(Model.) 3 Sheets—Sheet 1.

W. KOCH.

SEWING MACHINE.

No. 262,298. Patented Aug. 8, 1882.

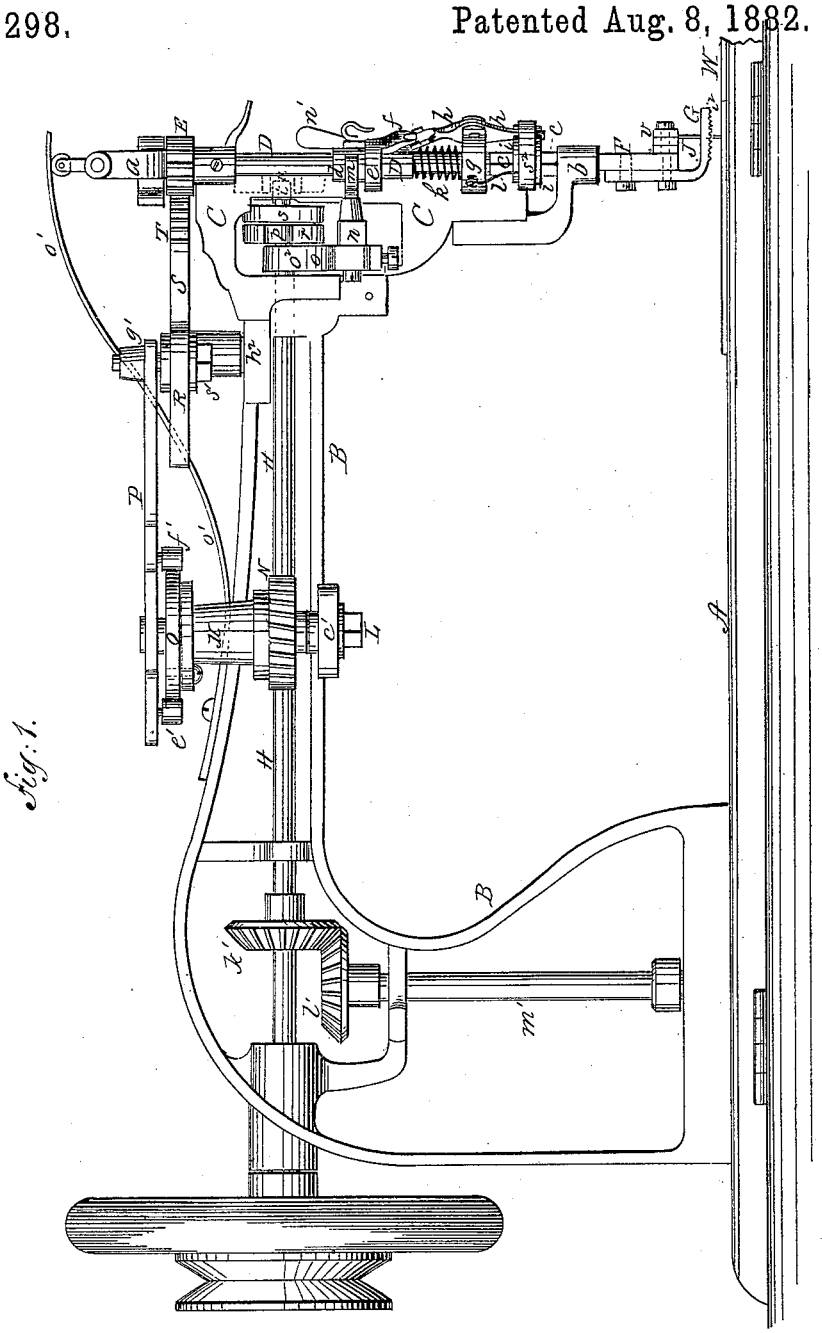

Fig. 1.

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Fig. 2.

