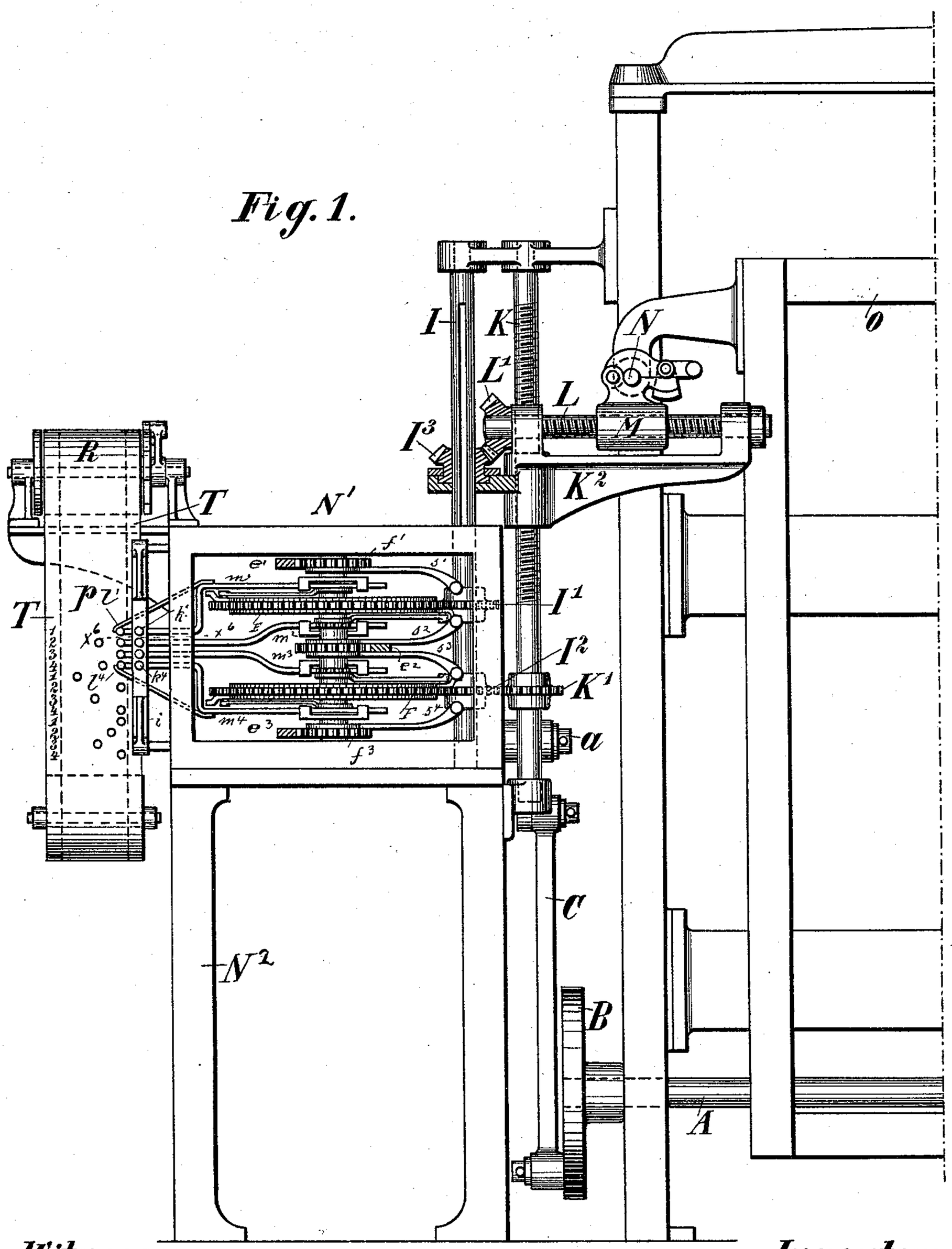
(No Model.) 7 Sheets—Sheet 1.

M. SCHOENFELD.

STITCH ADJUSTING MECHANISM FOR EMBROIDERING MACHINES.

No. 540,462. Patented June 4, 1895.

Fig. 1.



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(No Model.) 7 Sheets—Sheet 2.

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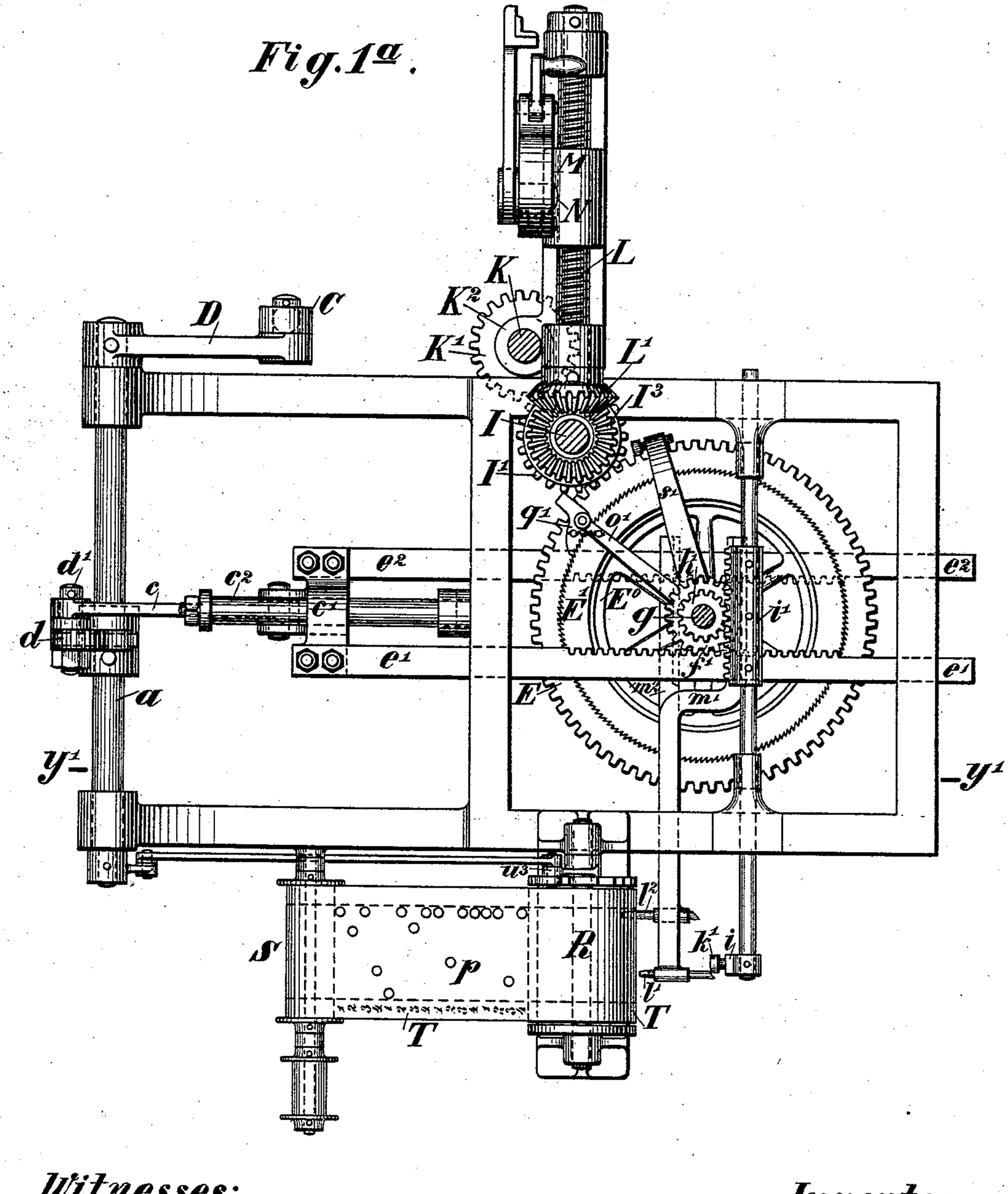
STITCH ADJUSTING MECHANISM FOR EMBROIDERING MACHINES.

