No. 652,326. Patented June 26, 1900.

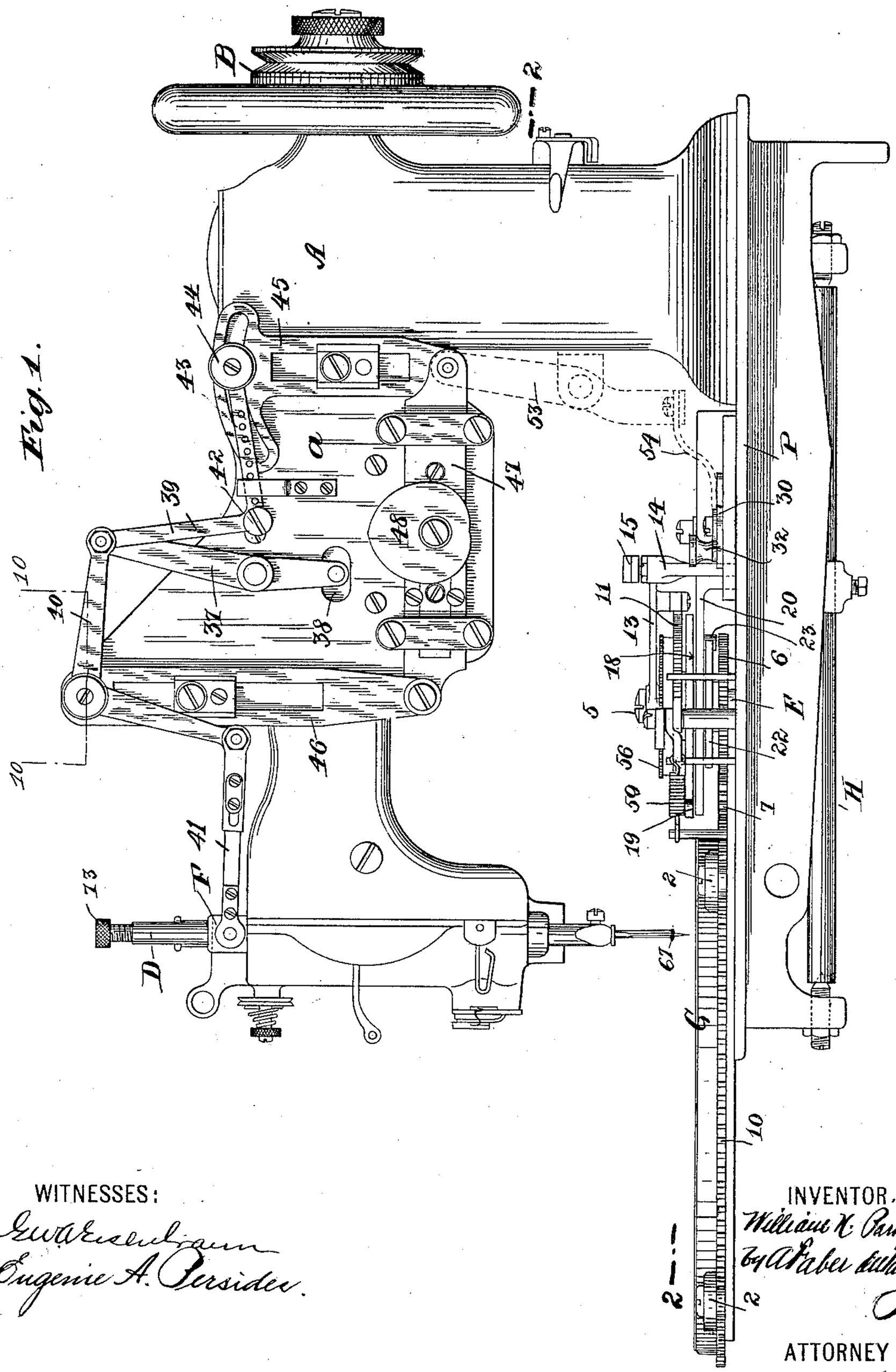
W. N. PARKES.

EMBROIDERING MACHINE.

(Application filed July 21, 1897.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



