(Model.) 2 Sheets—Sheet 1.

P. DIEHL.

BUTTON HOLE ATTACHMENT FOR SEWING MACHINES.

No. 270,290. Patented Jan. 9, 1883.

Fig. 1.

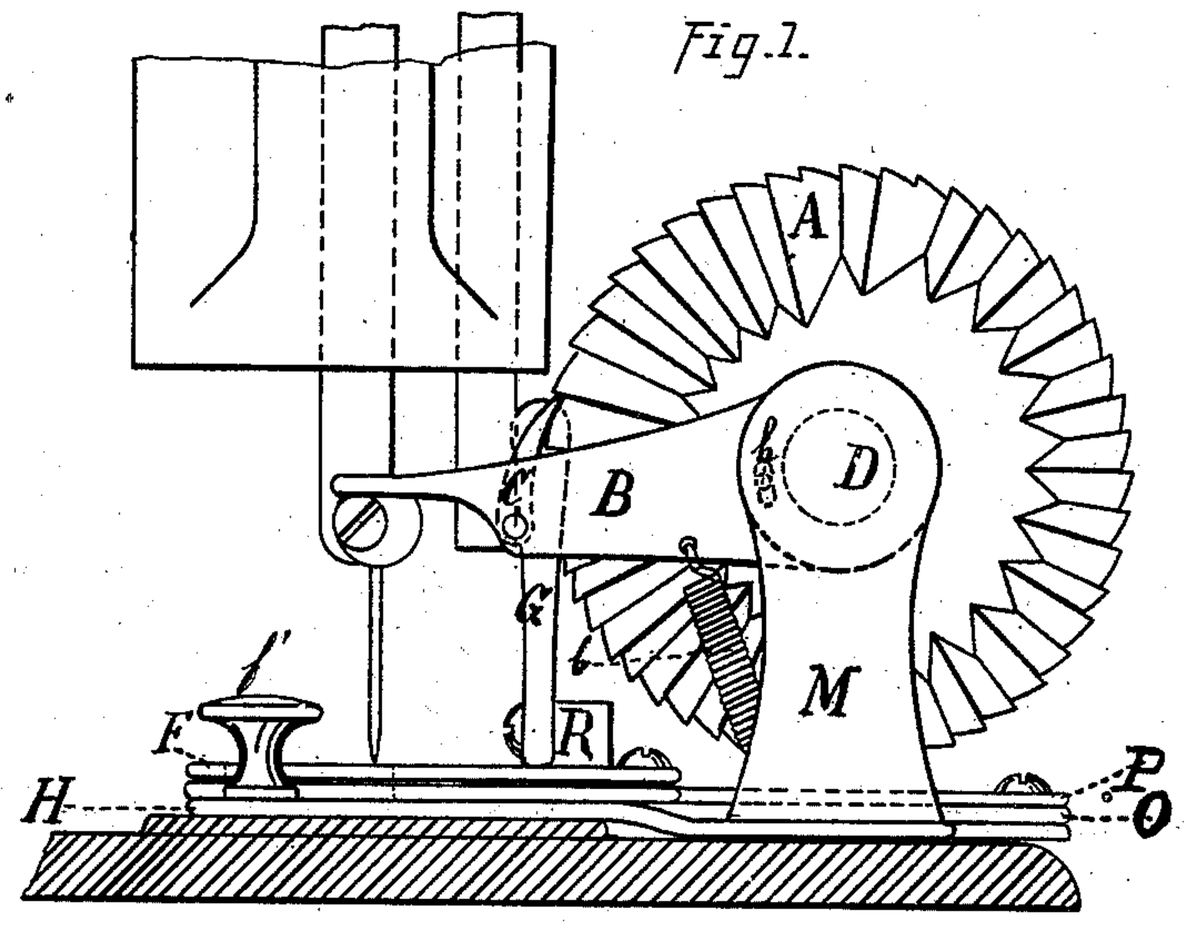
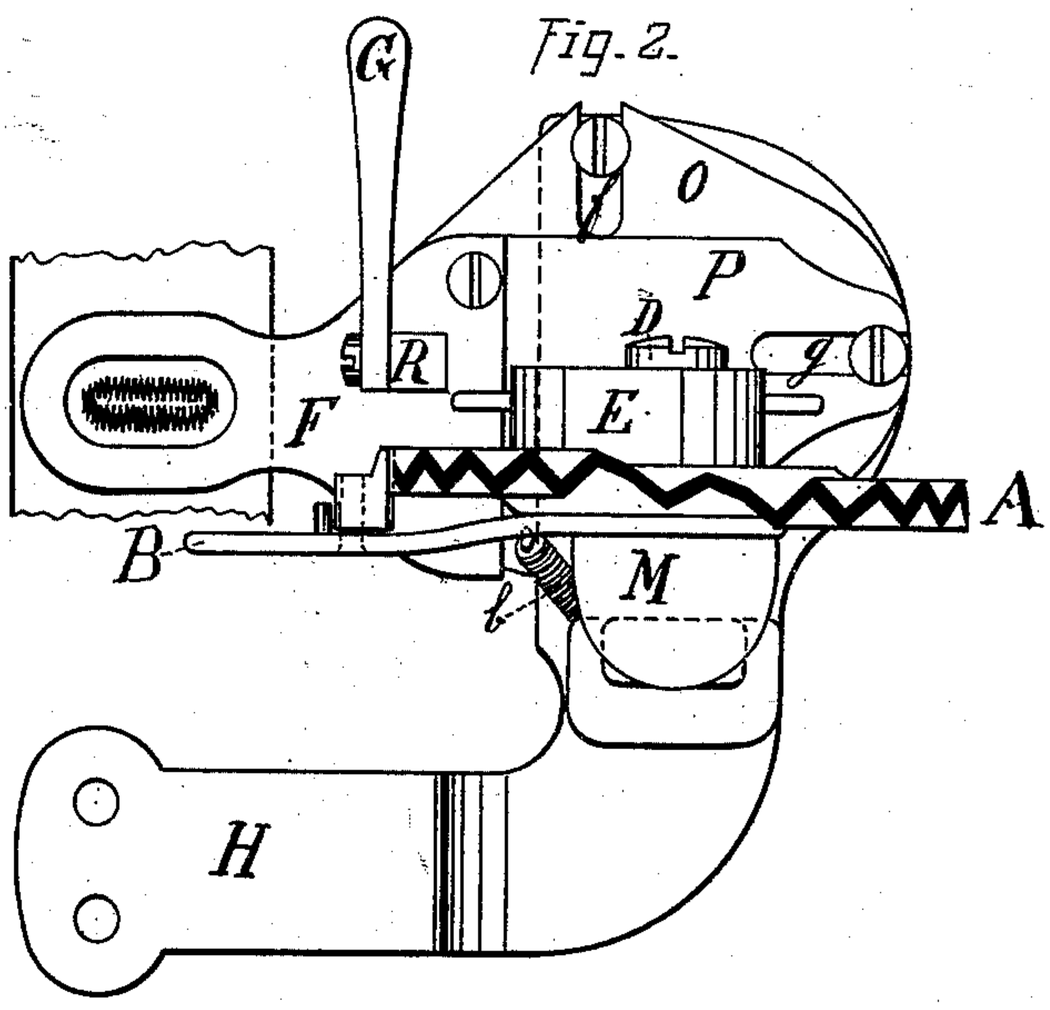


