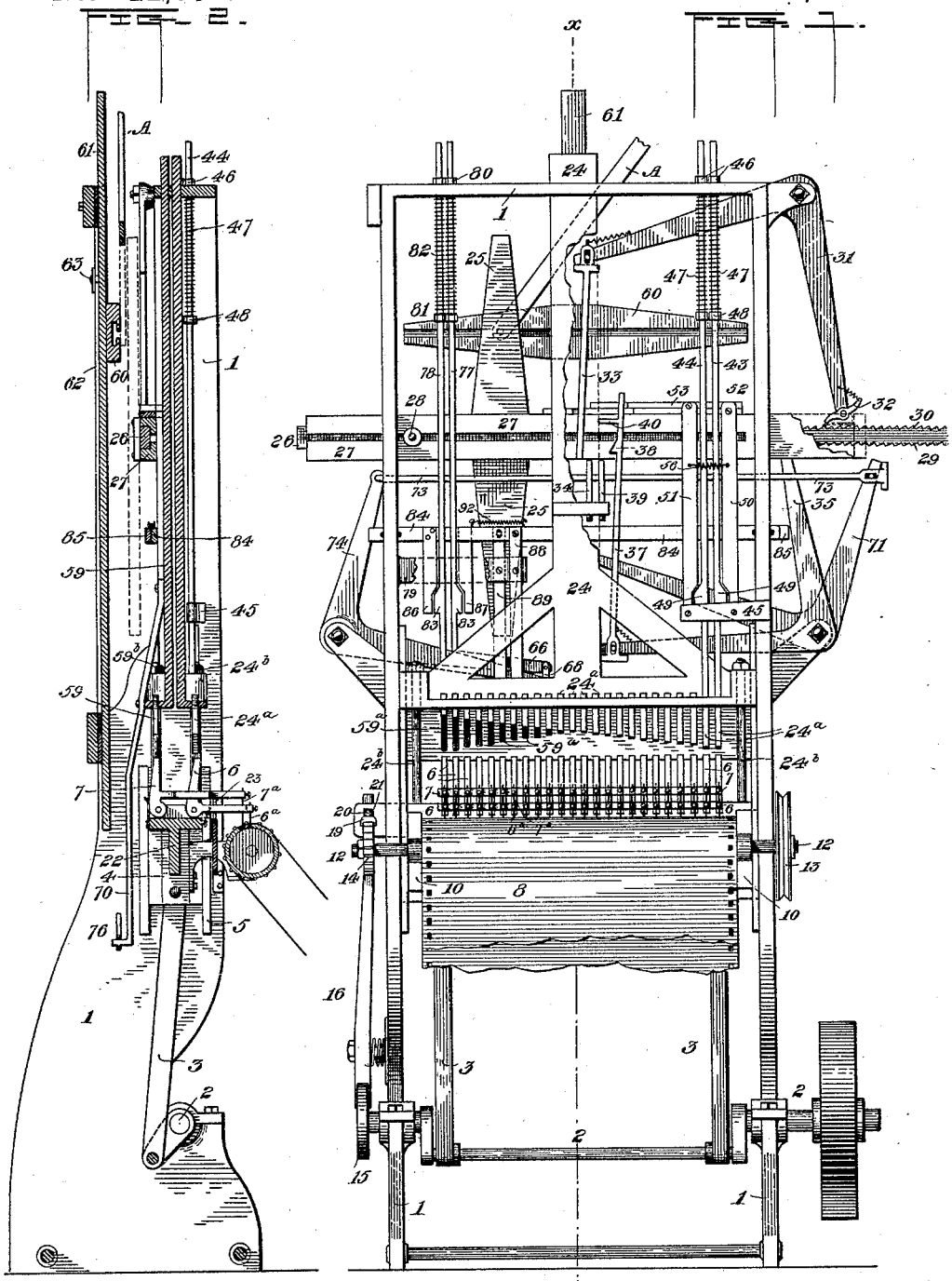
(No Model.) 3 Sheets—Sheet 1.

R. T. SMITH.

AUTOMATIC STITCH ADJUSTING MECHANISM FOR EMBROIDERING MACHINES.

No. 422,894. Patented Mar. 4, 1890.



WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

R. T. SMITH.

AUTOMATIC STITCH ADJUSTING MECHANISM FOR EMBROIDERING MACHINES.

No. 422,894. Patented Mar. 4, 1890.

FIG. 3.

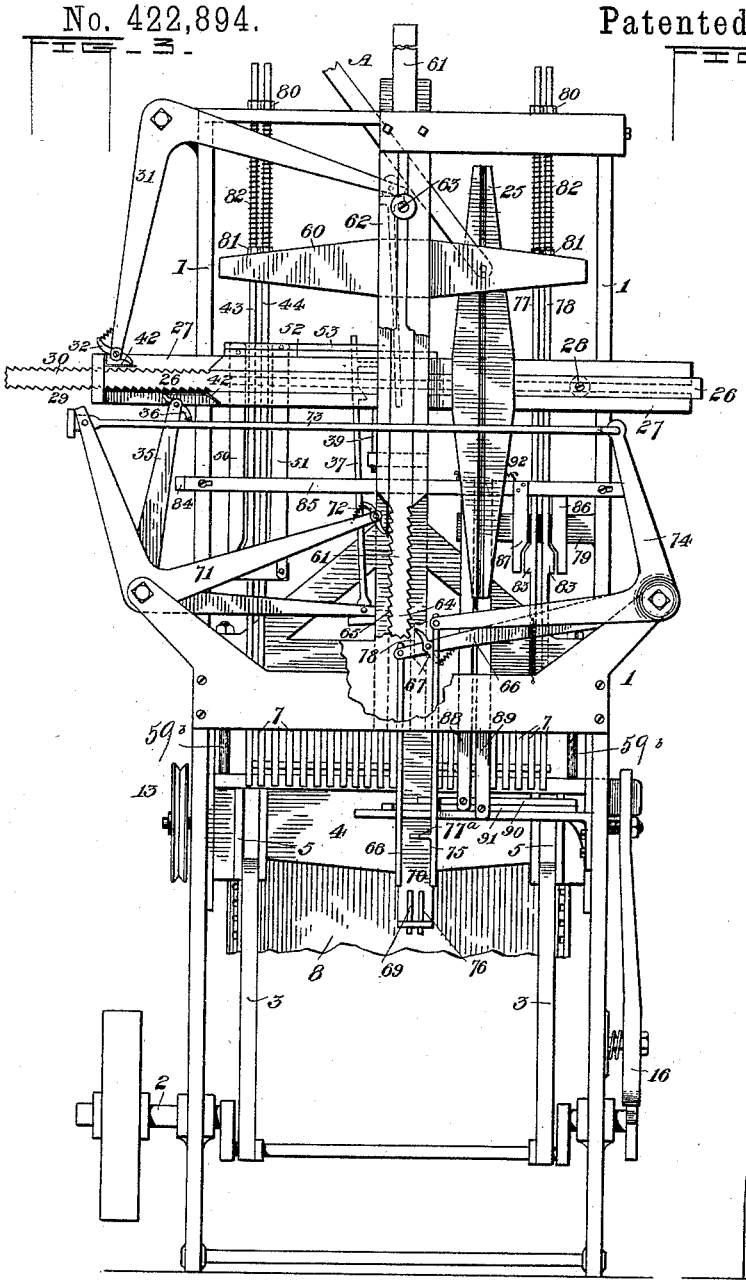
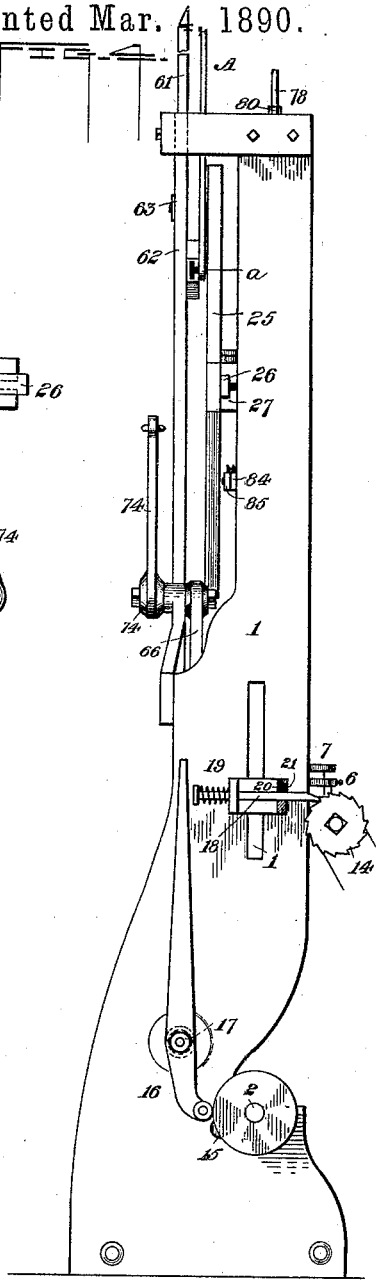