No. 540,462. Patented June 4, 1895.

Fig. 1ª.



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STITCH ADJUSTING MECHANISM FOR EMBROIDERING MACHINES.

No. 540,462. Patented June 4, 1895.

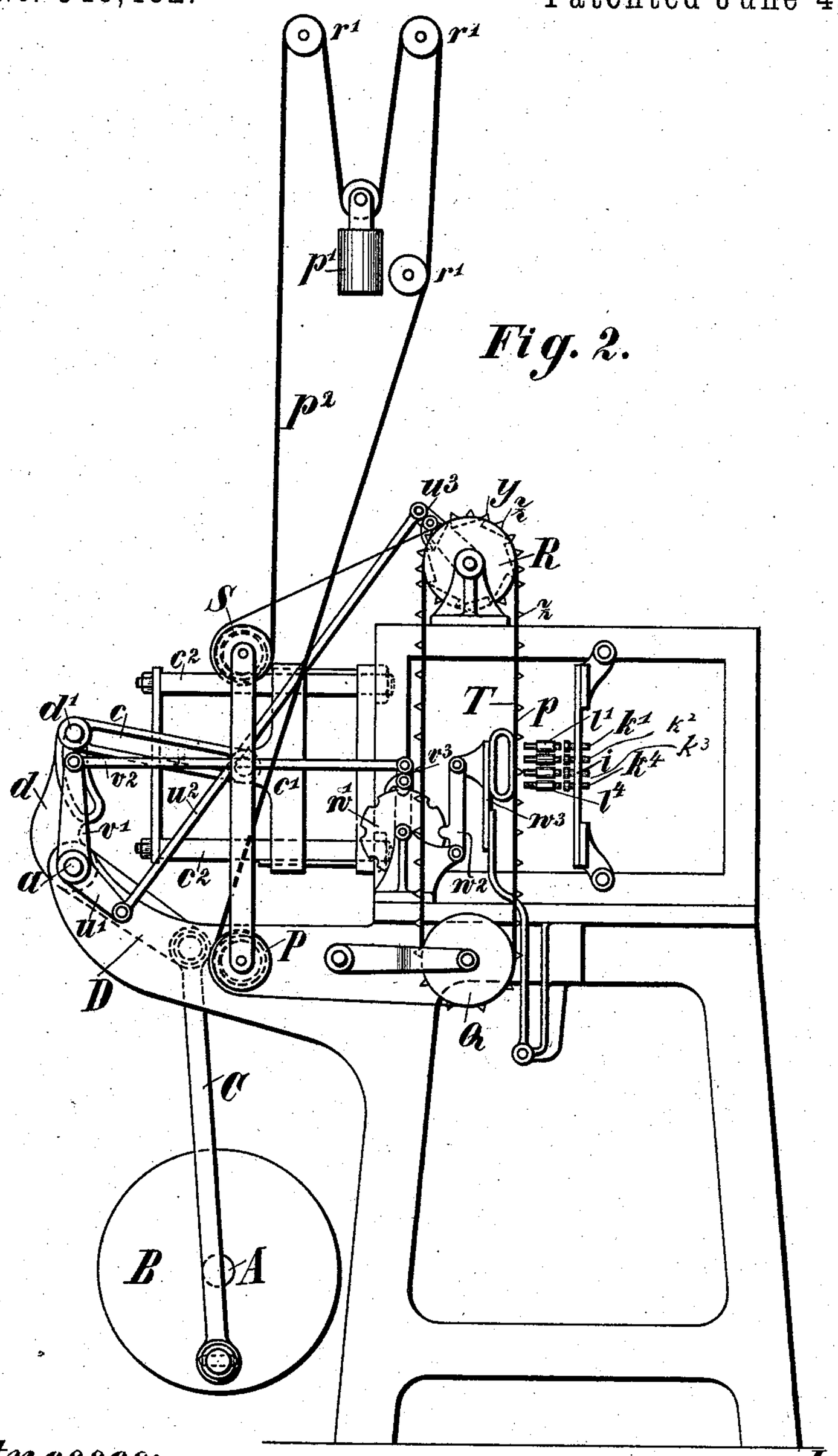

Fig. 2.

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(No Model.) 7 Sheets—Sheet 4.

