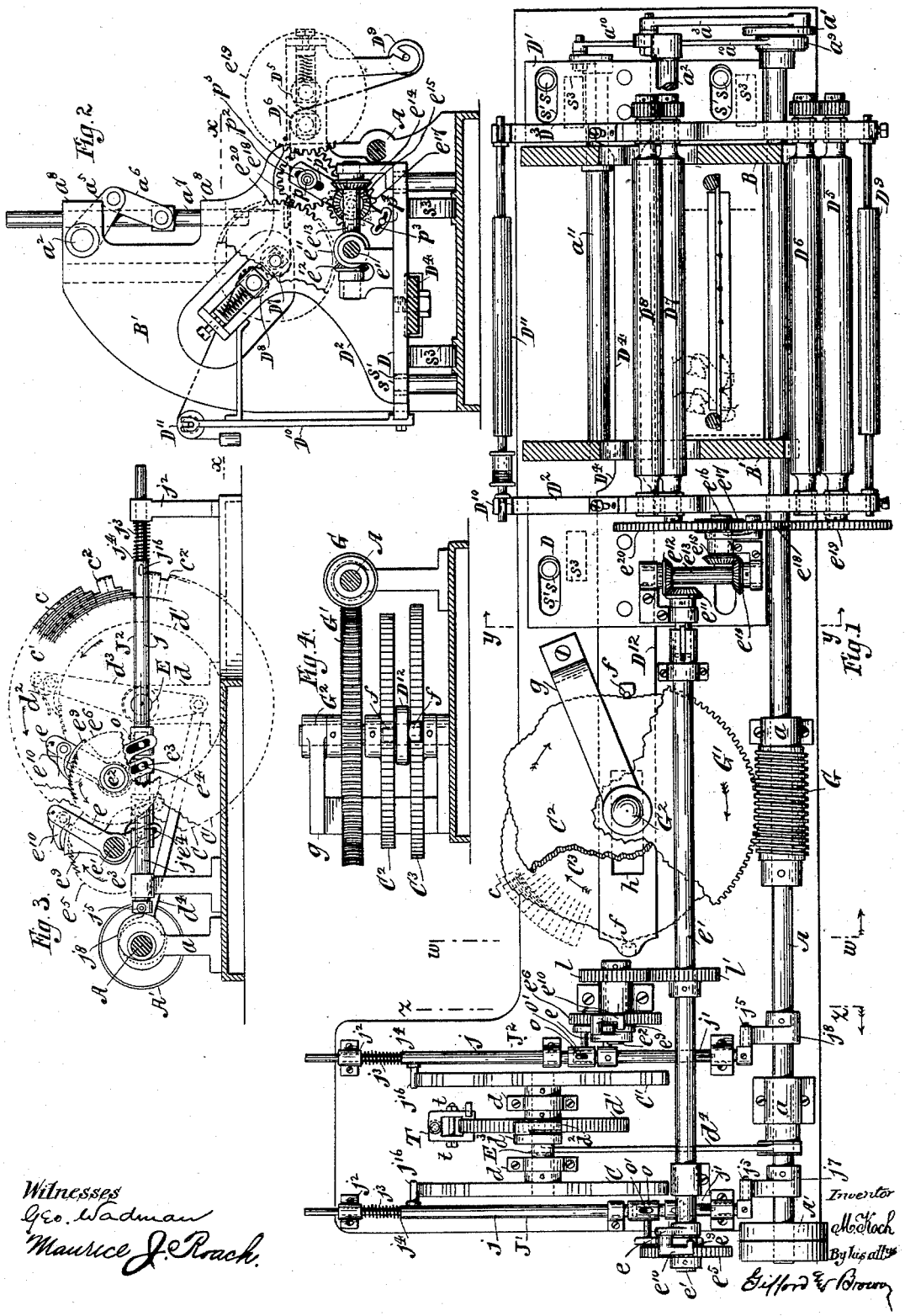
(No Model.) 3 Sheets—Sheet 1.

M. KOCH.

QUILTING MACHINE.

No. 456,726. Patented July 28, 1891.



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(No Model.) 3 Sheets—Sheet 2.