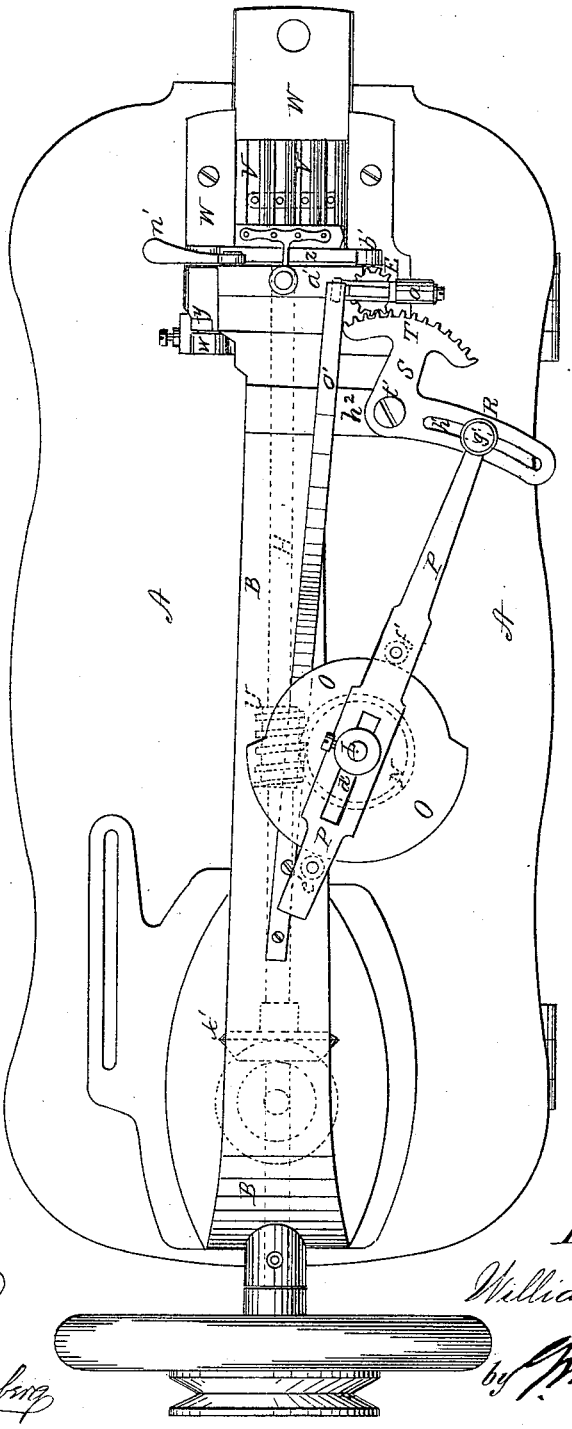

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Fig: 3.

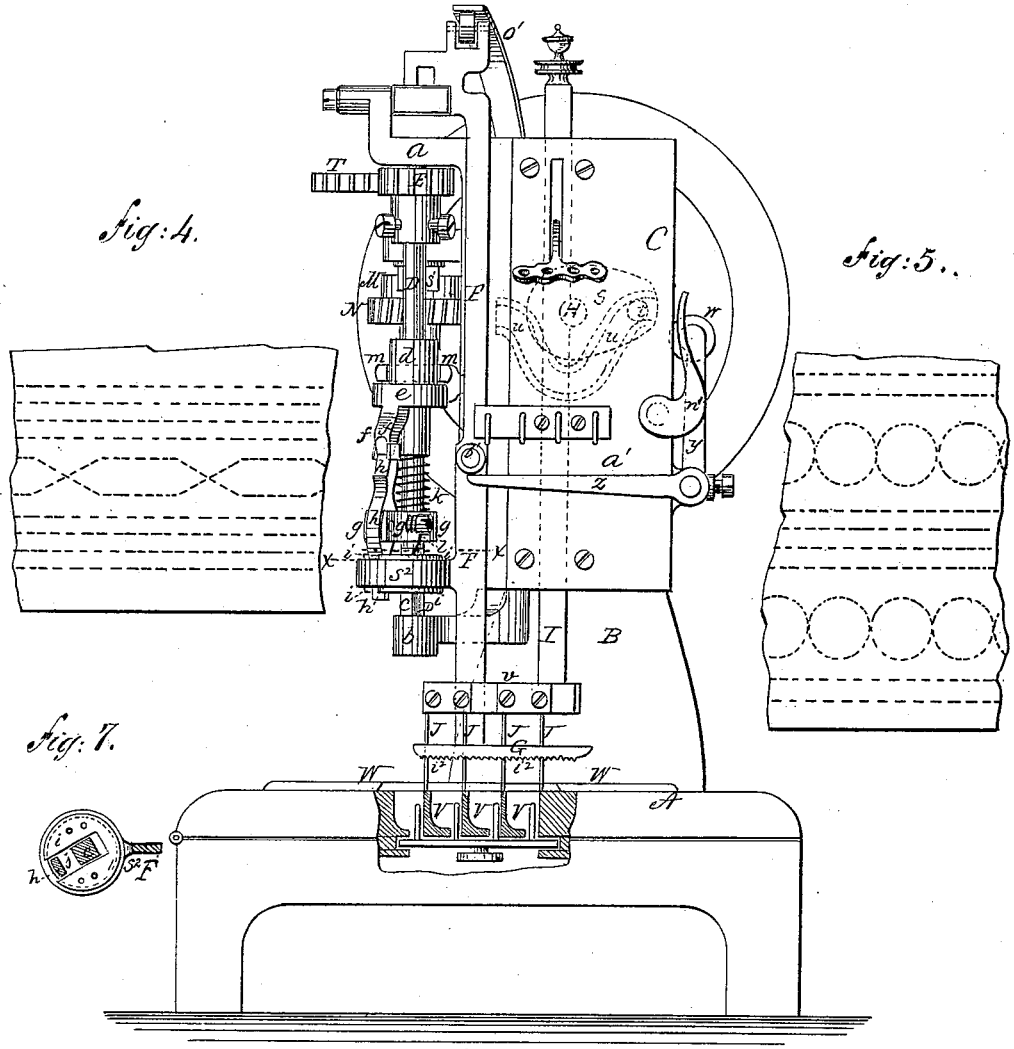
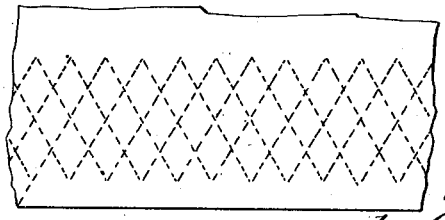