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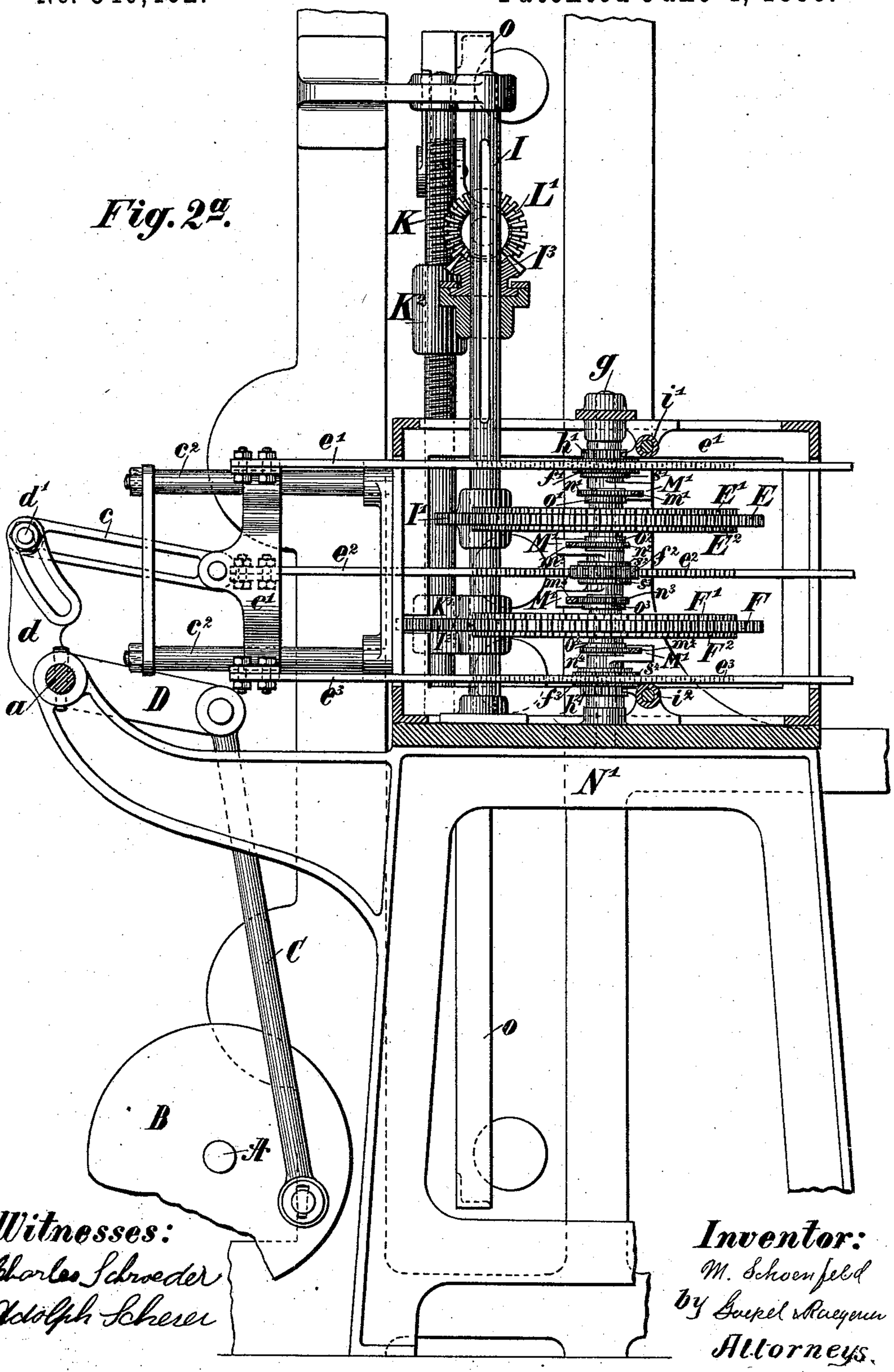
STITCH ADJUSTING MECHANISM FOR EMBROIDERING MACHINES.

No. 540,462. Patented June 4, 1895.

Fig. 2a.



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(No Model.) 7 Sheets—Sheet 5.

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STITCH ADJUSTING MECHANISM FOR EMBROIDERING MACHINES.

No. 540,462. Patented June 4, 1895.

Fig. 3.