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Fig. 5

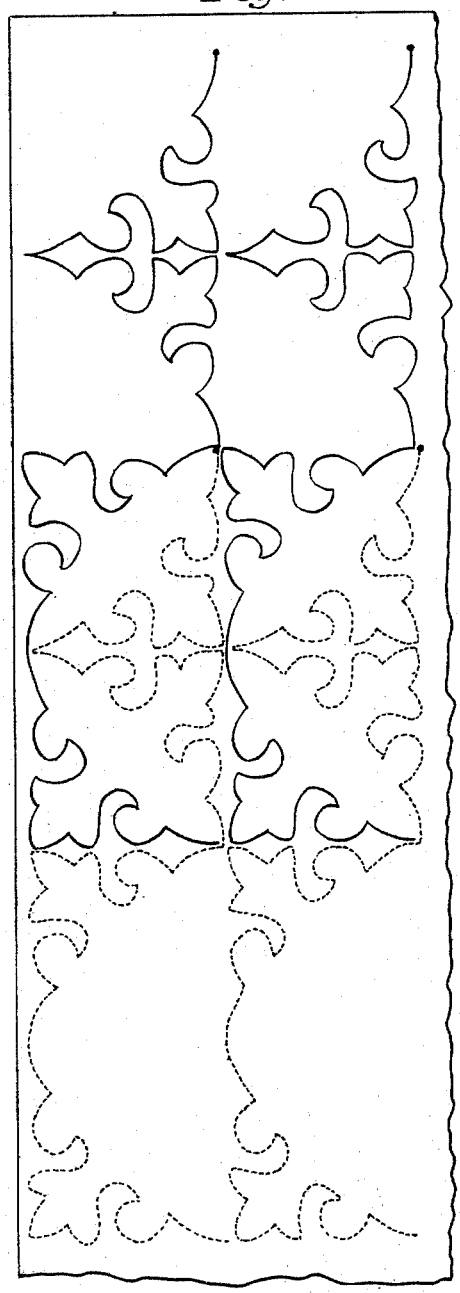
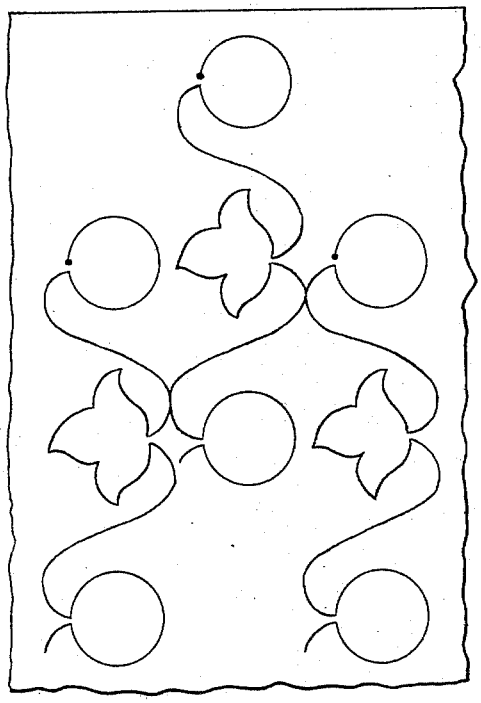


Fig. 6.



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QUILTING MACHINE.

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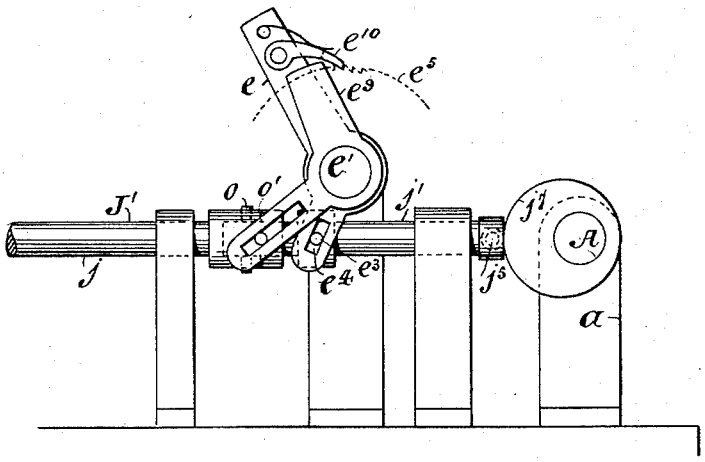
Fig. 1.



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UNITED STATES PATENT OFFICE.

MATTHIAS KOCH, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE EXCELSIOR QUILTING COMPANY, OF SAME PLACE.

QUILTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 456,726, dated July 28, 1891.

Application filed February 10, 1888. Serial No. 263,560. (No model.)

To all whom it may concern:

Be it known that I, MATTHIAS KOCH, of New York, in the county and State of New York, have invented a certain new and useful Improvement in Sewing-Machines, of which the following is a specification.

My improvement relates particularly to sewing-machines designed for making quilted fabrics.

I will describe in detail a sewing-machine embodying my improvement, and then point out the novel features in claims.

In the accompanying drawings, Figure 1 is a plan or top view of a sewing-machine embodying my improvement, a portion of the same being shown in section, the section being taken on the line *x x*, Fig. 2. Fig. 2 is a vertical section of the machine, taken on the plane of the dotted line *y y*, Fig. 1, and looking in the direction of the arrows at the ends of said line. Fig. 3 is a vertical section of the machine, taken on the plane of the line *z z*, Fig. 1, and looking in the direction of the arrow at one of the ends of said line. Fig. 4 is a transverse section showing in detail certain pattern-wheels for operating the same, the section being taken on the plane of the dotted line *w w* and looking in the direction of the arrow at one of the ends of said line. Figs. 5 and 6 illustrate different arrangements of needles and patterns which may be sewed by such arrangements. Fig. 7 is a detail view of certain parts on an enlarged scale.

Similar letters of reference designate corresponding parts in all the figures.

A designates the main shaft of the machine. Motion may be imparted to this shaft by means of a belt upon the pulley A′, rigidly keyed upon the shaft A. The shaft is journaled in suitable bearings *a*, mounted upon the bed of the machine, and also in upright portions B B′, comprising parts of the stationary frame of the machine.

Upon one end of the shaft A is mounted a crank a'. This crank imparts motion to a rock-shaft a^2 through an intermediate crank-rod a^3. The rock-shaft a^2 is journaled in suitable bearings in the portions B B′ of the frame, one of said bearings being shown more clearly in Fig. 2. Motion is transmitted from the rock-shaft to the needle-bar by arms a^5, rigidly connected to the rock-shaft and pivotally connected to links a^6, which are in turn pivotally connected to vertical sliding rods a^7, working in suitable guides a^8 in the frame. The needle-bar is rigidly secured to the rods a^7.

Upon the main shaft adjacent to the crank a' is an eccentric a^9, operating through an eccentric-rod a^{10} and rock-shaft a^{11} to impart motion to shuttle-drivers for operating the shuttles, which are of well-known construction and not shown in the drawings.

The usual presser-bar operated in the usual or any suitable manner is to be employed; but I have not illustrated the same in order to conduce to clearness in the drawings.

As the features thus far described do not constitute part of my invention, I have referred to them thus briefly.

In this machine I provide means for producing a reversal of the direction of the feed of the goods. In other words, the feed-rollers rotate at certain times to cause the goods to be fed in the direction of their length in one direction and at other times in the opposite direction. By these means various patterns may be sewed upon the goods, for the reason that by combining the side-to-side movement of the carriage carrying the feed-rollers and the reversed feed of the goods rows or lines of stitching may be sewed upon the goods in any desired direction.

I will first describe the means for imparting the side-to-side movement to the carriage in which the feed-rollers are mounted, premising with a short description of the said carriage and the feed-rollers. The carriage comprises two plates D D′, arranged horizontally and from which extend vertical side portions D^2 D^3. The side portions D^2 D^3 may, if desired, be made or cast integral with the bed-plates D D′. The plates D D′ are rigidly connected together by means of a reach D^4, extending beneath the plates D D′ and secured to said plates by bolts or otherwise. In the portions D^2 D^3 of the carriage are mounted feed-rollers D^5 D^6 D^7 D^8. As shown, the feed-rollers D^7 D^8 occupy a more elevated position than the feed-rollers D^5 D^6. A roller D^9 is mounted in brackets extending downwardly