Fig. 2.



WITNESSES=

H. Handenbergh

Jno. Scott

INVENTOR

Philip Diehl

by his attorney

Sydney A. Bennett

(Model.) 2 Sheets—Sheet 2.

P. DIEHL.

BUTTON HOLE ATTACHMENT FOR SEWING MACHINES.

No. 270,290. Patented Jan. 9, 1883.

Fig. 3.

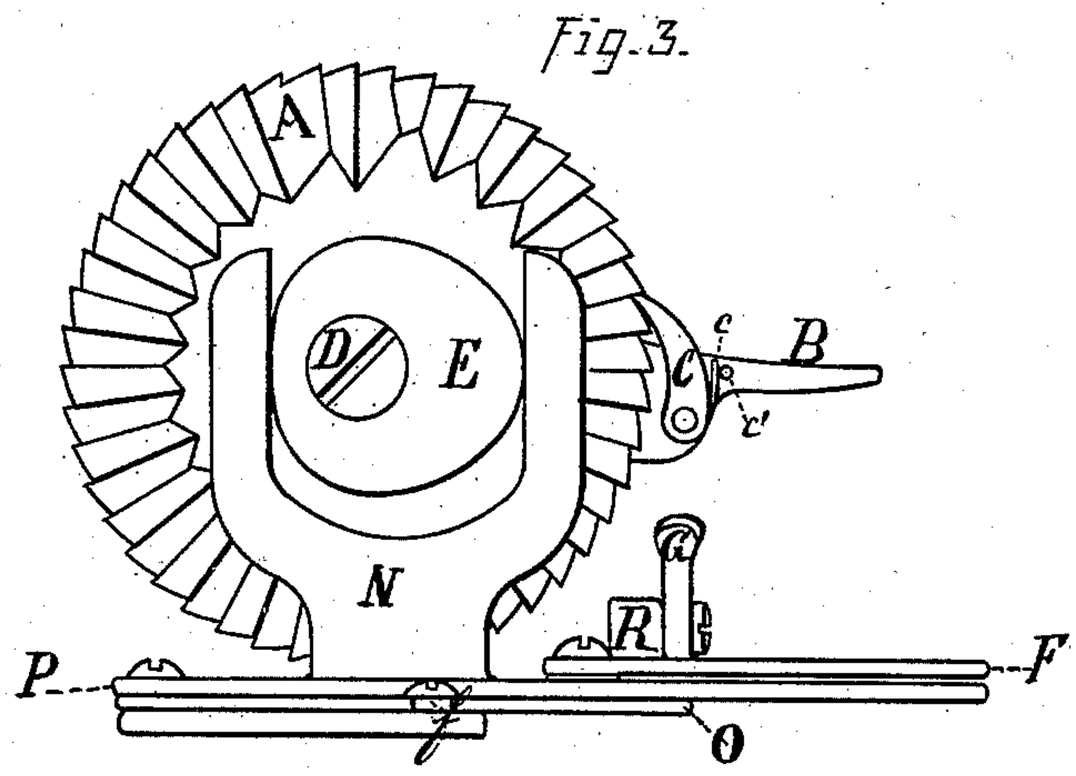
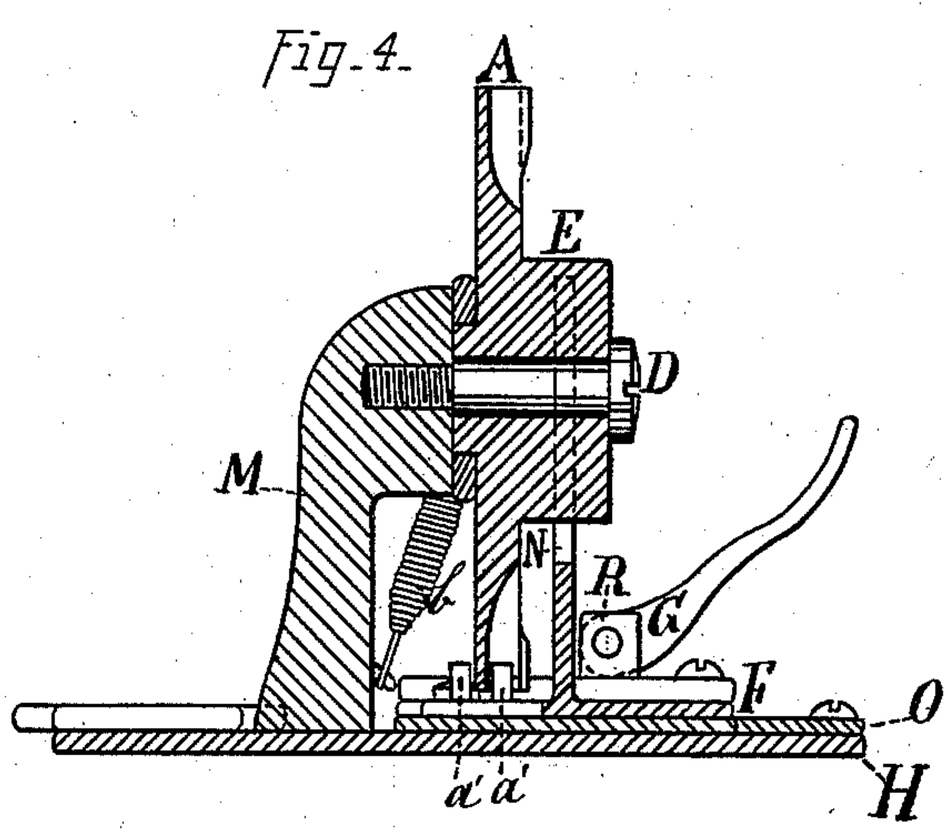
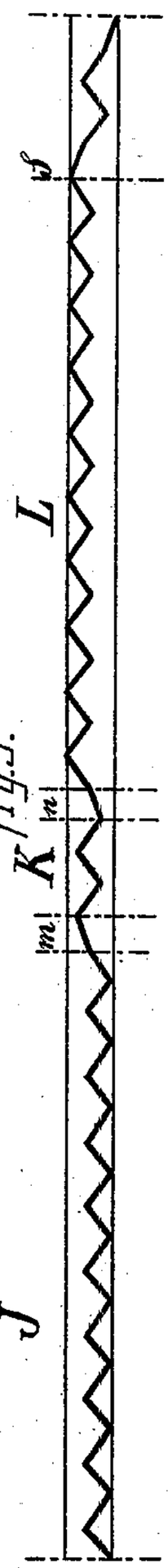