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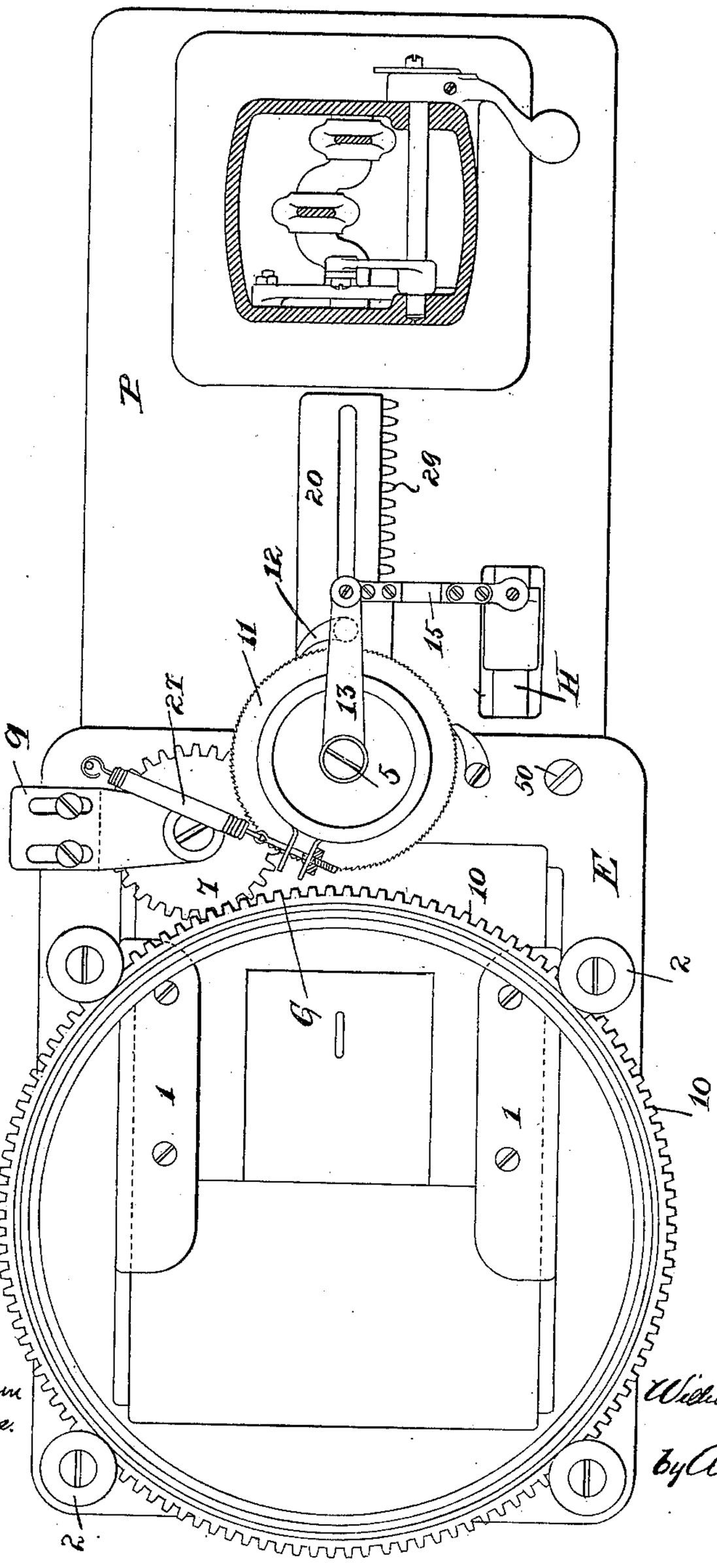
(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

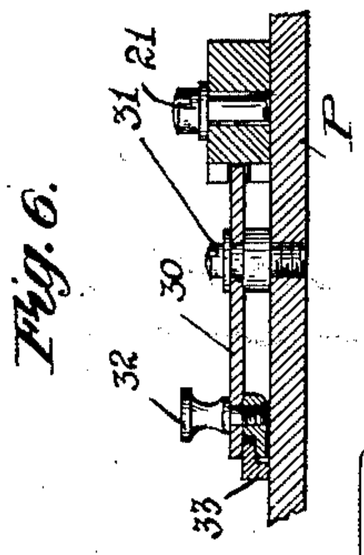

Fig. 6.

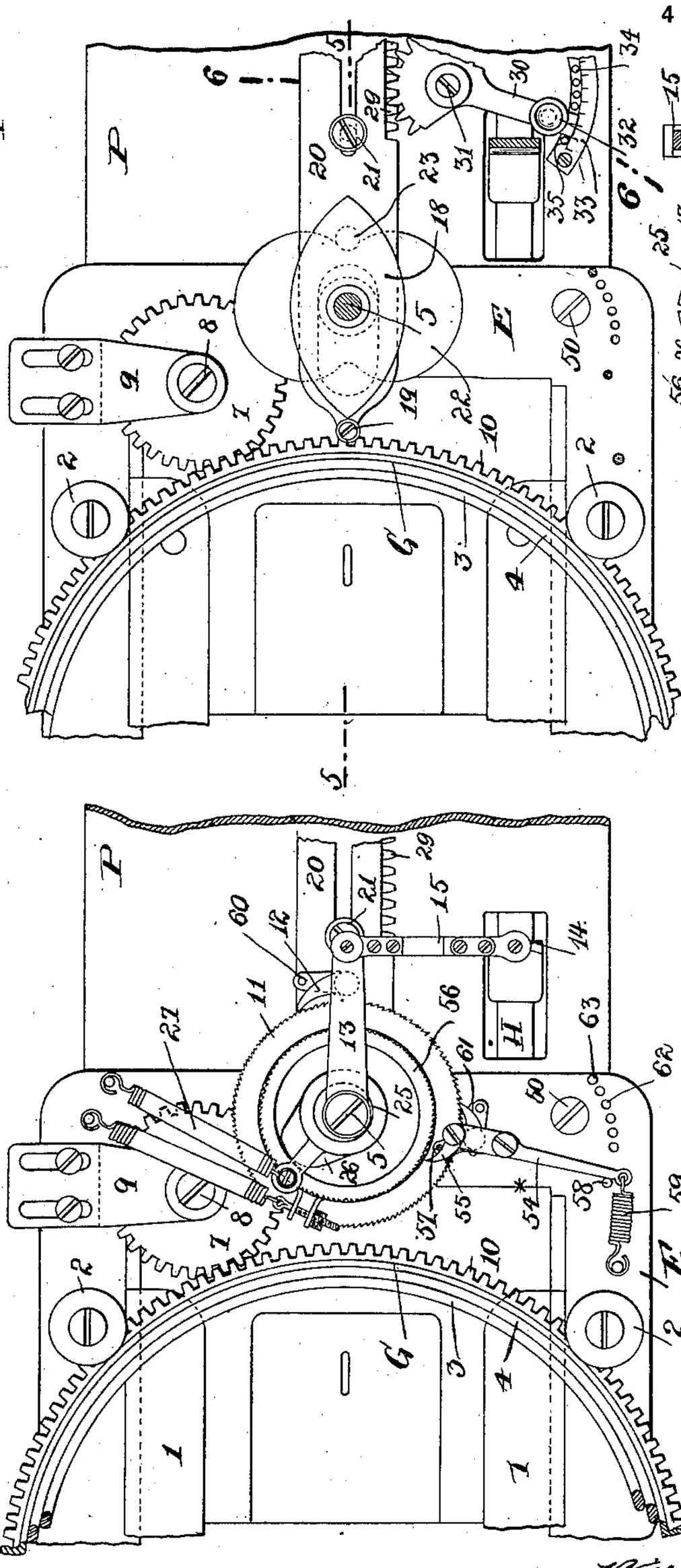

Fig. 4.