from portions of the side frames D^2 D^3, and another roller D^{11} at the back of the machine is mounted in brackets D^{10}, secured, as shown, to the plates D D′ of the carriage. The rollers D^9 D^{11} constitute, respectively, delivery and take-up rollers, according to the direction in which the goods are being fed. I have shown the rollers D^5 D^6 geared together near one of their ends and the rollers D^7 D^8 also geared together near one of their ends, whereby motion is transmitted from one of said rollers to the other of the corresponding pair and the rollers are caused to rotate in unison. The plates D D′ of the carriage are guided in their movements to and fro by means of studs or pins *s*, extending upwardly from the bed-plate of the machine and through slots *s′* in the said plates D D′. The plates D D′ rest upon anti-friction rollers s^3 upon the bed-plate of the machine. By the use of the anti-friction rollers a side-to-side movement of the carriage is facilitated. A continuation D^{12} of the reach D^4, extending beyond the plate D of the carriage, has mounted upon it vertically-extending projections *f*. These projections are arranged in such position as to always bear upon the peripheries of certain pattern-cams C^2 C^3, by which the side-to-side movement of the carriage is effected and by which the degree and direction of such movement are controlled. One of said projections bears against the periphery of the cam C^2 and the other against the periphery of the cam C^3.

On the main shaft A is a worm G, which worm engages a worm-wheel G′, rigidly mounted upon a vertically-arranged shaft G^2, journaled in suitable bearings in a bracket *g*, secured to the bed-plate of the machine. The pattern-cams C^2 C^3 are rigidly keyed upon the shaft G^2, and they and the worm-wheel G′ rotate in unison. One of the pattern-cams C^2 C^3 causes the movable carriage to be moved in one direction and the other of said cams causes the carriage to be moved in the opposite direction. This movement is effected by the rotation of the said cams. It will be observed that the peripheries of the cams C^2 C^3 are stepped. By this mode of construction an intermittent movement of the carriage for the goods is accomplished. It will also be observed that the peripheries of these cams are of uneven contour. This unevenness of the contour is for the purpose of varying the degree or length of movement of the carriage in a given direction, so as to provide for variations in the figure or pattern being sewed upon the goods. These pattern-cams may be removed when desired and others substituted in their place for the purpose of effecting the sewing of other and different patterns. The portion D^{12} of the reach D^4 has in it a longitudinal slot *h*, through which the shaft G^2 extends, whereby provision is made for the free longitudinal movement of said portion D^{12}.

I will now describe the means by which the reverse feed of the goods is effected. E designates a shaft journaled in bearings *d*, secured upon the bed-plate of the machine. To this shaft is keyed a ratchet-wheel *d′*. Upon the ends of the shaft E are also keyed pattern-wheels C C′. Motion is transmitted to the shaft E and consequently to the pattern-wheels C C′ by means of an eccentric-rod d^4, which latter is pivotally connected with a rocking pawl-carrier d^3, loosely mounted upon the shaft E and carrying a spring-actuated pawl d^2, adapted to engage the teeth upon the ratchet-wheel *d′*. The construction of the parts is such that at each rotation of the main shaft A the pawl *d* d^2 will be caused to rotate the ratchet-wheel *d′* a distance equivalent to the distance between two of the teeth on said ratchet-wheel. The motion of the ratchet-wheel, and as a consequence that of the pattern-wheels C C′, is intermittent. I may here remark that the intermittent motions of the pattern-wheels C C′ C^2 C^3 are for the purpose of enabling the needles to remain for a sufficient time in the goods being sewed to effect the formation of the stitches through the co-operation of the shuttles. In this machine the pattern-wheel C is adapted for causing the rotation of the feed-rollers D^5 D^6 D^7 D^8 in a direction to feed the goods forward or toward the rear of the machine beneath the needles, while the pattern-wheel C′ is adapted to cause the rotation of the rollers D^5 D^6 D^7 D^8 in a reverse direction, in order to cause the feed of the goods backward or toward the front of the machine.

J′ J^2 are bars extending fore and aft the machine close to the pattern-wheels C C′. Each of the bars J′ J^2 is composed of two sections *j* *j′*. The ends of the section *j′* extend into sockets formed in the adjacent ends of the sections. A slight play of the sections *j′* in the sockets upon the sections *j* is provided for, and the extent of such play is limited by pins *o* upon the sections *j′*, extending through longitudinal slots *o′* in the sockets upon the sections *j*. The longer of these sections *j* extend near their rear ends through guides j^2 on a portion of the frame of the machine. Springs j^3, surrounding the rods between said guides and shoulders j^4 on the rods, tend to force the rods toward the front of the machine. The sections *j′* bear near their front ends rollers or bowls j^5, which may be acted upon by cams j^7 j^8, mounted on the main shaft to force the rods toward the rear.

