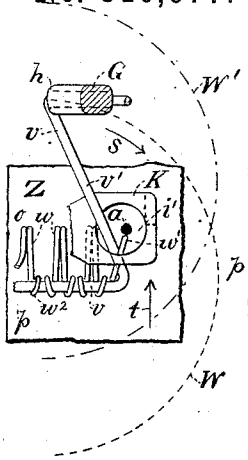

FIG. 8.

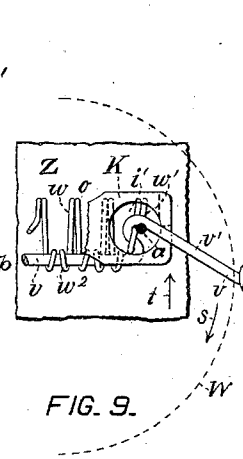

FIG. 9.

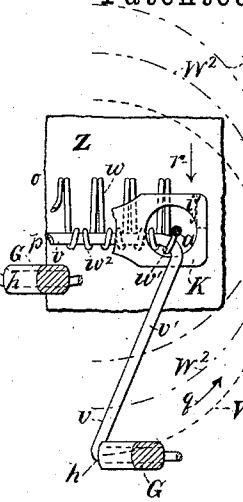

FIG. 10.

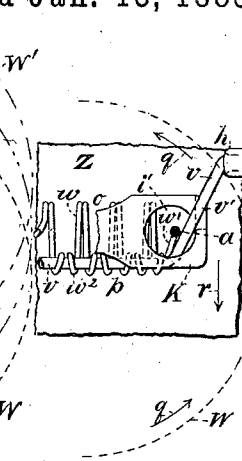

FIG. 11.

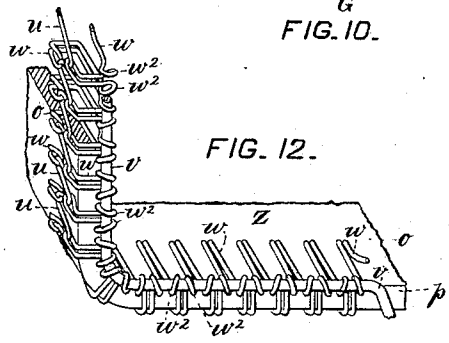

FIG. 12.

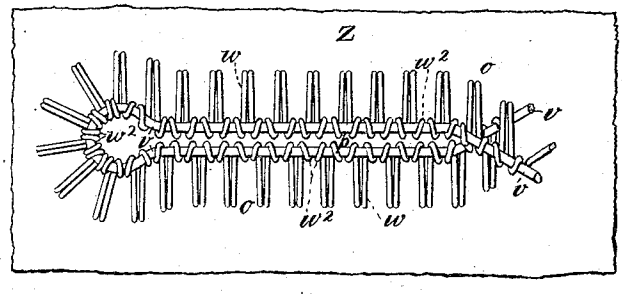

FIG. 13.

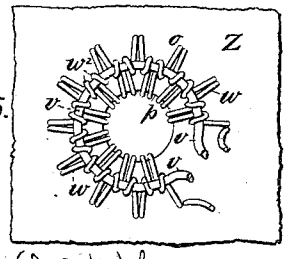

FIG. 15.

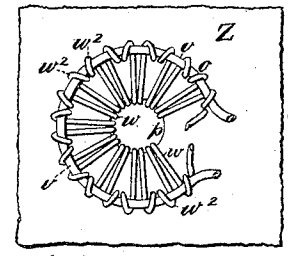

FIG. 14.

WITNESSES: Wm H Mowrey
James T. Goodfellow

INVENTORS: Joseph P. Hallenbeck,
Herbert L. Phelps.
by Austin F. Park, attorney.

# UNITED STATES PATENT OFFICE.

JOSEPH P. HALLENBECK, OF NEW YORK, N. Y., AND HERBERT L. PHELPS, OF CHICAGO, ILLINOIS, ASSIGNORS TO THE NATIONAL MACHINE COMPANY, OF NEW YORK, N. Y.

## SEWING-MACHINE FOR STITCHING BUTTON-HOLES, EYELET-HOLES, &c.

SPECIFICATION forming part of Letters Patent No. 310,677, dated January 13, 1885.

Application filed April 4, 1884. (No model.)

*To all whom it may concern:*

Be it known that we, JOSEPH P. HALLENBECK, a citizen of the United States, residing in the city of New York, in the State of New York, and HERBERT L. PHELPS, a citizen of the United States, residing in the city of Chicago, in the State of Illinois, have jointly invented new and useful Improvements in Sewing-Machines for Stitching Button-Holes, Eyelet-Holes, and other articles, and of which invention the following is a specification, reference being had to the accompanying drawings.