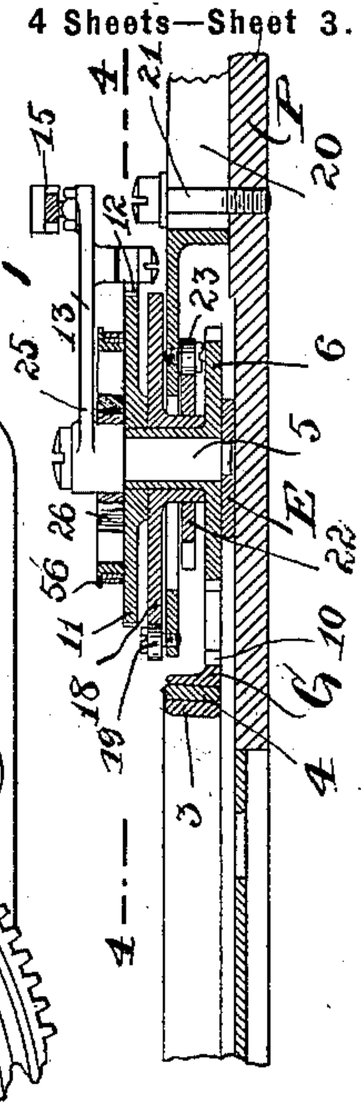

Fig. 5.

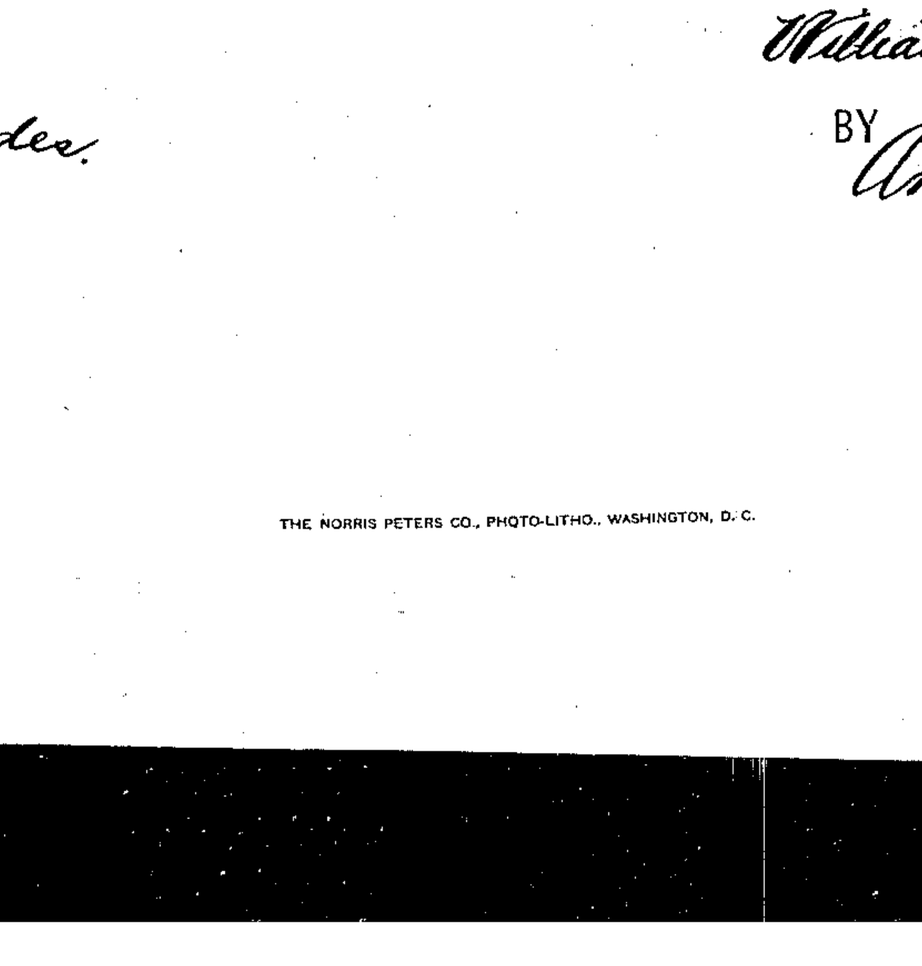

Fig. 3.

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(No Model.) 4 Sheets—Sheet 4.