Loosely hung upon shafts *e′* e^2, journaled in suitable bearings extending upwardly from the base of the machine, are arms *e*. These arms bear pawls e^{10} near their free ends, which are adapted to engage the teeth on ratchet-wheels e^5 e^6, keyed to the shafts *e′* e^2, respectively. The arms *e* have a loose connection with the sections *j′* of the rods J′ J^2. This connection consists of a pin e^3 upon the sections *j′* of said rods, which pin extends through longitudinal slots e^4 in the arms *e*. Also loosely hung upon the shafts *e′* e^2 are other arms e^9. These arms have a connection

with the sections j of the rods J′ J² similar to that described for the arms e. The upper ends of the arms e^9 extend beneath the pawls e^{10}. When these arms e^9 are moved far enough in one direction, they will lift the pawls out of engagement with the teeth on their respective ratchet-wheels. When the ratchet-wheel e^5 is rotated, it transmits motion to the shaft e' and to a gear-wheel e^{11}, mounted on a sliding section of said shaft, which section is journaled in bearings secured to the plate D of the carriage. This sliding section is connected by means of a feather or spline with the main portion of the shaft e', so that the sliding section may slide freely in the shaft e' and at the same time will be rotated with said shaft. The gear-wheel e^{11} meshes with a gear-wheel e^{12}, mounted upon a shaft e^{13}, journaled in suitable bearings upon the portion D of the carriage. Upon the shaft e^{13} is keyed another gear-wheel e^{14}, which meshes with a gear-wheel e^{15}, mounted upon a shaft e^{16}, journaled in bearings on the portion D of the carriage. The shaft e^{16} bears a gear-wheel e^{17}, which latter in turn meshes with an intermediate gear-wheel e^{18}. The intermediate gear-wheel e^{18} meshes with two gear-wheels e^{19} and e^{20}. The gear-wheel e^{19} is mounted upon the axle of the feed-roller D^5 and the gear-wheel e^{20} on the axle of the roller D^7. It will be quite evident that, according to the direction in which the shaft e' is rotated, the rollers D^5 D^6 D^7 D^8 will be rotated, so as to cause the feed of the goods either forward or backward.

I have shown the intermediate gear-wheel e^{18} as mounted upon a stud p, extending through a longitudinal slot p' in an adjustable bracket p^2. The bracket p^2 is loosely hung upon the shaft e^{16}, and its lower end is provided with an arc-shaped slot p^3, with which engages a clamping-screw p^4. The position of the gear-wheel e^{18} relatively to the gear-wheels e^{19} and e^{20} is maintained by means of a nut p^5, by which the stud p may be clamped to the bracket p^2. The means of mounting the gear-wheel e^{18}, just described, admits of the use of gear-wheels e^{18} of different sizes, as one may be readily removed and another substituted in its place. In other words, when the wheel e^{17} is taken off and another substituted, then a different-sized wheel e^{18} may be introduced between it and the wheels e^{19} e^{20}.

The slot in the bracket provides for the proper adjustment of the wheel substituted for the wheel e^{18}, and the rocking of the bracket p^2 also affords provision to accommodate the parts for the substitution of wheels. This substitution of wheels provides for a change in speed of movement of the fabric when it is desired to make a longer or shorter stitch. The rotation of the shaft e' in one direction is occasioned through the operation of the pawl e^{10}, acting upon the ratchet-wheel e^5, and the rotation of the shaft e' in the other direction is occasioned by the operation of the pawl e^{10}, acting upon the ratchet-wheel e^6, and transmitting motion to said shaft by means of gear-wheels l, mounted on the shaft e^3 and l', mounted on the shaft e'. It is of course to be understood that when the pawl e^{10} is operating upon the ratchet-wheel e^5 the pawl e^{10}, which is adapted to operate with the ratchet-wheel e^6, has been moved into such a position by the arm e^9 that it cannot act upon the said ratchet-wheel, and vice versa.