Fig: 4.

Fig: 5.

Fig: 7.

Fig: 6.



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UNITED STATES PATENT OFFICE.

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SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 262,298, dated August 8, 1882.

Application filed June 15, 1881. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM KOCH, of the city, county, and State of New York, have invented a new and Improved Sewing-Machine; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making part of this specification.

This invention is in the nature of an improvement in sewing-machines; and the invention consists in a sewing-machine constructed with a presser-foot feed mechanism and provided and combined with the pattern-cam and the other mechanism hereinafter particularly described, whereby the presser-foot feed will be automatically adjusted to any given pattern of embroidery or otherwise it is desired to produce with the machine.

In the accompanying sheets of drawings, Figure 1 represents a side elevation of my machine; Fig. 2, a plan or top view; Fig. 3, a front elevation, partly sectional, of the machine; Fig. 4, 5, and 6, specimens of embroidery produced by my machine automatically; and Fig. 7, a section of shaft and collar in line *x x*, Fig. 3.

Similar letters of reference indicate like parts in the several figures.

This invention relates more particularly to an improvement on the sewing-machine heretofore patented to Antoine Bonnaz on the 10th day of November, 1868—that is, a machine where the several working parts are so combined that a universal feed-motion causes the cloth to move in any direction desired, and so that the needles which make the stitch may move in combination with the feed-motion, so as not to change their relative positions to each other, and in this way be enabled to embroider work of any given design while the machine is running at any desired speed. The construction and operation of this Bonnaz machine, however, is such that in order to change the direction of the stitches, as in embroidering, it is necessary to perform this operation by hand—that is, by turning a crank each time the direction of the stitch is changed so that the looper, needle-bar carrier, and other mechanism may be made to accommodate themselves to the change of direction of the sewing, as in sewing or embroidering at sharp angles. In the Bonnaz machine as now constructed this can only be done by instantly arresting the motion of the machine and by suddenly turning a crank to the desired angle and again starting the machine; but by reason of my improvement the sewing and feeding mechanism of the Bonnaz sewing-machine or similar machines with a universal feed attachment is made to operate so that the change of direction of the feed is accomplished automatically, the feed being enabled to adapt itself to any desired direction or combination of movements, so that the cloth which is fed by it will be carried by such movements or movement of the feed to the angle or curve that is sought to be produced in the design that is being formed by the sewing of the machine automatically and without the assistance of the operator, and without slowing or stopping the machine, but while it is running continuously at any desired speed.