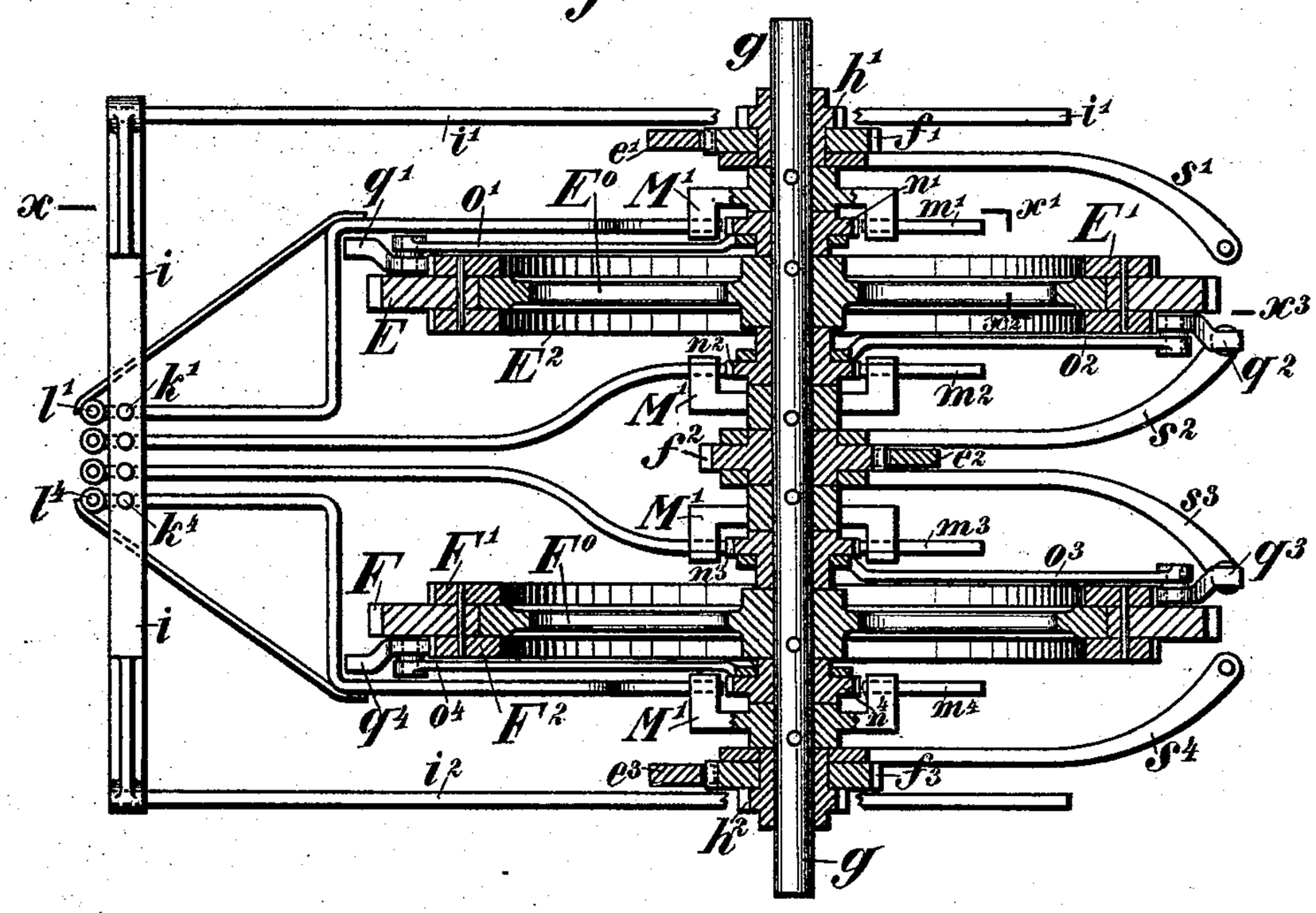
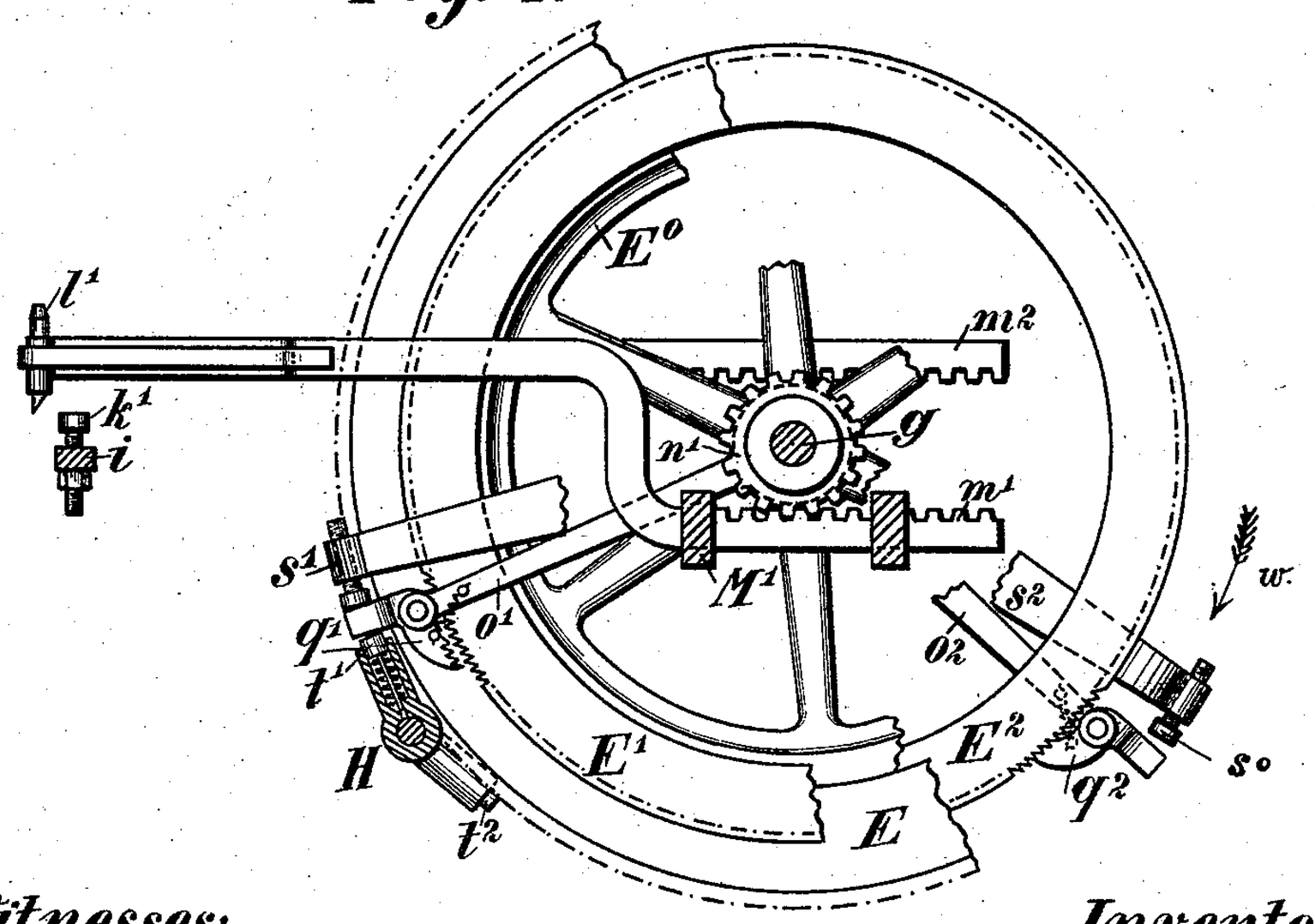


Fig. 4.



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(No Model.) 7 Sheets—Sheet 6.

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STITCH ADJUSTING MECHANISM FOR EMBROIDERING MACHINES.

No. 540,462. Patented June 4, 1895.

Fig. 5.

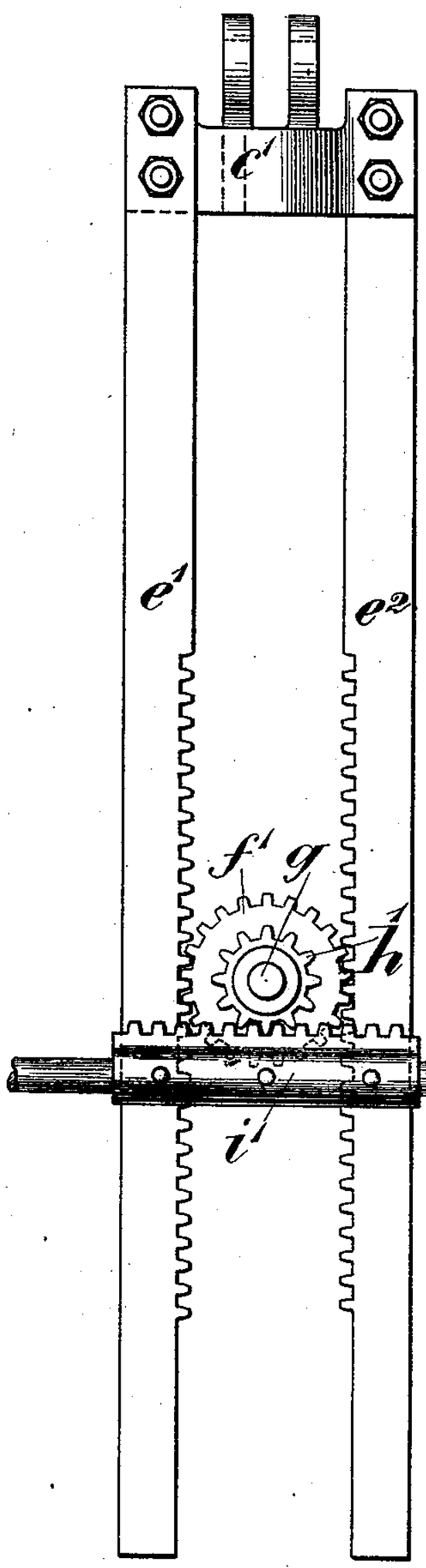

Fig. 6.