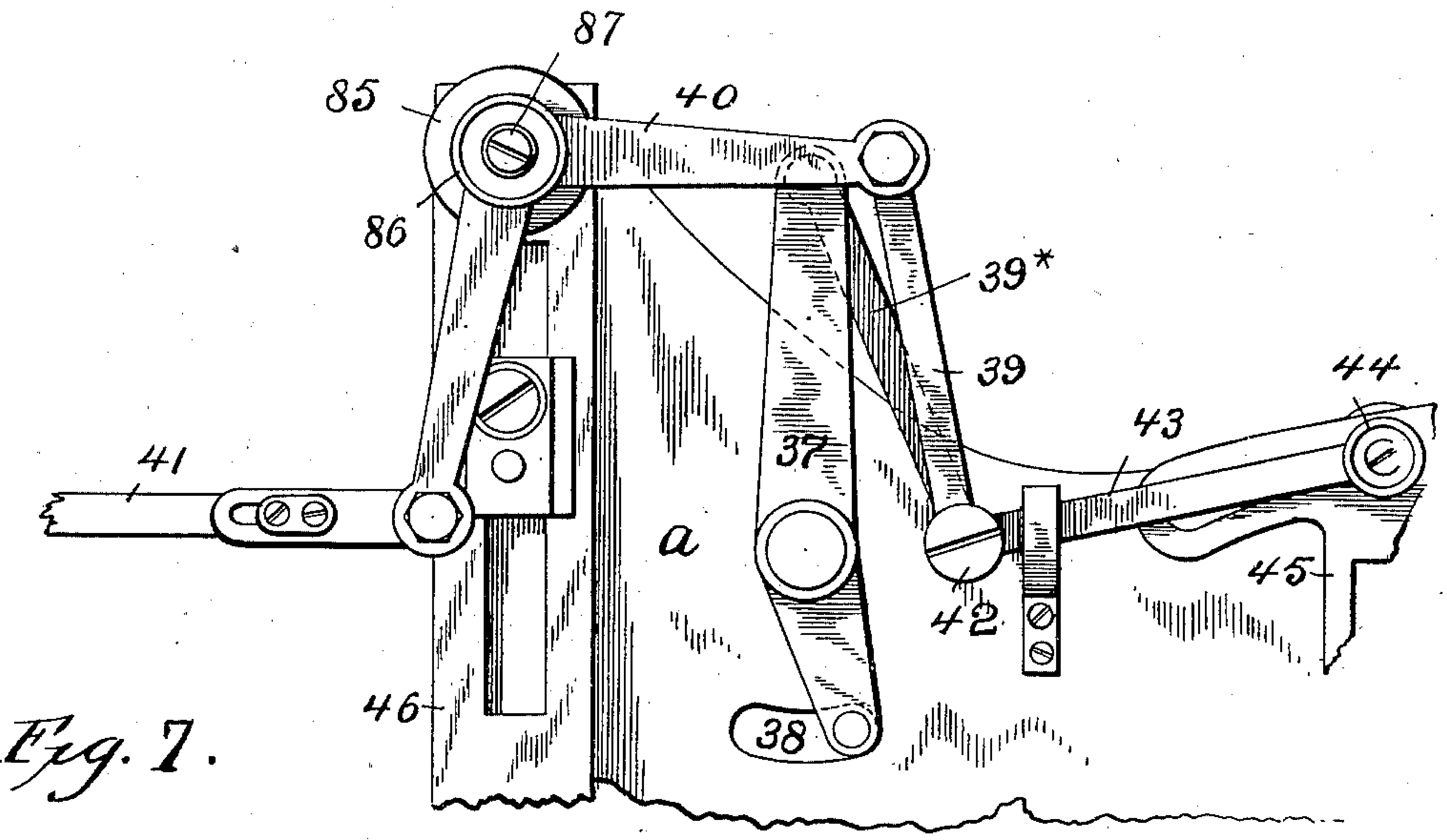
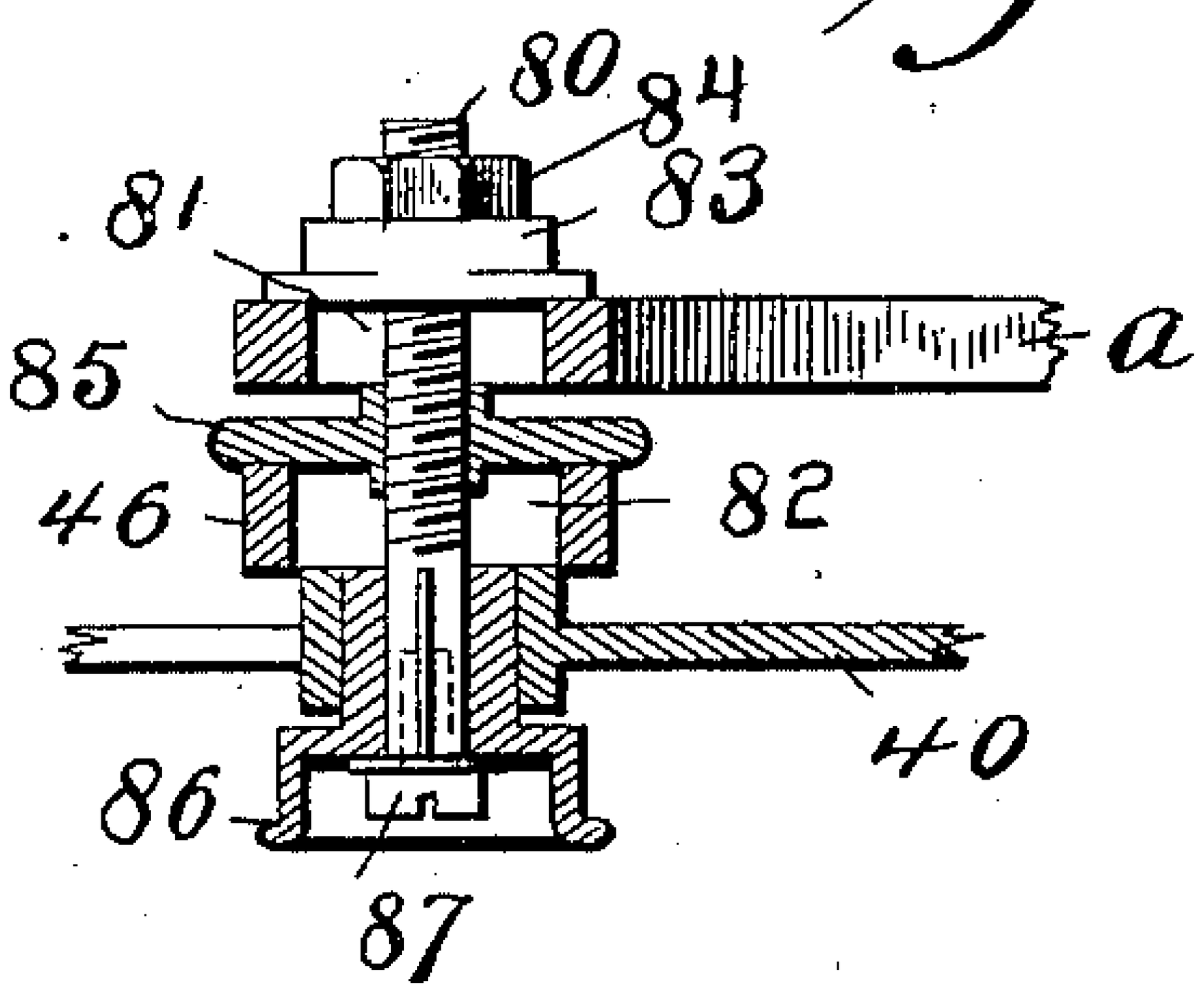


Fig. 7.

Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM N. PARKES, OF NEW YORK, N. Y.

EMBROIDERING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 652,326, dated June 26, 1900.

Application filed July 21, 1897. Serial No. 645,362. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM N. PARKES, a citizen of the United States of America, and a resident of New York, (Brooklyn,) in the county of Kings and State of New York, have invented a certain new and useful Improvement in Sewing-Machines, of which the following is a specification.

My invention has reference to a sewing-machine for automatically stitching or embroidering doilies, center pieces, and other similar kinds of work.

While my invention is useful in its application to any ordinary sewing-machine, it is especially adapted for that class in which a vertically-reciprocating needle is vibrated or moved laterally, and particularly to that class of machines in which the working position of the lateral vibrations of the needle is automatically moved laterally by means of a pattern-cam—such, for instance, as the machine described in United States Patent No. 592,510, granted to me October 26, 1897.

The general object of my invention is to provide a mechanism for moving the work circularly and also a mechanism for moving the work across the vertical line of reciprocation of the needle-bar by means of a pattern-cam in combination with mechanism for reciprocating and for producing part or all of the lateral movements of the needle-bar referred to in the above class of machines.

The nature of my invention will best be understood when described in connection with the accompanying drawings, in which—

Figure 1 represents a front elevation of the head of a sewing-machine embodying my invention. Fig. 2 is a horizontal section on the line 2 2, Fig. 1, parts being omitted. Fig. 3 is a view similar to Fig. 2, with part broken away, and showing the mechanism complete. Fig. 4 is a horizontal section on the line 4 4, Fig. 5. Fig. 5 is a vertical section on the line 5 5, Fig. 4. Fig. 6 is a vertical section on the line 6 6, Fig. 4. Fig. 7 is an enlarged side view showing a detail of the mechanism for vibrating the needle. Fig. 8 is an enlarged section on line 10 10, Fig. 1.

Similar letters and numerals of reference designate corresponding parts throughout the several views of the drawings.

Referring to the drawings, the letter A designates the head of a sewing-machine; B, the driving-wheel; D, the needle holder or bar; 67, the pressure-foot, which may be of any usual construction, and F the pivoted needle-bar gate or frame. In the present instance I have shown a zigzag machine of the Wheeler & Wilson pattern, but provided with means for laterally displacing the working position of the lateral vibrations of the needle-bar. The mechanism forming my present invention can be also applied to a sewing-machine having simply a reciprocating needle-bar; but by the use of a machine embodying the features above described a greater variety of stitches can be obtained. On the bed-plate P of the machine is mounted a frame E, which is guided to reciprocate across the vertical line of motion of the needle-bar and preferably in the longitudinal direction of the machine by suitable guides 1. On said frame is mounted a work-carrier G, which is made annular and guided to turn by a number of rolls 2, having their studs attached to the reciprocating frame E. The fabric to be stitched or ornamented is secured to this annular work-carrier in any usual manner—for instance, by the clamping-rings 3 and 4, which receive the upturned edge of the fabric between them and are wedged into the work-carrier. In the present instance I have shown the driving mechanism for the frame and work-carrier to be constructed as follows: To the inner end of the frame E is secured a vertical stud 5, on which is mounted to turn a gear-wheel 6, the hub of which is extended upwardly to near the top of the stud. This gear-wheel meshes with a second gear-wheel 7, adapted to turn about a stud 8, secured at its lower end in the frame E and at its upper end in a bracket 9, attached to said frame. This gear-wheel 7 meshes with a circular rack 10, formed on the outer periphery of the work-carrier G. On the hub of the gear-wheel 6 is rigidly mounted a horizontal ratchet-wheel 11, which is engaged by the pawl 12 of a feed-lever 13, adapted to swing about the stud 5 and actuated from the rock-shaft H of the usual feed mechanism by means of an arm 14 and a link 15. It may, however, be actuated from any other part of the usual feed mechanism or from any other suitable moving part of the machine. In this manner the work-carrier is rotated through a predetermined number of degrees for each stitch of the needle. On the hub of

the gear-wheel 6 is mounted a cam 18, the roller-stud 19 of which is attached to the overhanging portion of a slide 20, which latter can be adjusted longitudinally or held in the desired position by a set-screw 21. Below said overhanging portion is mounted a second or complementary cam 22, the roller-stud 23 of which is likewise carried by said overhanging portion. As the cams 18 and 22 turn with the gear-wheel 6, it is evident that a reciprocating motion is imparted to the frame E across the line of vertical reciprocation of the needle-bar, thus forming, in conjunction with the rotary movement of the work-carrier a scalloped or serrated line of stitches on the fabric. In place of the two complementary cams mentioned any suitable cam can be used. It is evident that as the frame E reciprocates the angle of the link 15 changes somewhat, and consequently the position of the pawl 12 on its forward stroke will change slightly, although the throw will remain substantially the same. An ordinary holding-pawl would under these circumstances prove unreliable, and for this reason I substitute for the same the following device: On the upper end of the stud 5 is formed an eccentric 25, which is encompassed by the hub of a holding-cam 26, adapted to engage with the inner surface of the ratchet-wheel 11. To this holding-cam or to an arm projecting from the same is attached a spring 27. The eccentric 25 and the holding-cam 26 are so placed that any tendency on the part of the wheel to move in a direction opposite to the feed is arrested by the cam binding against the inner periphery of the ratchet-wheel in view of its eccentric mounting.