To accomplish this I construct my machine with a bed-plate, A, onto which is cast a supporting-arm, B, the front end of which terminates in a head, C. To this head are fixed bearings *a* and *b*, which support the upper and lower ends of a vertical shaft, D. A portion, *c*, of this shaft is square in section, and the rest of the shaft is cylindrical. Onto this shaft D, near its upper end, is fitted a gear-wheel, E. Below this wheel is also fitted a sleeve, *d*, with a collar, *e*, surrounding the same, and to this collar is secured a projecting arm, *f*; also, to the shaft D, and below the sleeve *d*, is immovably fixed a bracket, *g*, to which is pivoted a lever, *h*, the lower part of this lever passing through a collar, *i*, and the upper part passes beneath the projecting arm *f*. Through this collar *i* passes the squared part *c* of the shaft D, and for that purpose a slot, *j*, is formed in the collar *i*, so that the collar may have a certain degree of lateral motion or play, as will be more particularly described hereinafter. The rim s^2 of this collar *i*, at its rear side, is fixed to a vertical feed or presser-foot bar, F, to the lower end of which is secured a presser-foot, G, with teeth i^2 formed on its under side; also, onto the shaft D, and between the sleeve *d* and bracket *g*, is fitted a spiral spring, *k*, and fixed

to the bracket *g*, passing downward into the collar *i*, are two spring-wires, *l*. Surrounding the sleeve *d*, and resting upon the upper surface of the collar *e* of the same, is a fork, *m*, which is fixed at its rear end to one arm, *n*, of a bell-crank lever, *o*, the other or upper end, o^2, of this lever being provided with a friction-roller, *p*, which bears upon the periphery of a cam, *r*, secured to the front end of the driving-shaft H, to which front end of this shaft is also fixed a cam, *s*, with a pin, *t*, eccentrically secured to it. This pin *t* travels in a semicircular track, *u*, at the rear side of the needle-carrying bar I, to the lower end of which bar is secured the arm *v*, to which are fixed two or more needles, J. The needle-carrying bar I has a vertical motion in suitable bearings formed in the head C of the arm B. The periphery of the cam *s* also bears against a friction-roller, *w*, borne on the upper end of an arm, *y*, of a bell-crank lever, the other arm, *z*, of which extends across the face-plate *a'* and beneath a stud, *b'*, projecting from the presser-foot or feed-bar F.

Cast or otherwise secured to the supporting-arm B of the machine, about midway of its length, is a bracket, *c'*, to which bracket is rigidly fixed a shaft, L, onto which shaft is fitted a sleeve, M, the lower end of which sleeve is provided with a worm-wheel, N, and its upper end with a removably-fixed pattern-cam, O. Extending across the upper surface of the cam O is a connecting-bar, P, with a guide-slot, *d'*, formed therein, and with studs *e'* and *f'* projecting from its under surface. Through this guide-slot passes the upper end of the shaft L, and against the studs *e' f'* bears the periphery of the pattern-cam O. The front end of the bar P has fixed to it a projecting stud, *g'*, which is received into a curved slot, *h'*, in a curved arm, R, of a bell-crank lever, the other arm, S, of which lever terminates in a curved rack, T, the gears of which rack mesh into the gears of the gear-wheel E, before mentioned as secured to the vertical shaft D. This bell-crank lever, composed of the arms R and S, is supported by a bracket, h^2, cast or otherwise fixed to the supporting-arm B.

Onto the driving-shaft H is fitted a worm, U, which meshes into the gears of the worm-wheel N, and also to the driving-shaft, near its rear end, is secured a bevel-gear wheel, *k'*, which meshes into the gears of a bevel-wheel, *l'*, fixed to a vertical revolving-shaft, *m'*.

To the under side of the bed-plate A are placed the ordinary shuttle-carriers, V, which are not particularly described, since they form no part of my invention.