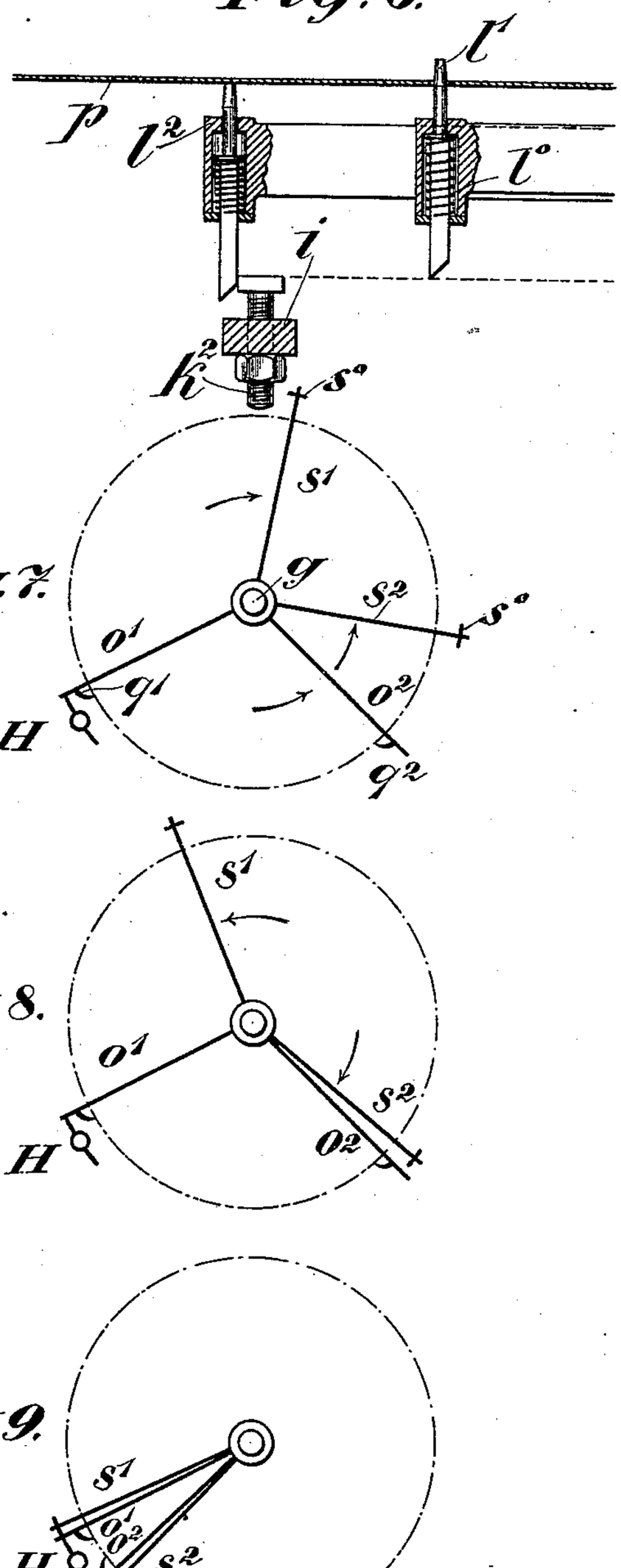

Fig. 7.

Fig. 8.

Fig. 9.

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STITCH ADJUSTING MECHANISM FOR EMBROIDERING MACHINES.

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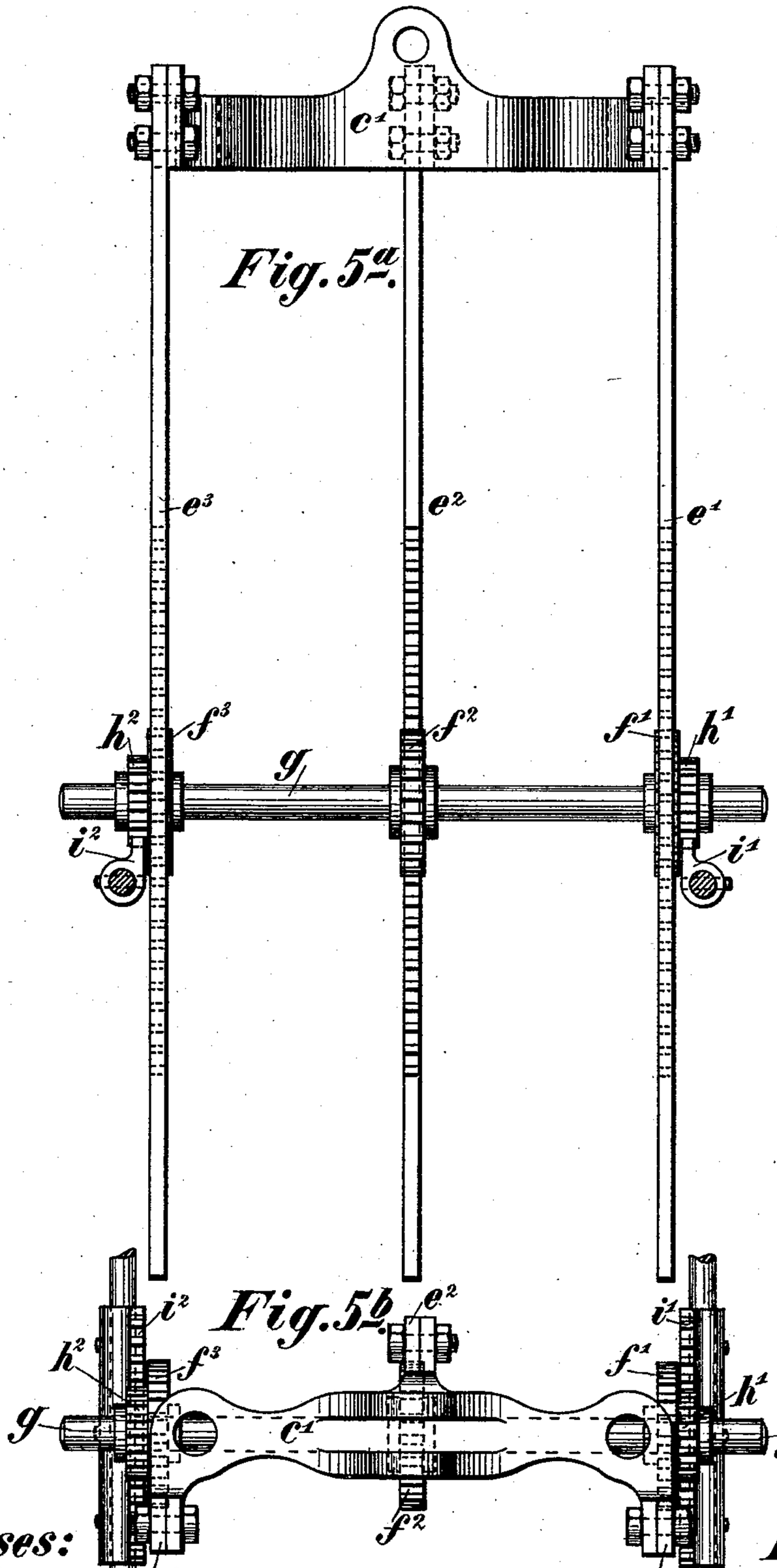

Fig. 5a.