As thus far described the machine will stitch in scalloped or serrated lines in view of the rotary motion of the work-carrier and the reciprocating motion of the frame; but if larger or smaller circumferences are to be stitched the working position of reciprocation of the slide must be changed. To effect this end, I provide means for shifting the slide 20 so as to change the initial position or eccentricity of the work-carrier with respect to the needle-bar. Said means in the present example consist in a rack 29, formed on one side of the slide 20, which is engaged by a toothed sector-lever 30, pivoted at 31 to the bed-plate P of the machine and provided at its free end with a clamp 32 for holding it to a graduated arc 33. The graduated arc 33 is provided with a series of sockets 34, adapted for the insertion of a pin or pins 35 for holding the sector-lever in any predetermined radial position. By turning the lever to the right the slide is moved to the left, and the circumference stitched is made longer, and vice versa. By means of the graduations and pins the frame can be set and held in any desired initial predetermined position.

In my present application I provide mechanism somewhat different from the mechanism employed in my former patent, No. 592,510, above referred to, for vibrating the needle and changing the working position of the same laterally. This mechanism consists of a lever 37, provided at its lower end with a roller-stud engaging with the usual switch-cam 38, while its upper end is connected by links 39 and 39* with one arm of a bell-crank lever 40, having its other arm connected by a link 41 with the needle-bar gate or frame F. The links 39 and 39* can turn about a common stud 42, which is connected by a link 43 to a stud 44, adapted to be connected either with a vertical stationary plate *a*, attached to the head of the machine, or to a lever 45. The pivot of the bell-crank lever 40 is attached to the upper end of a lever 46, said lever 46 being connected at its lower end to a slide 47, acted upon by a cam 48, to which slide is also attached the lower end of the lever 45. The cam 48 is rotated from the main shaft of the machine by an intermediate usual driving mechanism. Assuming for the present that stud 44 is rigidly held to the plate *a* and the machine started, the vibrations of the lever 37, induced by the switch-cam 38, will raise and lower the stud 42 by means of link 39*, said stud 42 swinging in an arc described from pivot 44 as a center, with link 43 as a radius, and by means of link 39 giving movement to the end of the horizontal member of the bell-crank lever 40, and consequently to the link 41, and thereby transmitting motion to the needle-bar gate or frame F.

Referring more in detail to the fulcrum of the lever 46, Fig. 8 shows details of this fulcrum. 80 is a stud on which the bell-crank lever 40 is fulcrumed. 81 is a slot in the plate *a*, and 82 is a slot in the upper end of the lever 46. Through these slots the stud 80 passes. 83 and 84 are nuts adapted to be locked on the end of the stud 80, and 85 is a nut on the stud 80 between the plate *a* and the lever 46, and 86 is a head keyed on the stud 80 and held in place on the same by a screw 87. When it is desired not to move the working position of the vibrating needle, the nut 85 is held from turning and the stud 80 is turned to the left by means of the head 86. As the stud 80 is threaded, this movement draws the nut 85 against the plate *a*, holding the same in a fixed position on the plate. When it is desired to move laterally the fulcrum of the lever 40 and through it the working position of the lateral vibrations of the needle, the nut 85 is held from turning and the stud 80 is turned to the right, which fastens the said stud 80 to the lever 46 by reason of the said lever being clamped between the nut 85 and the head 86.

Referring more particularly to the lever 37 and its connections with the bell-crank lever 40 and the stud 44, it is noted that in Fig. 7 this lever is shown in one of its extreme lateral positions when the links 39 and 39* assume substantially the position shown in this figure. The means for connecting the stud

44 to the plate *a* or to the lever 45 are substantially the same as those shown in Fig. 10 for connecting the stud 80 to the plate *a* or to the lever 46, the only difference being the slots for permitting the movements of the stud 44 are longer, as the lever 45 has more action at its upper end than the lever 46, and for the further reason that it is advantageous to have the slots long enough to permit of the adjustments of the stud 44 for increasing or decreasing the extent of the lateral vibrations of the needle.

It is seen that by adjusting the connection of the link 42 through the stud 44 to the right on the lever 45 the links 39 and 39* are brought around toward a horizontal position and that, consequently, the extent of the lateral vibration of the needle is increased, and vice versa when it is adjusted to the left. For example, the lever 37 gets a vibratory action from the cam 38, which action is communicated to link 39* and through it to the stud 42, through the stud 42 to the link 39, and through it to the bell-crank lever 40, through it to the link 41, and in turn through the link 41 to the needle-bar gate or frame F. If it is desired to have a uniform vibration of the needle, the stud 44 is attached to the plate *a*, the slot which is seen in the upper end of the lever 45 permitting the lever to oscillate on its fulcrum without affecting the stud 44 or the link 42. The position of the stud 44 on the plate *a* of course determines the extent of the lateral vibrations of the needle. If it is desired when giving the needle a uniform vibratory action to increase the extent of the said vibratory action, stud 44 is adjusted to the right on the plate *a*, and if it is desired to decrease the extent of the said vibratory action it is of course adjusted to the left on plate *a*, a suitable slot being formed in the said plate *a*, through which the stud 44 is adapted to be adjustably attached, the said slot serving also as a means for allowing the movements of the stud 44 when it is attached to the lever 45. When the stud 44 is attached to the lever 45, which is actuated through the cam 48, it is seen that through the connection between the said stud and the needle-bar gate F the lateral vibrations of the needle are automatically increased and decreased.