Now, my sewing-machine, when constructed substantially as is hereinbefore described, is operated in this wise: Power being applied to the driving-shaft H in any desirable manner, the usual vertical reciprocating motion is imparted to the needle-carrying bar I by the operation of the cam *s* on the end of the driving-shaft H, and the pin *t*, projecting therefrom, causing the needles J to reciprocate vertically. The material to be sewed or embroidered is placed on the cloth-plate W in the ordinary way, and the presser-foot G, by means of any of the ordinary sewing-machine devices for such purpose, is brought down in contact with the cloth. When this is done the friction-roller *w* on the arm *y* is brought against the periphery of the cam *s*, which by its operation causes the arm *z* to lift the presser-foot at intervals from the surface of the cloth, to be again restored to it by the action of a spring, *o'*, fixed to the supporting-arm B and bearing down upon the upper end of the feed or presser-foot bar F, so that this presser-foot will have an up-and-down motion. As the fabric is in this way sewed or embroidered, the driving-shaft H, continuing to revolve, causes the cam *r*, on the end of the driving-shaft H, to bear at intervals against the friction-wheel *p* on the end of the arm o^2 of the bell-crank lever *o*, forcing downward the fork *m*, fixed to the other arm, *n*, of this bell-crank lever *o*, and as this fork is in this way forced down, it bearing against the collar *e* on the sleeve *d*, this sleeve is likewise forced down on the shaft D, causing the projecting arm *f*, which forms part of the collar *e* on said sleeve, to engage with the upper end of the pivoted lever *h*, thereby forcing the lower end of said lever outward and against one side of the rim s^2 of the collar *i*, forcing this collar in a given horizontal direction, the slot *j* in the collar permitting this, and as the collar is in this way forced outward or horizontally it carries with it in this movement the feed or presser-foot bar F, and the feed or presser foot G also. This action of the pivoted lever *h* ceases the instant that the cam *r* passes the friction-roller *p*, at which time the spiral spring *k* on the shaft D, which had been compressed by the downward forcing of the collar *e* on that shaft, by its elasticity forces upward the sleeve *d*, releasing the upper end of the pivoted lever *h* from the action of the projecting arm *f* on the collar *e*, when the spring-wires *l* return the collar *i* to the position from which it had been forced by the action of the pivoted lever *h*, just described, and in this way, by the alternate action of this pivoted lever and the action of the coiled spring *k* and spring-wires *l*, the collar *i*, and consequently the presser-foot or feed bar F, and the presser-foot G itself, is caused to have at intervals a slight horizontal reciprocating movement, as well as a vertically-reciprocating one. The horizontal movement of the presser-foot or feed F, it may be well to mention, when caused by the action of the pivoted lever *h*, occurs always when the presser-foot is on the fabric that is being sewed, and since the under side of this presser-foot is provided with teeth i^2, it carries, forces, or feeds the fabric on which it rests in the direction in which it is horizontally forced. The return horizontal movement of the presser-foot, by the action of the coiled spring *k* and spring-wires *l*, takes place only when the presser-foot is raised from the fabric. Therefore, the return

horizontal movement of the presser-foot produces no feeding movement of the fabric beyond giving the needles an opportunity of sewing the fabric as it is fed in a given direction beneath them by the pushing action of the presser-foot when operated by the pivoted lever *h*, so that the fabric is in fact fed in a given direction by the presser-foot by a series of horizontal pushes of the presser-foot. Now it is clear that if the fabric is in this way fed to the action of the needles at any given angle to the needles the stitches which will be formed in the fabric will necessarily be parallel to the direction in which the fabric has been fed, so that if this direction of the feed is changed from time to time the stitches on the fabric may be made to assume various designs—such as diamond-patterns, circles, scrolls, &c.—in fact, any given design, and so produce an embroidered pattern. In Fig. 6 the diagonal crossing lines are produced by the operation of the mechanism herein shown. The pattern shown in Fig. 4 is produced by running the material through the machine in straight lines, the requisite number and disposition of the needles having been previously secured, after which the crossed lines are made by a suitable cam; and in like manner the pattern in Fig. 5 is made by straight-stitching first and then making the circles by a suitably-shaped cam operating the mechanism. Other and more intricate designs or patterns may be similarly made.