This invention relates, mainly, to improvements in sewing-machines furnished with a work-holder and means for imparting to the work-holder intermittent momentary to and fro lateral movements and step-by-step progressive movements, whereby a row of zigzag to-and-fro or over-edge stitches can be produced.

The general objects of these improvements are to provide means for introducing a purling or filling thread, so as to cause the needle-thread to be looped around the filling or purling thread at each stitch or at each to or fro movement of the work-holder, to secure accuracy and uniformity in the location and formation of the row of to and fro stitches as the work is fed to and fro and progressively to the needle by the work-holder, and to provide improved means for operating a supplemental presser and the purling-thread carrier.

In carrying out this invention we use any suitable sewing-machine which produces the lock-stitch, chain-stitch, or other suitable stitch, and which is furnished with any suitable work-holder, and means for imparting to the work-holder intermittent momentary to and fro movements and a progressive movement, so as to produce a row of zigzag to-and-fro or over-edge stitches.

In the accompanying drawings, Figure 1 represents in perspective one form of our invention applied to a No. 7 Wheeler and Wilson sewing-machine, furnished with a work-holder and mechanism like that described in United States Patent No. 273,727, granted to Joseph P. Hallenbeck, March 13, 1883, for imparting to the work-holder intermittent momentary to and fro transverse movements, step-by-step lengthwise movements, a semicircular movement between the lengthwise movements, and short gradual transverse movements in opposite directions just before and after the semicircular movement, all adapted to bind the edge of an eyelet-end button-hole by a series of over-edge stitches, with the needle-thread of each stitch looped about a purling-thread along the edge of the button-hole. Fig. 2 is a perspective view of the same sewing-machine and feeding and purling mechanisms, but with the feeding mechanism mostly covered and the work-holder and the purling-thread carrier in different relative positions from those in which they are shown in Fig. 1. Fig. 3 is a perspective end view of portions of the same sewing-machine and mechanisms with the parts in essentially the same positions as in Fig. 1. Fig. 4 is a section of the purling-thread carrier and its pivoted support at or about the line $z\ z$ in Fig. 3. Fig. 5 is a partial vertical section of parts at or about the line $y\ y$ in Fig. 3; and Fig. 6 is a partial vertical section at or about the line $x\ x$ in Fig. 2. Fig. 7 is a view on a larger scale of the under portion of the auxiliary or supplemental work-presser. Fig. $7^a$ is a side elevation partly in section of some parts of the same machine and mechanism represented in Figs. 1 and 2, the side shown in Fig. $7^a$ being opposite to the one presented in those other figures. Figs. 8, 9, 10, and 11 are diagrams on a large scale illustrating the action of the mechanism shown by Figs. 1, 2, and 3 in producing a row of to and fro stitches with the needle-thread looped around a purling-thread at each stitch. Fig. 12 represents on an enlarged scale a fabric bound along one edge by a series of over-edge lock-stitches, with the needle-thread looped around a purling-thread at every stitch, as can be made by the mechanism represented in part by Figs. 1, 2, and 3. Fig. 13 is an enlarged plan of an eyelet-end button-hole having its edge bound all around by a row of over-edge stitches, with the needle-thread looped around a purling-thread at each stitch,

as produced by the sewing-machine and mechisms illustrated by Figs. 1, 2, and 3. Figs. 14 and 15 show on a large scale eyelet-holes partly bound by a series of over-edge stitches, with each stitch of needle-thread looped around a purling-thread, which in those figures is placed in different positions in respect to the edge of the eyelet-hole, as can be done by our invention. Figs. 8, 9, 10, 11, 12, 13, 14, and 15 represent the stitches disproportionately far apart in order to clearly show their construction and the action of our improved mechanism in producing them.

Similar parts are marked by like letters in the different figures, and the directions in which some of the parts move are indicated by adjacent arrows.

A is the bed, A′ the head and bracket-arm, $A^2$ the needle-driving cam, $A^3$ the needle-operating lever, $A^4$ the needle-bar, and $A^5$ the take-up lever, of the sewing-machine, from which its usual presser and work-feeding device are removed.