If now it is desired to produce a number of uniform circular patterns by the zigzag motion of the needle or a number of uniform scalloped patterns by means of the zigzag motion and the lateral displacement of the zigzag motion of the needle, the frame E is set and held stationary in the desired position by means of a set-screw 50, so that no reciprocating movement of the frame E takes place, while the set-screw 21 of the slide 20 is loosened, so as to permit said slide to move under the action of the cams. Instead of laterally displacing the position of the lateral vibration of the needle-bar the lateral position of reciprocation or oscillation of the frame E may be correspondingly displaced by simply connecting the sector-lever 30 with the slide 47, Fig. 1, by a suitable lever 53 and link 54, as shown in dotted lines in Fig. 1, and by throwing out of action the mechanism for changing laterally the working position of vibration of the needle. It will be readily understood that as the slide 47 reciprocates under the influence of cam 48 a like reciprocation is imparted to the frame E. By the displacement of the frame a wider range of displacement can be accomplished without danger of skipping stitches.

In case the thread breaks and the machine runs ahead a certain distance before it is stopped by the operator the work must be turned back a measured distance, so that the patterns which are the result of the motions of cam 48 and cams 18 and 22 will again match. For accomplishing this I provide means for turning the work-carrier and cams 18 and 22 back through the proper distance to match the pattern made by cam 48. In the present example I have shown these means to consist of a lever 54*, carrying a pawl 55, adapted to engage with a ratchet-wheel 56, formed on the hub of the ratchet-wheel 11, but normally held out of contact with the teeth of said ratchet-wheel by a spring-catch 57. The lever is normally held against the stop 58 by a spring 59. To readjust the work-carrier and cams in case of breakage of the thread, the operator disengages pawl 12 of pawl-lever 13 from the ratchet-wheel 11, and it is so held by a spring-catch 60, and then releases pawl 55, so as to permit it to engage ratchet-wheel 56. The operator then turns the holding-cam 26 backwardly to free the ratchet-wheels and moves the lever 54* to and fro until the work-carrier and cams 18 and 22 are returned to the proper position. The teeth on ratchet-wheel 56 are proportional to the teeth on ratchet-wheel 11, as well as to the teeth of the feed-wheel for the cam 48, and consequently accurate return is assured with the proper calculation.

The feeding mechanism for the frame E and the work-carrier G, as at present described, will normally cause concentric circles to be formed either plain or scalloped or serrated in periphery. If the scalloped or serrated circles are to be formed with intersecting or eccentric scallops, it is necessary to give the work-carrier a lead after the completion of each circle of stitching. This I accomplish by attaching a second pawl 61 to the lever 54*, which engages with the ratchet-wheel 11. By moving this pawl-lever to the right after the completion of the first circle the ratchet-wheel 11, and consequently the work-carrier, is turned to cause a circular displacement of the second circle of stitching with respect to the first circle of stitching. The amount through which the work-carrier is turned can be determined by a series of sockets 62, formed in the frame E, and the pin 63, which is set into the desired socket.

By turning the lever 54* until it engages with the pin the same distance of movement is always assured.

If more cam action is wanted, different cams are inserted between the roller-studs of the slide 20, or when jaws are used in place of the rollers, together with cams which may be shifted eccentrically in a usual manner, the cams can be set according to the action desired. The length of the stroke of the feed-pawl can be changed to take more or less teeth at each stroke, thereby bringing the stitches closer together or making them farther apart. This may be done by changing the position of the usual stitch-regulating lever. In the example illustrated the driving-gear 6 on stud 5 turns eight times to one revolution of the work-carrier, and as this driving-gear carries a heart-shaped cam the work-carrier is reciprocated laterally eight times at a uniform speed while it revolves once. A star-shaped outline with eight points is thus formed. If the driving-gear 6 is replaced by one that turns four times while the work-carrier revolves once, the work-carrier is reciprocated laterally four times while it turns once, thus forming a four-pointed figure. The particular shape will depend upon the throw of the cam. To illustrate, let it be assumed that a square is drawn within the circle of the work-carrier and the cam is given a throw equal to the distance between the center of one of the sides of the square and the circle. Then a corresponding square will be stitched. If the throw of the cam is increased, the side of the square will run toward the center and a star-shaped outline is the result. If the throw of the cam is decreased, the sides of the square will bulge out, producing practically an octagon.

From the above it will be readily understood that each time the ratio between the driving-gear and the toothed rack of the work-carrier is changed the number of lateral displacements of the work-carrier due to the cam is varied, and consequently the outline or shape of the design stitched.

By changing the feed of the pawl on the ratchet-wheel to correspond to the change in ratio between the driving-gear and the rack on the work-carrier the stitches will remain the same distance apart. To illustrate, assuming that the driving-gear turns eight times while the work-carrier revolves once and a gear turning four times is substituted for the driving-gear, then the speed of the work-carrier is doubled and the stitches would be so much farther apart. To counteract this, the stroke of the pawl is reduced one-half.

What I claim as new is—

1. In combination in a sewing-machine, a stitch-forming mechanism, comprising a vertically-reciprocating needle-bar mounted and adapted to be moved laterally, a rotating work-carrier mounted and adapted to move laterally, means for moving the said needle-bar laterally, and means for moving the said rotating work-carrier laterally a predetermined number of times during a predetermined number of lateral movements of the needle-bar, substantially as described.

2. In a sewing-machine having a stitch-forming mechanism comprising a laterally-moving needle, and a work-moving mechanism comprising a laterally-moving rotating work-carrier, means adapted automatically to vary the extent of one of said lateral movements with respect to the other of said lateral movements a predetermined number of times during one rotation of the work-carrier or a portion of said rotation, substantially as described.

3. The combination with a sewing-machine having a stitch-forming mechanism comprising a vertically-reciprocating and laterally-vibrating needle-bar, of a frame adapted to reciprocate in the same direction in which the needle-bar moves laterally, a work-carrier adapted to rotate on the said frame, and means for reciprocating the said frame and for rotating the work-carrier, substantially as described.