Fig. 5b.

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UNITED STATES PATENT OFFICE.

MORRIS SCHOENFELD, OF RORSCHACH, SWITZERLAND.

STITCH-ADJUSTING MECHANISM FOR EMBROIDERING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 540,462, dated June 4, 1895.

Application filed December 5, 1891. Serial No. 414,130. (No model.) Patented in Germany November 20, 1891, No. 63,946.

To all whom it may concern:

Be it known that I, MORRIS SCHOENFELD, a citizen of the United States of America, residing at Rorschach, Switzerland, have invented certain new and useful Improvements in Automatic Stitch-Adjusting Apparatus for Embroidering-Machines, (for which I have obtained Letters Patent in Germany, No. 63,946, dated November 20, 1891,) of which the following is a specification.

This invention relates to improvements in embroidery-machines and the object of my invention is to control and regulate the movements of the fabric-holding frame of an embroidery-machine by means of a strip of paper, fabric or like material provided with holes in accordance with the pattern to be reproduced.

The invention consists in mechanism operated from the embroidery-machine driving shaft and controlled by a pattern sheet or strip having holes for receiving pins which at times are engaged by tappet screws moved by swinging arms from which motion is transmitted to the tambour frame, said motions being up or down or to the right or left in any desired order as may be necessary so as to shift the tambour frame successively in such a manner that any desired pattern can be embroidered by the machine on the fabric held on the tambour frame.

The invention also consists in the construction and combination of parts and details as will be fully described and set forth hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of my improved attachment and of the end part of an embroidery-machine. Fig. 1ª is a plan view. Fig. 2 is a side view of my improved pattern attachment. Fig. 2ª is a side view, in section, on the line y' y' of Fig. 1ª. Fig. 3 is a detail vertical sectional view, on an enlarged scale, of the parts shown in Fig. 1. Fig. 4 is a horizontal sectional view on the line x x' x^2 x^3 of Fig. 3, parts being broken out. Fig. 5 is an enlarged detail top view of the slide-frame, parts being broken out. Fig. 5ª is a side view of the same, and Fig. 5ᵇ is a front view of the same. Fig. 6 is an enlarged detail horizontal sectional view on the line x^6 x^6 of Fig. 1 and Figs. 7, 8, and 9 are diagrammatical views illustrating the movements of the parts.

Similar letters and numerals of reference indicate like parts in all the figures.

The apparatus is operated from the disk B, mounted on the main shaft A of the embroidery machine, which disk by means of the connecting-rod C oscillates the lever D and the shaft a rigidly connected therewith. (See Figs. 1ª, 2, and 2ª.) A second arm d of the shaft a transmits these oscillating movements by means of the rod c to a slide-piece c' (see Figs. 2ª, 5, 5ª and 5ᵇ), which slide-piece c' is guided by suitable guides c^2 c^2 so as to have a reciprocating motion. The slide-piece c' is rigidly connected with the three racks e' e^2 e^3, which, as shown in Figs. 1ª, 2ª, 5, 5ª and 5ᵇ, engage the three cog-wheels f', f^2, f^3 that are mounted loosely on the vertical shaft g fixed on the frame N′ of the apparatus. (See Figs. 1 and 2ª.) The rack e^2 engages its corresponding cog-wheel f^2 on that side of the shaft g opposite the one at which the racks e' e^3 engage their cog-wheels, so that the movement of the slide-piece c' causes the cog-wheel f^2 to rotate in reversed direction to that in which the cog-wheels f' and f^3 are rotated by their racks e' and e^3. The cog-wheels f' and f^3, which are turned in the same direction by their racks e' and e^3, engage these wheels on the same side of the shaft g. The cog-wheels h' and h^2, Figs. 3, 5, 5ª and 5ᵇ, are rigidly connected, with the cog-wheels f' and f^3 which cog-wheels h' h^2 transmit to the racks i' and i^2 and their connecting-piece i (Figs. 3 and 4) a corresponding reciprocating motion when the slide-piece c' is moved. The connecting-piece i is further provided with four adjustable tappets k' k^2 k^3 and k^4 (Fig. 6), which can be adjusted to project more or less from the connecting-piece i by means of suitable threads, and which tappets during the movements of the connecting-piece i can act on four corresponding pins l' l^2 l^3 and l^4. These pins each consist of a pin proper, which is pressed upward from its seat by a spring l^0 that is pressed in the direction from the tappets k' k^2 k^3 and k^4 and thus rests against the paper p or card (Figs. 1ª and 6) that contains the pattern. If now one of the pins, for example l', arrives at a hole in the pattern

paper or sheet, it is pressed by its spring into the same and moves to the front, whereby it is moved out of the path of movement of the tappet k', which can now pass by the same without acting on it. (See Fig. 6.) Each pin l' l^2 l^3 and l^4 is connected with one of the racks m' m^2 m^3 and m^4, which slide in the guides M' on the fixed shaft g and which racks engage the loose cog-wheels n' n^2 n^3 n^4 on the shaft g, and on the hubs of said cog-wheels swinging carrier-arms o' o^2 o^3 o^4 are fastened, which carry the pivoted pawls q' q^2 q^3 q^4, which are pressed by springs against the ratchet-wheels E', E², F' and F² respectively (Figs. 3 and 4), as will be set forth hereinafter. If one of the pins (l^2, for example) is pushed along by the tappet k^2, it carries along the rack m^2 and thereby moves or turns the cog-wheel n^2, whereby the carrier arm o^2 is moved from its initial position until the pin l^2 drops into one of the holes of the pattern paper or chart P. At this moment the tappet k^2 passes over the pin l^2 and the arm o^2 remains at rest and the pawl q^2 drops under the action of its spring in engagement with the teeth of its ratchet-wheel. The cog-wheels f' f^3 are also provided with arms s' s^4, and the cog-wheel f^2 is provided with the two arms s^2 and s^3, which carry screws s^0, Fig. 4, which when the arms swing strike against wings of the pawls q' q^2 q^3 and q^4.