Fig. 4.





WITNESSES:
I. C. Vardenbergh
M. Scott

INVENTOR
Philip Diehl
by his attorney
Sydney A Bennett

UNITED STATES PATENT OFFICE.

PHILIP DIEHL, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO THE SINGER MANUFACTURING COMPANY, OF NEW JERSEY.

BUTTON-HOLE ATTACHMENT FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 270,290, dated January 9, 1883.

Application filed April 8, 1880. (Model.)

To all whom it may concern:

Be it known that I, PHILIP DIEHL, of Elizabeth, in the county of Union and State of New Jersey, have made an invention of certain new and useful Improvements in Button-Hole Attachments for Sewing-Machines; and I do hereby declare that the following is a full, clear, and exact description and specification of the same.

This invention relates especially to the method of communicating to a clamp or other device for holding the material to be sewed the movements necessary to form button-hole, zigzag, or overseaming stitches through the intervention of mechanism adapted to be operated by some working part of an ordinary sewing-machine; and it consists of certain constructions and combinations of mechanical devices, which are set forth in detail in the claims at the close of this specification.

In the drawings, Figure 1 represents a side view of such an attachment, showing especially the method by which motion is given to the corrugated ratchet-wheel, and showing also one method of applying the attachment to an ordinary sewing-machine. Fig. 2 is a top view of said attachment, showing especially the periphery of the said corrugated wheel, and also showing a button-hole worked in the clamp. Fig. 3 is a view of the attachment on the side opposite to that shown in Fig. 1, and shows especially the device for advancing and retracting the clamp. Fig. 4 is a view in cross-section on a vertical line drawn through the center of the corrugated wheel, showing especially the manner in which the alternately-inclined surfaces of said wheel act on the pins attached to the clamp-plate to give the clamp the necessary vibratory or reciprocating motions. Fig. 5 is a plan of the periphery of the driving-wheel, showing how corrugations or alternately-inclined surfaces are formed to produce a series of movements of the clamp corresponding with the stitches required.