In sewing a figure—such, for instance, as that which is illustrated in Fig. 1—it is quite evident that it is essential that a variable motion should be imparted to the goods beneath the needles. In other words, the lines of stitches will sometimes be from side to side and other times in the direction of the length of the goods, and at other times will be a combination of these movements. The pattern-wheels C C′ are so constructed that they will cause the feed-rollers C^5 C^6 C^7 C^8 to rotate to feed the goods forward or backward only at such times and for such distances as is necessary in sewing a desired line of stitches in the direction of the length of the goods, while the construction of the pattern-wheels C^2 C^3 is such that they will cause a side-to-side movement of the carriage carrying the goods at such times and for such distances only as are necessary in sewing lines of stitches in the direction of the width of the goods. Of course if the two operations—that of feeding the goods forward or back and that of moving the carriage from side to side—occur simultaneously, the result will be a combined movement in which the rows of stitching sewed by the needles will result in curved lines in both the direction of the length of the goods and from side to side thereof. When this combined movement transpires, it will be apparent that the deviation from lines running parallel with or at right angles to the direction of the forward feed of the goods will be very slight in some instance. In order to provide for these slight deviations and produce a symmetrical figure, I have, for convenience, divided each stitch into ten arbitrary equal parts, so that the slightest deviation from a right line which a stitch may take will equal one-tenth the length of a stitch taken at right angles to the line from which the first stitch deviates. Such deviation from a right line may equal any number of tenths of the length of a stitch which may be desired, according as the curve or angle of the pattern be slight or great. The deviations of the stitches from a right line are produced as follows: Each figure of the pattern which I have illustrated contains one hundred and fifteen stitches. Each of the pattern-wheels C C′ C^2 C^3 is divided radially into one hundred and fifteen sections c, corresponding to the number of stitches in the pattern. Consequently when the pattern-wheels have made one complete revolution each of the needles has sewed a complete figure. Each separate movement of the pattern-wheels is equal to the length of one of the

sections on the periphery of the wheels. Each of said pattern-wheels is also divided into eleven sections c', which are formed by concentric circles whose centers are identical with those of the pattern-wheels. The combined width of the ten inner of these sections represents the length of a single stitch taken on the goods on a right line, and each one of these sections represents one-tenth of the length of a stitch. The periphery of each of the wheels is indented at intervals. The depth of each indentation corresponds to the number of tenths of the length of a stitch which it is desired that the stitch shall deviate from a right line—as, for instance, if an indentation equals the width of one of the sections c', the stitch will deviate one-tenth the length of a stitch from a right line. If the indentation be equal to the width of five of the sections c', the deviation from a right line will be equal to five-tenths the length of a stitch, and so on.

I have previously referred to the pattern-wheels C^2 C^3 and the manner in which they operate to cause the movement of the carriage from side to side. It is but necessary to add in this connection that the uneven contour of the peripheries of these cams is such as may be found essential to the formation of the pattern to be sewed, and also that, while the cam C^2 is moving the carriage in one direction through the constantly-increasing diametrical distance between the center of rotation of said cam and the pin f with which it is in contact, the diametrical distance between the center of rotation of the cam C^3 and the pin f with which it coacts is being proportionally decreased. In other words, the diametrical distance between the peripheries of the cams C^2 C^3 at the point where they contact with the pins f is always the same, no matter in which direction the carriage is being moved.

The indentations upon the peripheries of the cams C^2 C^3 are in the form of steps which are graduated in their depth according to the number of tenths of a stitch which it is desired the direction of the stitch shall deviate from a line parallel with the direction of the feed of the goods, and the peripheries of said cams may be so formed that no side-to-side movement will be imparted to the carriage if desired, or, in other words, so that lines parallel with the direction of the feed of the goods may be sewed. I wish it to be understood, however, that I do not consider it wholly essential that the cams C^2 C^3 should be stepped, as described. The indentations upon the peripheries of the cams C C′ are different in construction from those upon the cams C^2 C^3, as will be clearly seen by a comparison of Figs. 1 and 3. Upon the sections j of the rods J′ J^2 are pins or studs j^{16}. These pins bear constantly upon the pattern-wheels, against which they are forced by the springs j^3. As the pattern-wheels rotate, the pins j^{16} drop into the notches in the pattern-wheels. It will be perceived that as a pin j^{16} drops into a notch the bar j' j^2, as the case may be, of which the pin forms part, is shot forward by the spring j^3, causing the pawl-carrier e to rock and the pawl e^{10}, which is immediately after actuated by the cam J^7 or J^8, to rotate the ratchet-wheel e^5 or e^6, with which it acts in conjunction.