The motion is transmitted in the apparatus in such a manner that the arms s' s^2 s^3 and s^4 at the same time describe a greater path than the carrier-arms o' o^2 o^3 and o^4, so that during the forward motion of the slide-piece i the arm s^2 will swing back farther than the arm o^2, which is held, as its pin has dropped into one of the holes of the pattern chart or paper. Accordingly as this stopping takes place sooner or later the size of the movement of the embroidery frame is controlled. If during the return motion of the piece c' the racks e' e^2 and e^3 begin their return movement, the arm s^2, for example, strikes at a certain fixed position the pawl q^2 of the carrier-arm o^2 and the latter and also a ratchet-wheel engaged by said pawl q^2 is swung in the direction of the movements of the hand of the clock back to the starting position of the swinging arm.

The above mentioned ratchet-wheels work in pairs with each other, and of the pair E' E² one is at each side of the toothed wheel E and of the other pair F' F² one is at each side of the toothed wheel F and rigidly connected therewith. The toothed wheels E and F can turn on the disks E⁰ and F⁰, that are rigidly connected with the axle G. The ratchet-wheels E' and E², which are firmly connected with the opposite sides of the toothed wheel E, have their teeth inclined in the opposite direction, as shown in Fig. 4, so that the toothed wheel can turn either to the right or to the left, according as the pawl q' is engaged with the ratchet-wheel E' or the pawl q^2 is engaged with the ratchet-wheel E². In an analogous manner the ratchet-wheels F' and F² are arranged in relation to the toothed wheel F. If, for example, as shown in Fig. 4, the pawl q^2 is engaged with the ratchet-wheel E² and is pushed forward by the carrier-arm s^2 and the ratchet-wheel E², and the toothed wheel E is to be turned, the second pawl q' must be disengaged from the ratchet-wheel E', which is accomplished by the lug H fixed on the frame, which lug carries at the same height as the pawl q' a spring-pin t'. Corresponding spring-pins are also arranged for the other pawls; for example, the spring-pin t^2 for the pawl q^2, Fig. 4. If the arms s' s^2 s^3 and s^4 all swing back until their pawls q' q^2 q^3 q^4 strike against the lug H, that is, until the spring-pins t' and t^2, &c., are pressed back into their sockets, then all the pawls q' q^2 q^3 q^4 are pressed by their springs on the corresponding ratchet-wheels and thereby the toothed wheels E and F are held at absolute rest. As soon as one of the arms, for example, s', (Fig. 4,) is moved from its corresponding pawl q' the corresponding spring-pin t' is pressed by its spring to the front and throws back the pawl of the arm that has remained at rest and thus destroys the connection between the pawl q' and the ratchet-wheel E', so that the ratchet-wheel E² can freely move and turn the toothed wheel E. The two toothed wheels E and F engage the cog-wheels I' and I², of which the former is rigidly secured on the shaft I, whereas the latter is mounted loosely on the shaft I and engages the cog-wheel K' of the spindle K. By the turning of the spindle K a support K² is moved vertically, said support K² carrying in suitable bearings the horizontal spindle L on the end of which a bevel cog-wheel L' is fixed and which engages and is rotated by the bevel cog-wheel I³ that is so mounted on the shaft I as to turn with the same by means of a spline, so that said wheel I³ can be shifted on the shaft. Thereby the nut M mounted on the spindle L is adjusted horizontally, which nut carries the embroidery frame O.

The nut M and the embroidery frame perform a movement which is the resultant of the movements of the two toothed wheels E and F, that is, a movement corresponding to the distance between the holes of the pattern paper. The connection N between the nut M and the embroidery frame O can be disconnected by raising the cover of the bearing, so that the embroidery frame can be shifted independently of the above described mechanism, for performing certain operations without requiring any change on the above described apparatus.

The pattern chart or paper P (Figs. 1, 1ª and 2ª) is rolled on a wooden roller Q and is guided to the roller R and to the roller S, upon which it is again rolled. If the pattern has been embroidered, the pattern paper or chart is wound back around the roller P, the cord p^2 passing over guide-rollers r' and kept taut by a weight p' serving for the purpose of

keeping those parts of the pattern chart or paper that are not operating taut on the rollers P and S. For the purpose of protecting the pattern chart and also for the purpose of obtaining a uniform feed of the pattern two endless steel bands T T run over the rollers R and Q and are provided with projections Z and guide the pattern chart or paper, which is drawn forward uniformly by the pins or projections y of the roller R. This shifting of the pattern chart is accomplished by the lever u' on the shaft a (Fig. 2), which lever by means of the rod u^2 and the pawl u^3 turns a ratchet-wheel connected with the roller R. By means of the lever v', also mounted on the shaft a, the rod v^2 and the pawl v^3, a wheel w' is operated periodically, whereby by means of the levers w^2 and w^3 the pattern chart or paper p is brought at the proper time in contact with the pins l', l^2, l^3 and l^4 and moved from the same respectively for the purpose of protecting said chart from undue wear. In the lever d (Figs. 2 and 2^a), which operates the slide-piece c', the pivot d' of the rod c can be adjusted and the stroke of the entire mechanism thus changed, whereas the movements of the pattern chart p remain the same. For example, if a pattern is to be embroidered that only has short stitches, then the stroke of the racks c' c^2 c^3 can be decreased, and thus the number of strokes increased without requiring the mechanism of the apparatus itself to have greater speed in relation to the distance to be traveled; in other words, for small stitches the apparatus can make a greater number in the same time and for larger stitches it makes a less number in the same time.