In the attachment shown in Figs. 1 to 5, inclusive, and embodying my said inventions in the best form in which I have embodied them at the present date, H, Fig. 2, is a bed-plate, to which the other parts are secured, and which is adapted to be attached to the bed of a sewing-machine, as shown at Fig. 1, by the common guide thumb-screw, *f'*. Upon this bed-plate H rests a lower plate, O, from the upper surface of which rise two pins or projections, *a' a'*, Fig. 4, with sufficient space between them to admit the periphery of the wheel A, and so arranged as to be alternately encountered by opposite inclines of said wheel when it is rotated, as hereinafter described. This lower plate is so secured to the bed-plate by screw-pins acting in slots (one of which is shown at *f*) cut in or nearly in the direction in which the clamp is to be vibrated or reciprocated that it can only be moved horizontally in the direction of said slots. To this lower plate, O, an upper plate, P, is so secured by upper and under screw-pins acting in slots (one of which is shown at *g*) cut in or nearly in the direction in which the clamp is to be advanced and retracted (and at right angles, or nearly so, to the slots in the lower plates) that while partaking of the vibrating motion of the lower plate it can also slide horizontally over said plate O in the direction of the said upper-plate slots *g*. This upper plate is extended forward to form the lower jaw of an ordinary clamp, F, which must hold the material under the needle of the machine on which the attachment is used. This clamp F is slotted to permit the passage of said needle in sewing a button-hole, and its upper jaw is made to open and close to clasp or release the material by the action of the cam-lever G, pivoted to the post R. From this upper plate, P, rises the fork N, Fig. 3, formed to fit and work on the cam E, and rigidly attached at its base to said upper plate, P, so that said plate must partake of any movement communicated to said fork by the action of said cam E.

From the bed-plate H rises a curved standard, M, whose office is to receive the screw-threaded end of the shaft D and sustain said shaft, with the corrugated wheel A and ratchet-lever B, in their proper positions above said plates. On this shaft D is placed the corrugated ratchet-wheel A, provided with the cam E, and between said wheel and said standard is placed the ratchet-lever B, provided with the pallet C, a small spring, *c*, and stud *c'*, to cause said pallet to press against the

outer edge of said wheel A, and also with the spiral spring *b* and stop *h*, said stop *h* being a stud placed on the standard M and acting in a slot in the ratchet-lever B, so as to keep said lever up in its proper working position, and where it will not be encountered by the clamp or projection from the needle-bar, in the manner hereinafter described, until said bar has risen far enough to draw the point of the needle out of the material being sewed. The said wheel A is formed as a ratchet-wheel, having inclined teeth on its outer edge, so that when the free end of the ratchet-lever B is allowed to rest over the needle-clamp or other projection from the vertically-reciprocating needle-bar of an ordinary sewing-machine in the position shown at Fig. 1 each upward motion of said bar will raise the ratchet-lever, force the pallet C against a tooth of said wheel, and move said wheel. With each downward motion of said bar the pressure on the lever will cease, the lever will be retracted by the spiral spring *b* against the stop *h*, and thus by a proper arrangement an intermittent rotary motion may be given to said wheel A, corresponding in time with the reciprocating motion of such needle-bar. The sides of this wheel A, toward its outer circumference, are corrugated or formed with alternately-inclined or zigzag surfaces, corresponding in number with the inclined teeth on its periphery, and said wheel is so arranged that as it is rotated by the action of the ratchet-lever these inclined surfaces will alternately encounter the pins *a' a'*. Said pins *a' a'* being rigidly attached to plate O, which is free to move only horizontally in the line of its slots, which are at right angles, or nearly so, to the line of motion of said wheel, it is evident that when said wheel is rotated as each pin is encountered by an inclined surface of said wheel and pressed outward by its action it will move horizontally, carrying the plate O with it in the line of the said slots, and bring the pin on the opposite side of said wheel into position to encounter an oppositely-inclined surface of said wheel, and be in turn moved horizontally in an opposite direction in the line of said slots, thus giving to said plate O, and to the plate P and clamp F, secured to it, a horizontally vibrating or reciprocating motion, the extent of which will be governed primarily by the formation of the inclines on said wheel. As said wheel A is rotated it must also give motion to the cam E, and said cam is so formed that this movement will cause the fork N to be advanced and retracted in a horizontal line at right angles to the axis of the wheel A once with every complete revolution of said wheel, carrying with it the upper plate, P, and the clamp F.