The work-holder shown consists of a skeleton-toothed foot, B, jointed to a spring-arm, $b^2$, which is mounted on a carrier, C, that is furnished with a cam-lever, $C^2$, by which the foot B can be depressed and held with a spring-pressure upon the work Z, which is supported by a smooth surface, on or with which the work is moved momentarily to and fro and progressively by and with the work-holder. Each to-and-fro movement is imparted to the work-holder, while the needle-bar of the sewing-machine is elevated, and by means of the switch-cam $A^6$, Fig. 1, which is fastened on the shaft of the needle-driving cam $A^2$ and engages with a follower on the lever D that is pivoted at $e^2$ on the fixed bed-plate E of the feeding mechanism, and is connected by a link, $D^2$, with the lever L, which is pivoted at $e^3$ on the plate E, and is connected with the slide F on which the carrier C is mounted, so that the latter and the work-holder B receive all to and fro movements of the slide F, and so that the carrier C with the work-holder can be moved in a straight course and in a semicircle on that slide. The straight progressive step-by-step movements are imparted to the carrier C and the work-holder from the lever L by the link L′, lever Q′, which carries a pawl, Q, that engages with the ratchet-wheel P, which is geared with the toothed wheel H, that engages with the toothed rack $c^3$ of the work-holder carrier. The faster semicircular movement is imparted to that carrier from the lever D by a slide, S′, carrying a pawl, S, which acts on the segmental ratchet R on the wheel H; and the short progressive movements in opposite directions just before and after the semicircular movement are imparted to the slide F, and consequently to the work-holder by the cam I and lever J interposed as connecting devices between the lever L and that slide. This work-holder and feeding mechanism are constructed and combined so as to properly feed an eyelet-end button-hole to the needle *a* of the sewing-machine, as fully set forth in the aforesaid Patent No. 273,727, to which reference may be had, and are not claimed herein, but are introduced to present some good means for imparting to the work intermittent momentary to and fro movements and step-by-step progressive movements in various directions.

The work-holder and feeding mechanism set forth in United States Patent No. 227,640, or No. 261,563, and other suitable mechanisms, can be used to impart from the sewing-machine intermittent momentary to and fro movements and a progressive movement to eyelet-hole work in carrying out our invention.

In Figs. 1 and 2 the needle-thread *w* extends from the spool Y through the guiding, controlling, and adjustable tension devices at *d*, and thence up over the end of the take-up lever $A^5$ and down to the needle *a*, through its eye, and to the work. We generally prefer to adjust the tension of the needle-thread in relation to the tension of the under thread, by which the loops of needle-thread are locked or chained together, so that only the loops of needle-thread *w* and the purling-thread *v* shall be exposed upon and along the upper surface and edge of the work, as indicated in Figs. 12, 13, 14, 15, and that the under thread, *u*, in Fig. 12 shall be in zigzag form, about as shown in that figure, to secure superior elasticity, strength, and durability in the over-edge stitching. The purling-thread *v* extends from the spool X through an adjustable tension device at *f*, and thence through the fixed guides *g g′* and intervening eye $g^2$ on the take-up spring $g^3$ and down through a guide-eye and the eye end *h* of the carrier G to the work. The carrier G is intermittingly moved to and fro laterally about the fixed vertical line of movement of the needle and simultaneously with and in essentially opposite directions to the intermittent momentary to and fro movements of the work-holder, so as to make the carrier G draw and hold the lowest stretch, *v′*, Figs. 8, 9, 10, 11, of the purling-thread in rear of the vertical line of movement of the needle *a* and in front of the stretch *w′* of needle-thread extending from the last preceding stitch to the needle when the latter is elevated, and so that the needle at each descent passes in front of the stretch *v′* of purling-thread, which extends from its carrier G to the next preceding stitch, as illustrated by Figs. 8, 9, 10, 11. While the needle *a* is elevated and the work Z is being moved by and with the work-holder B in the direction pointed by the arrow *t* in Figs. 2, 8, and 9, from its position in Figs. 2 and 8 to its place in Figs. 1 and 10, the delivery end *h* of the purling-thread carrier is moved curvilinearly in an opposite direction (indicated by the arrow *s*) from its place in Figs. 2 and 8 to its position in Figs. 1, 3, and 10; also at each movement of the work by its holder in the direction of the arrow *r* in Figs. 1, 10, and 11, from its place in Figs. 1 and 10 to that in Figs.

2 and 8, the end *h* of the purling-thread carrier is moved in the opposite direction, indicated by the arrow *q*, from its place in Figs. 1, 3, and 10 to its position in Figs. 2 and 8. At the same time the tension of the purling-thread *v* is made so great relatively to the tension of the needle-thread *w* that the latter is drawn into a loop, $w^2$, around the purling-thread at each stitch, as clearly indicated by Figs. 8, 9, 10, 11, and 12.