To accomplish the required change in the feed movement of the machine, it is necessary to turn the shaft D, to which, as before stated, is secured all the mechanism which operates the horizontal movement or motion of the feed. Now, in the sewing-machine patented by Bonnaz, before referred to, this turning of the shaft D for the purpose of changing the direction of the feed had to be accomplished by a crank-lever moved by the hand of the operator from time to time, as the change of direction in the feed was desired, keeping the operator constantly on the alert, and causing much irregularity in the designs produced. In my machine this change of direction of the feed and for any given design is accomplished automatically, for as the driving-shaft H revolves in the manner before stated the worm U on this shaft engages with the worm-wheel N on the sleeve M, causing that sleeve to revolve, and likewise the pattern-cam O. Now, as this cam in this way turns, certain portions of its periphery are brought at intervals in contact with the studs *e' f'* on the bar P, causing this lever to be alternately thrust forward and backward, the slot *d'*, formed in the bar, permitting this movement, and as this bar is by this means thrust forward and backward the projecting stud *g'*, secured to its front end, and which passes through the curved slot *h'* in the arm R, forces the arm R forward or backward, as the case may be, causing the bell-crank lever, which is composed of the arms R and S, to turn on its pivotal point, thereby imparting a horizontal motion to the curved rack T, which is secured to the extremity of the arm S, and since this curved rack meshes into the gears of the gear-wheel E, secured to the shaft D, this shaft D is secured to turn in its bearings *a b* to an extent equal to the movement of the curved rack T, which movement is governed by the extent of the forward or backward thrust of the connecting-bar P, and which thrust is given by the shape of the pattern-cam O. As the shaft D turns the pivoted lever *h* moves with it, and the collar *i* likewise turns in the required direction within its rim s^2. The extent of the forward or backward motion of the bar P may be regulated, however, by changing the point at which the projecting stud *g'* at the forward end of the bar P is fastened within the curved slot *h'* of the arm R. This adjustment is accomplished by means of a set-screw, *s'*, on the projecting stud *g'*, for as the point of attachment of the front end of the bar P is shifted in the curved slot *h'* farther from or nearer to the pivotal point *t'* of the curved arm R it is clear that the leverage of this arm R will be increased or diminished, and therefore the horizontal movement or throw of the curved rack T is likewise increased or diminished in extent, and so, also, is the turning of the gear-wheel E, fixed to the shaft D, increased or diminished, and consequently the turning of that shaft itself, and the angle of the horizontal movement of the presser-foot or feed widened or contracted, resulting in a more or less widening of the angle that is being formed on the fabric.

To produce on the fabric, however, designs of various kinds of embroidery, it is necessary to place on the sleeve M a pattern-cam with a periphery of such form as will cause the turning of the shaft D at greater or less intervals, so that the fabric to be embroidered will be fed more or less quickly in different directions, a separate pattern-cam O being provided for each design that is to be embroidered, whether it be a diamond, scroll, circle, letters, or any other desired design. The cam O, when in place, however, for the purpose of producing a given design, need not be again changed until it is desired to produce some other design. The pattern-cam O once in place and the bar P properly adjusted in the curved slot *h'* in the arm R, nothing further need be done toward the adjustment of the machine; but it can then be allowed to run continuously, and as it runs the embroidery is produced on the fabric in the manner before described. As the driving shaft H revolves motion is imparted to the shuttle-carriers through the bevel-wheels *k'* and *l'* and shaft *m'*.

If it is desired at any time to increase or diminish the number of stitches to be made in a given direction, then the worm-wheel N may be removed and a worm-wheel with a greater or less number of gears in it be substituted.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a sewing-machine, a presser-foot, in combination with a presser-foot-carrying bar, a vertical shaft, a collar operating in conjunction with said bar and shaft and adapted to have a horizontal motion, a geared wheel fixed to said vertical shaft, a bell-crank lever with a curved rack and slotted arm, a pattern-cam, and a bar for connecting said arm and cam, substantially as and for the purpose described.

2. In a sewing-machine with a presser-foot feed, the following elements in combination: a worm fixed to the driving-shaft of the machine, a worm-wheel engaging therewith, a pattern-cam, a bell-crank lever with one arm slotted and connected by a rod or bar with the cam and the other arm provided with a curved rack, and a gear-wheel fixed to a vertical shaft constructed to turn in its bearings, whereby the horizontal motion of the feed may be automatically effected, substantially as and for the purpose described.

3. In a sewing-machine, the combination of a presser-foot, a vertical bar carrying said foot, a horizontally-movable collar connected with said bar, a vertical shaft, D, a pivoted lever, *h*, sliding sleeve *d*, with collar and projecting arm *f*, a fork and mechanism for operating the same, a bell-crank lever, a connecting-bar, a pattern-cam, and a gear-wheel fixed to said vertical shaft, all constructed and arranged to operate substantially as and for the purpose described.

4. In a sewing-machine, the presser-foot, its carrying-bar, a collar thereon, a vertical shaft extended through a slot in such collar, and adapted to be connected therewith, as described, an elbow-lever geared to said vertical shaft and having a slotted arm, a pattern-cam, O, deriving a rotary motion from the driving-shaft, substantially as shown, and a slotted bar, P, adjustably connected with the elbow or bell-crank lever and deriving motion from the cam by rollers fitted to its periphery, substantially as specified.

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