In order to produce automatically the two parallel rows of zigzag stitching and the stitches across at either end, technically termed the "barring-off" stitches, which are necessary to make a good practical button-hole, the corrugations of the wheel A are formed as shown in the plan view of its periphery in Fig. 5. The rotation of said wheel A during the time the alternate inclines shown in section J are acting on the pins *a' a'* (the clamp F being at the same time advanced by the action of the cam E on the fork N) will produce the regular vibrations of the clamp necessary to form the row of zigzag stitching for one side of the button-hole. At section *m*, instead of reversing the incline, as before, another incline is formed in the same general direction, but at a less angle, the action of which will be to shift the clamp farther over. At section K the limit of the forward movement is reached, the clamp is vibrated, so as to produce a barring-off stitch, and the retrograde movement commences. At section *n*, by a similar formation of inclines, the clamp is again shifted over, and as it is retracted is regularly vibrated by the action of section L until the point *s* is reached, when it is shifted, as before, and another barring-off movement completes a button-hole stitched and ready for cutting. Thus it will be seen that by this attachment with every revolution of its wheel all the movements necessary to produce a complete button-hole from the ordinary stitch of a sewing-machine will be automatically communicated to the clamp, no matter from what point the revolution commences.

It is evident that the form of these corrugations or inclines may be varied at will to produce corresponding movements of the clamp and effects of stitching. It is also evident that the wheel may receive the necessary motion by connection with any regularly-moving part of a sewing-machine—as, for instance, with a vibrating arm in machines where such an arm is used instead of a reciprocating needle-bar.

I am aware that the movements necessary to form the stitching for a complete button-hole have heretofore been automatically communicated to a clamp by special and more complicated mechanism; but, so far as I know or believe, this has never been done in a simple removable attachment by the intervention of a single wheel.

I claim as my invention—

1. A button-hole attachment consisting substantially of a wheel suitably supported, provided with alternate and extended inclines and with a cam, of a clamp adapted to receive motions from said inclines and cam, and of mechanism whereby an intermittent rotary motion is communicated to said wheel by contact with a regularly-moving member of a sewing-machine, all substantially as and for the purposes set forth.

2. In a button-hole attachment for a sewing-machine, the wheel A, provided with mechanism for rotating it by connection with some regularly-moving member of a sewing-machine, and formed with a series of alternate and extended inclines and with a cam, both adapted to act on a clamp, substantially in the manner and for the purposes described.

3. In a button-hole attachment adapted to

be operated by connection with a sewing-machine, the combination of the ratchet-lever B, provided with the pallet C, spring *c*, stud *c'*, and stop *h*, with the bed-plate H, standard M, shaft D, and wheel A, substantially as shown and described.

4. In a button-hole attachment for a sewing-machine, the combination, with the bed-plate H, lower plate O, provided with the pins or projections *a' a'*, and upper plate, P, provided with the fork N and clamp F, all formed, arranged, and secured together substantially as shown and described, of the wheel A, provided with cam E, and the ratchet, with its pallet, spring, stud, and stop, substantially in the manner and for the purposes described.

PHILIP DIEHL.

Witnesses:
LEWIS BAAR,
FRED W. PRATT.