FIG. 4.



WITNESSES

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(No Model.) 3 Sheets—Sheet 3.

R. T. SMITH.

AUTOMATIC STITCH ADJUSTING MECHANISM FOR EMBROIDERING MACHINES.

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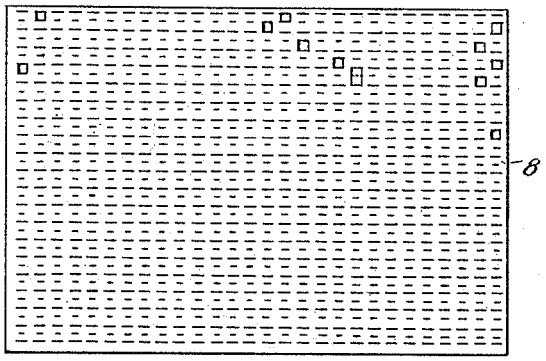

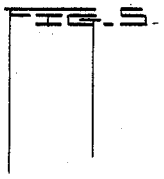

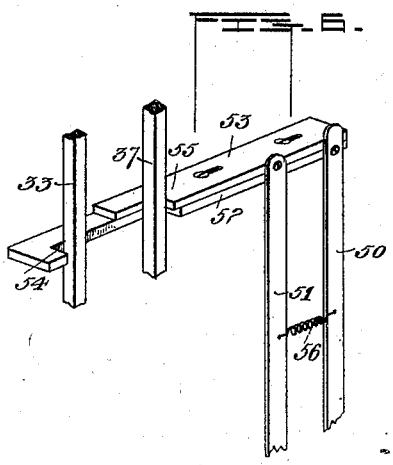

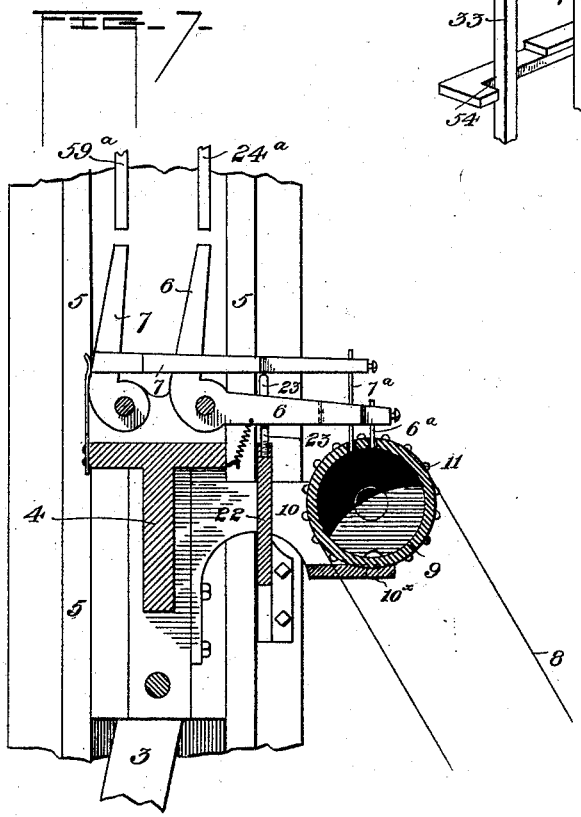

WITNESSES

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UNITED STATES PATENT OFFICE.

ROSWELL T. SMITH, OF NASHUA, NEW HAMPSHIRE.

AUTOMATIC STITCH-ADJUSTING MECHANISM FOR EMBROIDERING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 422,894, dated March 4, 1890.

Application filed August 5, 1889. Serial No. 319,852. (No model.)