To secure the purling-thread *v* with its surrounding loops $w^2$ of needle-thread along the edge *p* of the row of to-and-fro stitches, as shown in Figs. 8, 9, 10, 11, 12, 13, the purling-thread carrier G is arranged or adjusted so that its delivery end *h*, when moved outward beyond the edge *p* of the stitches, as represented in Figs. 1 and 10, shall then be at a greater distance from the needle, and thereby produce greater tension on the stretch *v'* of purling-thread than when the delivery end of the purling-thread carrier is moved outward beyond the other edge, *o*, of the row of stitches, as shown in Figs. 2 and 8.

In Figs. 8, 9, 10, and 11, the dotted line W indicates about the line of to-and-fro movement of the delivery end *h* of the purling-thread carrier when arranged to place the purling-thread with its surrounding loops of needle-thread along the edge *p* of the row of stitches. In Figs. 8 and 10 the broken line W' shows about the path of the to and-fro movement of the delivery end of the purling-thread carrier when adjusted to place the purling-thread *v* along the edge *o* of the row of stitches, as in Fig. 14. In Fig. 10 the broken line $W^2$ indicates about the course of the to and fro movements of the delivery end of the purling-thread carrier when arranged to place the purling-thread in a line about midway between the two edges of the row of stitches, as shown in Fig. 15. The carrier G can be adjusted to move in such different courses by suitably bending its lower part laterally, or by having it formed with a suitable adjusting joint or slide.

In order to secure a more uniform location and accurate formation of the over-edge stitches along the edges of button-holes and similar work, (whether the purling-thread shall or shall not be introduced and looped about by the stitches) when the work is moved to and fro laterally and progressively by a work-holder in combination with a sewing-machine, we combine with the sewing-machine, work-holder and operating mechanism an auxiliary presser, K, adapted, arranged, and operated, so as to press and hold successive parts of the edge portion of the work down on its supporting-plate, while the needle is being forced down into, remains in, and is being withdrawn from the work, and so that the presser K shall be elevated, and thereby leave the work free to be moved by the work-holder while the needle is elevated. The presser K has a toe, *i*, Fig. 7, arranged to bear upon the work near the needle when the presser is forced down upon the work, as in Figs. 1, 2, 3, $7^a$, 8, and 10, and the presser has an opening, *i'*, through which the stretcher *w'* and *v'* of the needle-thread and purling-thread constantly extend from the work to the needle *a*, and carrier G, respectively, as shown in Figs. 8, 9, 10, 11.

In carrying out the combination of the presser K with the sewing-machine and the work-holder having intermittent to and fro and progressive movements, as above set forth, we support and operate that presser relatively to the movements of the work-holder by various devices. As an excellent means for that purpose the presser K is secured to a bar, K', Figs. 3 and $7^a$, that is fitted to slide up and down in the head A', and has an attached part *j*, Fig. 3, extending over a projection, $a^2$, on the needle-bar $A^1$, and a spring, $K^2$, Fig. $7^a$, is secured at one end to the arms A', and is connected at the other end to the bar K', so as to press down on the latter. Consequently the presser K is lifted and held off from the work Z by the parts K' *j* $a^2$, while the needle-bar is elevated, as indicated by dotted lines in Figs. 3 and $7^a$, and the work-holder is in motion, and the presser is held down upon the work by the action of the spring $K^2$ on the bar K', while the needle-bar is depressed and the work-holder is at rest. The degree of pressure of the spring $K^2$ upon the bar K' can be regulated by an adjusting-screw, $K^1$, mounted on the arm A', and the extent of the downward movement of the presser K can be limited by a stop, $K^3$, Fig. $7^a$, fastened on the presser-bar over a part of the head A', as clearly shown.

In carrying out the above described combination of the purling-thread carrier with a sewing-machine work-holder, and means for imparting to the work-holder intermittent to and fro and progressive movements, we use various devices for supporting and operating the purling-thread carrier. As an improved means for that purpose the carrier is shown in the form of a lever, G, extending upward and secured by a pivot, *k*, Fig. 4, to a part, *k'*, that is connected by a headed pivot, $k^2$, to a part, $k^3$, on the head of the machine, so that the lever is thus secured to the head of the machine by a two-way joint. The upper end of the lever is jointed by a ball, *l*, and socket, *l'*, Fig. 6, to a crank-arm, M, mounted to vibrate horizontally in or on a fixed part, $l^2$, on the head of the machine.