In the example of my invention shown each of the ratchet-wheels e^5 e^6 has one hundred teeth, and each complete rotation of the ratchet-wheel will cause a movement of the goods in a rectilinear plane a distance equal to the length of ten stitches. Therefore each ten teeth of the ratchet-wheel represents a movement of the goods equal to the length of one stitch. If the pin j^{16} drops into a notch in the pattern-wheel whose depth equals the combined width of ten sections c' of the pattern-wheels, the ratchet-wheel will be moved a distance equal to ten teeth, and in like proportion for each notch into which the pin drops, according to its depth. The cams J^7 J^8 operate to throw the bars J′ J^2 backward or toward the rear of the machine at each rotation of the main shaft sufficiently far to cause the pin j^{16} to move out of the notch, into which it has just previously been sprung, as far as the tenth outward circumferential section c' or to the dotted line indicating the eleventh circumferential section. (Shown in Fig. 3.)

It is obvious that only one of the pattern-wheels C C′ can be operating to rotate the feed-rollers at a time. A change from one to the other and a consequent reversal of the direction of rotation of the feed-rollers, as the case may be, is produced by lifting the pawl e^{10}, which has been actuating a given ratchet-wheel, out of engagement with said ratchet-wheel, as previously explained. This is effected by causing the pin j^{16} of its corresponding bar J′ J^2 to ride up from the tenth outer circumferential section onto the periphery of the pattern-wheel with which it acts. The pin is thus caused to ride upon the periphery of the wheel by means of the rotation of the pattern-wheel itself, which is cam-shaped, as at c^2, to admit of this. When this action takes place, the portion j of the bar J′ or J^2, as the case may be, is moved so far to the rear of the machine that the arm e^9 comes in contact with the pawl e^{10} and moves it out of engagement with the teeth of the ratchet-wheel e^5 or e^6 with which it coacts. The slight movement of the section j, necessary to move the pin j^{16} onto the periphery of the wheel, is effected independently of the section j' by means of the pin o and slot o', previously described.

It will be seen from the above that provision is made for varying the amounts of movement imparted to the feed-rollers throughout different periods of equal duration. When the pin j^{16} rides up on the periphery of the cam, no motion is imparted to the section j' by the cams j^7 j^8.

I have shown a friction device T, comprising arms t, upon opposite sides of and bear-

ng against the ratchet-wheel *d*, whereby movement of said ratchet-wheel in a contrary direction from that desired is prevented. This friction device is of ordinary construction.

Any number of rows of needles may be used, and these may be operated in any desired manner. In Figs. 5 and 6 I have shown that more than one row of needles may be employed in the machine. In Fig. 5 two rows of needles are indicated, the needles of one row being arranged directly behind those of the other row. In Fig. 6 two rows of needles are delineated, the needles of one row being at a distance from and intermediate of the needles of the other rows, so that a line drawn between the needles of the two rows will be a zigzag line. The resultant movement of the goods beneath the needles is such as to produce the respective patterns delineated. The patterns may of course be changed at will by changing the pattern-cams.

I have filed an application for United States Letters Patent for an improvement in sewing-machines, No. 199,412, and dated April 19, 1886. In that application I show and describe means for causing a relative movement between sewing mechanism and a support for the goods, both fore and aft of the machine and from side to side of the machine in both directions, and rotary patterns for effecting such movements. I do not herein lay claim to anything claimed in said application.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a quilting-machine, the combination, with sewing mechanism comprising a reciprocating needle-bar, of a movable carriage, pattern mechanism for moving the carriage to and fro, feed-rollers arranged on opposite sides of the needle-bar, gearing connecting these feed-rollers so as to compel them to rotate in unison, and pattern mechanism causing the rotationof the feed-rollers in reverse directions, substantially as specified.

2. In a quilting-machine, the combination, with sewing mechanism comprising a reciprocating needle-bar, of a movable carriage, pattern mechanism for moving the carriage to and fro, feed-rollers, and pattern mechanism rotating the feed-rollers in reverse directions and varying the amounts of movement imparted to them throughout different periods of equal duration, substantially as specified.

3. In a quilting-machine, the combination, with sewing mechanism and a carriage, of mechanism substantially such as described for imparting a to-and-fro motion to the carriage, feed-rollers for the work arranged on opposite sides of the needles and positively driven, a pattern-wheel causing the rotation of said feed-rollers in one direction, and another pattern-wheel rotating said feed-rollers in a reverse direction, substantially as specified.

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Witnesses:
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