The operation is as follows: The slide c' with its three racks and wheels f' f^2 f^3 is reciprocated at regular intervals. Thereby the arms s' s^2 s^3 s^4, with their lugs s^0, are swung and the connecting-piece i, with its tappets, is reciprocated. These tappets k' k^2 k^3 k^4 move the pins l' l^2 l^3 l^4 along and swing the pawls. Figs. 1 and 1^a show the arrangement of the holes in the pattern paper; and 1 corresponds to the movement to the right, 2 to the left, 3 upward, and 4 downward; and it is evident that of two holes that represent opposite movements one must be directly under the starting position of its pin and the other must be a greater or less distance away from the first hole; that is, from the starting position of the pin. The first kind of holes will therefore always be in one row and the second kind corresponding to the stitch will have corresponding positions to the left and in any suitable manner and without depending upon the subdivisions of the stitch-regulating devices used heretofore. By this arrangement of the holes it is desired to accomplish the turning of one of the pair of carrier-arms o', o^2 or the pair o^3, o^4 while the other remains stationary, for at the moment that the turning of one of said arms begins the pattern paper or chart p is pressed by the devices previously described against the pins l' l^2 and l^3 l^4 and thereby a tappet is moved into the corresponding hole of the pattern chart by the two pairs of pins l' l^2 and l^3 l^4. Thus the movement of the corresponding rack of the carrier-arm is stopped from the start, so that only the movements 1 or 2, and 3 or 4, Figs. 1 and 3, can take place. These movements of the carrier-arms o' o^2 and the arms s' s^2 are shown diagrammatically in Figs. 7 to 9. Fig. 7 shows a position after the connecting-piece i has arrived at its end position in being pushed over the pattern chart or paper. The arms s' s^2 with their lugs s^0 are also in their end position, whereas the carrier-arm o^2 by means of its pin l^2 engaging in the corresponding hole in the pattern chart, is locked in its desired position. The carrier-arm o' could perform no movements whatever, as at the beginning of the operation it is held by its pin that has dropped into one of the holes, whereas at the same time its pawl has been disengaged from the teeth of a corresponding ratchet-wheel E′ by the pin t'. (See Fig. 4.) Fig. 8 shows the return movement. The arm s' turns freely, the arm s^2 strikes, according to the pattern, sooner or later against the carrier-arm o^2 and turns the ratchet-wheel E^2 until the two arms s' s^2 arrive at the starting position—that is, until the arm s' strikes against the carrier-arm o' the pawl q' and presses back the pin t', permitting the pawl to engage the ratchet-wheel E′, whereby the toothed wheel E, which was formerly moved in the same direction as the arm s^2, is now locked. The toothed wheel E in this case transmitted the movement to the nut M to the embroidery frame O in the direction 2, that is, moved the same to the left. The toothed wheel F operates in a similar manner, and if the same during the left movement that has just occurred is turned in the direction of the ratchet-wheel F′ the movements of the embroidery frame will be 2 and 3, that is, to the left and upward.

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

1. The combination, with an embroidery-machine tambour-frame, of mechanism for shifting the same vertically and horizontally, gearing for operating said mechanism, pins connected with said gearing and for operating the same, means for shifting said pins in a plane parallel with the surface of the pattern-sheet or strip and in contact with the same, and a pattern-sheet or strip provided with holes into which said pins can pass so as to avoid the shifting means, substantially as set forth.

2. The combination, with an embroidery-machine tambour-frame, of mechanism for shifting said frame vertically and horizontally, gearing for operating said mechanism arms connected with the gearing and provided with a series of pins, a reciprocating-frame having projections for engaging and shifting

said pins in a plane parallel to the surface of a pattern-sheet or strip and in contact with the same, and a movable pattern-sheet or strip provided with holes into which said pins can pass so as to avoid the projections of said reciprocating-frame, substantially as set forth.

3. The combination, with an embroidery machine tambour frame, of mechanism for shifting the frame vertically and horizontally, cog-wheels for operating said mechanism, ratchet-wheels connected in pairs with said cog-wheels, swinging arms, carrying pawls for engaging said ratchet-wheels, cog-wheels formed on said swinging arms, reciprocating racks for engaging said cog-wheels, movable pins on said racks, a movable pattern sheet having holes into which the pins, when moved over said pattern sheet can pass, mechanism for moving the pattern-sheet and a reciprocating frame having projections for acting on said pins, so as to cause them to pass over the pattern sheets, substantially as set forth.

4. The combination, with an embroidery-machine tambour-frame, of mechanism for moving said tambour-frame vertically and horizontally, cog-wheels for operating said mechanism, two ratchet-wheels having opposite teeth, for each cog-wheel, a swinging-lever for each ratchet-wheel, a pawl on each lever, a cog-wheel formed on each lever, a rack engaging each cog-wheel, a movable pin held in the end of each rack, a movable pattern-sheet or strip having holes into which the pins can pass, mechanism for moving said pattern-sheet or strip, and a reciprocating-frame having projections that can act on the pins, substantially as set forth.

5. The combination, with an embroidery-machine tambour-frame, of mechanism for moving said frame vertically and horizontally, cog-wheels for engaging and driving said mechanism, two ratchet-wheels having opposite teeth at opposite sides of each cog-wheel and connected therewith, a lever for each ratchet-wheel, a pawl on the end of each lever, a cog-wheel formed on each lever, a rack-bar engaging each of said cog-wheels, a movable pin in the outer end of each rack-bar, a movable pattern-sheet or strip provided with holes into which said pins can pass, mechanism for shifting the pattern-sheet, a reciprocating-frame having projections that can act on the pins and the rack-bars, swinging arms that can act on the pawls, cog-wheels formed on said swinging arms, rack-bars engaging said cog-wheels, and a reciprocating-frame with which said rack-bars are connected, substantially as set forth.

6. The combination, with an embroidery-machine tambour-frame, of mechanism for shifting the tambour-frame horizontally and vertically, two cog-wheels engaging said mechanism, two ratchet-wheels having opposite teeth, connected with each cog-wheel, a swinging arm for each ratchet-wheel, a pawl on each swinging arm, a cog-wheel formed on each swinging pawl-arm, a rack-bar engaging each cog-wheel, a movable pin held on the outer end of each of said rack-bars, a pattern-sheet or strip having holes through which the pins can pass, mechanism for moving the pattern-sheet or strip, a reciprocating cross-piece having projections that can act on the pins, a reciprocating-frame, rack-bars on said frame, cog-wheels with which said rack-bars engage, an arm on each cog-wheel, a projection on the end of each arm, which projection can act on the pawls of the ratchet-wheels, and spring-stops against which the pawls can strike, substantially as set forth.

7. The combination, with an embroidery machine tambour frame, of mechanism for moving the same horizontally and vertically, gearing for operating said mechanism, rack-bars engaging said gearing, pins on said rack-bars, a movable pattern-sheet or strip having apertures into which the pins can pass, means for moving said pins over the pattern-sheet, a reciprocating pin provided with projections that can act on said pins on the rack-bars for moving them over the pattern-sheet or strip and a rocking lever for pressing the pattern sheet or strip against the pins for the purpose of bringing them into the path of the reciprocating frame, substantially as set forth.

In testimony whereof I hereunto sign my name, in the presence of two subscribing witnesses, this 3d day of November, 1891.

MORRIS SCHOENFELD.

Witnesses:
S. H. M. BYERS,
JOSEPH SIMON.