4. The combination with a sewing-machine having a reciprocating needle and complemental loop-engaging device, of a frame mounted to reciprocate laterally in a plane substantially at right angles to the reciprocations of said needle, a work-carrier mounted to rotate on said frame, an actuating ratchet-wheel, and intermediate mechanism whereby said work-carrier is rotated and said frame is reciprocated laterally, substantially as described.

5. The combination with a sewing-machine having a reciprocating needle and complemental loop-engaging device, of a frame mounted to reciprocate laterally in a plane substantially at right angles to the reciprocations of said needle, a work-carrier mounted to rotate on said frame, mechanism for automatically imparting a rotary movement to said work-carrier and a reciprocating movement to the frame, and means for arresting the reciprocating movement of the frame, substantially as described.

6. The combination with a sewing-machine having a reciprocating needle and complemental loop-engaging device, of a frame mounted to reciprocate laterally and a work-carrier mounted on said frame and constructed to rotate in a plane substantially at right angles to the reciprocations of said needle, a ratchet-wheel carried by the frame, an eccentrically and loosely mounted holding-cam adapted to engage with the ratchet-wheel, a spring connected with said holding-cam, and means for rotating the ratchet-wheel, substantially as described.

7. The combination with a sewing-machine having a reciprocating needle and complemental loop-engaging device, of a frame mounted to reciprocate laterally in a plane substantially at right angles to the reciprocations of said needle, a work-carrier mounted

to rotate on said frame, a ratchet-wheel mounted on said frame, a pawl-lever engaging with said ratchet-wheel, a feed rock-shaft, an operative connection between the feed rock-shaft and the feed-lever for actuating the latter, a holding-cam loosely and eccentrically mounted about the axis of rotation of the feed-wheel and adapted to engage with the same, a spring for holding said cam in contact with the feed-wheel, a slide connected with the bed of the machine and provided with a roller-stud, a cam mounted concentric with the feed-wheel and adapted to engage said roller-stud, and an operative connection between the feed-wheel and the work-carrier for rotating the latter, substantially as described.

8. The combination with a sewing-machine having a reciprocating needle and complemental loop-engaging device, of a frame mounted to reciprocate laterally, a work-carrier mounted on said frame to rotate in a plane substantially at right angles to the reciprocations of said needle, a feed-wheel mounted on said frame, a pattern-cam actuated by the feed-wheel, means for rotating said feed-wheel, and means whereby when said feed-wheel is rotated, the frame is reciprocated by said pattern-cam and the work-carrier rotated, substantially as described.

9. The combination with a sewing-machine having a reciprocating needle and complemental loop-engaging device, of a frame mounted to reciprocate laterally, a work-carrier mounted on said frame to rotate in a plane substantially at right angles to the reciprocations of said needle, a feed-wheel mounted on said frame, a pattern-cam actuated by the feed-wheel, means for rotating said feed-wheel, a slide provided with a roller-stud engaging with said pattern-cam, means for holding said slide stationary, and means whereby when said feed-wheel is rotated, the frame is reciprocated by said pattern-cam and the work-carrier rotated, substantially as described.

10. In combination in a sewing-machine, a stitch-forming mechanism, a work-carrier mounted and adapted to rotate and to move laterally, a cam mounted and adapted to move laterally in unison with the said work-carrier, means in contact with said cam whereby when the cam is actuated the work-carrier is moved laterally, a ratchet-wheel, means intermediate the ratchet-wheel and the cam, the ratchet-wheel and the work-carrier whereby when the ratchet-wheel is actuated the cam is actuated and the work-carrier is rotated, substantially as described.

11. In combination in a sewing-machine, a stitch-forming mechanism, a work-carrier mounted and adapted to rotate and to move laterally, means for rotating the work-carrier, means for moving the work-carrier laterally comprising a cam, and means for moving the working position of the work-carrier laterally consisting of the sector-lever 30, the rack 29, the slide 20, and an operative connection between the said slide and the aforesaid cam, substantially as described.

12. In combination in a sewing-machine, a stitch-forming mechanism, a work-carrier adapted to rotate and move laterally, means for rotating the said work-carrier and for moving the same laterally, means for predetermining the working position of the said work-carrier consisting of the graduated arc 33, the sector-lever 30, the rack 29, and operative connections between the said rack and the work-carrier, substantially as described.

13. In combination in a sewing-machine, a work-carrier mounted and adapted to rotate and move laterally, the ratchet-wheel 11, means intermediate the same and the work-carrier whereby when the said ratchet-wheel is actuated the work-carrier is rotated and moved laterally, means for actuating the said ratchet-wheel, and means adapted to adjust the said work-carrier to a predetermined position with respect to its movements consisting of the lever 54*, the pawl 55 adapted to engage the ratchet-wheel 56, and a connection between the said ratchet-wheel 56 and the aforesaid ratchet 11, substantially as described.

14. In combination in a sewing-machine, a stitch-forming mechanism, a work-carrier mounted and adapted to rotate and move laterally, means for rotating and moving laterally said work-carrier comprising two ratchet-wheels placed in connection with each other, the teeth of said ratchet-wheels inclined in opposite directions, an actuating pawl-lever, a pawl on said pawl-lever in engagement with one of said ratchet-wheels, a second pawl-lever, and means in connection therewith adapted to engage the teeth of either of said ratchet-wheels, substantially as described.

15. In combination in a sewing-machine, a stitch-forming mechanism, comprising a vertically-reciprocating needle-bar mounted and adapted to move laterally and means for moving the same laterally, a frame adapted to reciprocate in substantially the same direction in which the needle-bar moves laterally, a work-carrier operatively mounted on said frame, said work-carrier adapted to move the work under the needle in a direction substantially at right angles to the lateral movements of the needle-bar, means for actuating the work-carrier, and means adapted to reciprocate the frame a predetermined number of times with respect to a predetermined number of lateral movements of the needle-bar, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 19th day of July, 1897.

WILLIAM N. PARKES.

Witnesses:
EUGENIE A. PERSIDES,
GEORGE W. EISENBAUM.