For imparting to the crank-arm M from a part having only a short to-and-fro movement the necessary extent of vibration to give to the purling-thread carrier G the required length of to-and-fro movement, various devices can be employed. As a superior means for that purpose we secure to the axis of the crank-arm M a pinion, N, and engage therewith a toothed segment, O, pivoted at O' to a part, $l^2$, fast on the head of the machine.

For imparting to and fro movements to the toothed segment O from the sewing-machine,

various contrivances can be used. As an improved means for that purpose we connect the segment O by a rod, T, and lever U with a switch-cam, V, which is fast on the shaft of the needle-operating cam $A^2$, and switch-cam $A^6$, which gives motion to the work-holder. The cam V is constructed and arranged so that the purling-thread carrier shall be moved in one direction at one ascent of the sewing-machine needle, and in the reverse direction at the next ascent of the needle, and simultaneously with but in opposite directions to the to and fro movements imparted to the work-holder.

By means of the pinion N and toothed segment O the locality of the arc through which the thread-carrier G vibrates can be changed in a circular direction by simply making the same teeth of the segment engage with different teeth of the pinion.

The length of the arc of movement of the purling-thread carrier can be altered by means of a radial undercut slot, *m*, Figs. 3 and 5, in the segment O, and a headed screw-bolt, *m'*, adjustable along that slot to different distances from the pivot O' of the segment by a screw-nut, *n*, which is shown in section in Fig. 5, and serves as a pivot to connect the rod T with the toothed segment.

The above-described combination of the presser K, with a sewing-machine, work-holder, and means for imparting to the work-holder intermittent to and fro progressive movements is useful without the purling-thread carrier, and is more useful in combination with that carrier.

By our invention we are enabled to use a common sewing-machine having a needle moving in one line only in producing a row of zigzag to-and-fro or over-edge stitches, having a purling-thread with the needle-thread looped around the purling-thread at each stitch, as hereinbefore set forth.

We claim as our invention—

1. The combination, with a sewing-machine furnished with a work-holder, and with means for imparting to the work-holder intermittent momentary to and fro movements and a step-by-step progressive movement, of a purling-thread carrier and devices for imparting to that carrier to and fro movements simultaneously with and in essentially opposite directions to the to and fro movements of the work-holder, substantially as set forth.

2. The combination, with a sewing-machine furnished with a work-holder and with means for imparting to the work-holder intermittent momentary to and fro movements and a step-by-step progressive movement, of the supplemental presser and devices for elevating that presser at each movement of the work-holder, substantially as set forth.

3. The combination, with a sewing-machine furnished with a work-holder, and with means for imparting to the work-holder intermittent momentary to and fro movements and a step-by-step progressive movement, of a purling-thread carrier and devices for imparting to that carrier to and fro movements simultaneously with and in essentially opposite directions to the to and fro movements of the work-holder, substantially as specified, and the supplemental presser and devices for elevating that presser at each movement of the work-holder and purling-thread carrier, substantially as set forth.

4. The combination, with a sewing-machine furnished with a work-holder, and with means for imparting to the work-holder intermittent momentary to and fro movements and a step-by-step progressive movement, of the presser K, slide K', carrying the presser, needle-bar $A^4$, and the parts *j* and $a^2$, arranged on said slide and needle-bar, substantially as described.

5. The combination, with a sewing-machine provided with means for producing a row of zigzag stitches, of the thread-carrying lever G, secured by the two-way joint to the head of the machine, the crank-arm M, mounted on the head of the machine, and connected by the universal joint to said thread-carrying lever, and means for imparting to and fro movements to said crank-arm relatively to the movements of the needle of the sewing-machine, substantially as set forth.

6. The combination, with a sewing-machine provided with means for producing a row of to-and-fro stitches, of the thread-carrying lever G, secured by a two-way joint to the head of the machine, the crank-arm M, mounted on the head of the machine, and connected by a universal joint to said lever, the pinion N on the shaft of the crank-arm, toothed segment O, pivoted to the head of the machine, and engaging with said pinion, and means for imparting to and fro movements to said toothed segment relatively to the movements of the needle of the sewing-machine, substantially as set forth.

7. The combination, with a sewing-machine furnished with means for producing a row of over-edge stitches, of the thread-carrying lever G, crank-arm M, pinion N, toothed segment O, rod T, lever U, and switch-cam V, substantially as described.

In testimony whereof we hereunto set our hands in the presence of two subscribing witnesses.

JOSEPH P. HALLENBECK.
HERBERT L. PHELPS.

Witnesses as to Joseph P. Hallenbeck:
JAMES T. HOGAN,
W. I. KILPATRICK.

Witnesses as to Herbert L. Phelps:
J. H. WILLETS,
W. H. PARKER.