To all whom it may concern:

Be it known that I, ROSWELL T. SMITH, a citizen of the United States, residing at Nashua, in the county of Hillsborough and State of New Hampshire, have invented new and useful Improvements in Automatic Stitch-Adjusting Mechanism for Embroidering-Machines, of which the following is a specification.

My invention relates to the class of devices shown in my patent, No. 377,410, dated February 7, 1888, which have for their object to effect an automatic movement of the tambour-frame of embroidering-machines, so as to permit the working of any desired design upon the fabric held by said frame. In the device shown in said patent I effected the adjustment of the tambour-frame necessary to secure the desired length of stitch by a step-by-step movement, each step having the length of a common unit.

The immediate and main purpose of my present invention is to secure a continuous movement of the tambour-frame for any distance from the unit of movement to any multiple thereof. To accomplish this, the vertical and horizontal slide-bars, to both of which the pantograph-arm is connected, have movement imparted to them by rack-bars and pawl-carrying levers, substantially as in my former device; but one or the other or two of said levers, instead of operating by successive reciprocations to impart a step-by-step movement to the tambour-frame until the desired length of stitch is formed, are first selected for operation by means of a pattern mechanism, and then the lever or levers so selected are caused to move a certain distance by means of a reciprocating cross-head, the extent of movement in every case being determined by a pattern mechanism and devices to be described hereinafter. I employ four rods or bars and their corresponding selectors, substantially like those employed in my former device; but in the present instance these four rods and selectors have the sole function, in connection with the pattern mechanism, of determining the direction of movement of the tambour-frame. Other selectors and the devices above referred to have the function of determining the extent of the movement of the tambour-frame and of producing the movement.

The particular mechanism which I have found to be a convenient and desirable embodiment of my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of my improved mechanism, parts being broken out to show other parts more clearly. Fig. 2 is a section on the line *xx* of Fig. 1. Fig. 3 is a rear view of the mechanism, with parts broken away. Fig. 4 is a side elevation. Fig. 5 is a plan of the pattern or stencil paper. Figs. 6 and 7 are details to be referred to.

In the drawings, 1 represents the supporting frame-work of the mechanism. A crank-shaft 2 and pitmen 3 impart continuous reciprocation to a cross-head 4, which slides in ways 5 in the side of the frame. Upon the cross-head are pivoted two series of dogs or selectors 6 and 7. The dogs of one series are employed for selecting and operating the devices which effect the horizontal movement of the pantograph-arm, while the dogs of the other series are employed for selecting and operating the devices which effect the vertical movement of said arm. Each dog or selector, as shown, is in the form of an elbow-lever with a vertical and a horizontal arm, and in the outer end is secured a pin 6^a or 7^a, the horizontal arms being offset to permit the pins to stand in line, the one behind the other. The stencil-sheet 8, which co-operates with these pins to determine the position of the selectors, and through them to control the direction and extent of the adjustments of the tambour-frame, is supported by and moves over a fixed cylinder or shell 9, pierced with holes corresponding to the pins 6^a and 7^a, and in turn supported by the cross-bar $10^\times$ and stands 10, which are carried by the cross-head 4. The shell and stencil are thus made to reciprocate with the cross-head and the selectors. The stencil is engaged by gears 11, fast to the shaft 12, which carries also the pulley 13 and the ratchet-wheel 14. The ratchet-wheel is actuated from a cam 15 on the shaft 2 through a spring-pressed lever 16, pivoted at 17 to the frame 1, which strikes a feeding-bolt 18, sliding in bearings in a bracket attached to the cross-head and pro-

jecting through the side frame. The bolt is thrown backward by a spring 19, and in its forward movement, under the pressure of the lever 16, engages the teeth of the ratchet-wheel. The stencil is thus driven with a step-by-step movement in harmony with the reciprocations of the cross-head. The front bearing of the bolt in the bracket is an elongated vertical slot 20, at the bottom of which the bolt is held by a spring 21. This construction permits the bolt to work with ease and with but slight friction upon the ratchet-wheel. The pulley 13 may be made to turn a take-up roll for that part of the stencil which has been used.

The stencil is made, preferably, of heavy Manila paper, and is provided with two series of openings corresponding, respectively, to the two series of pins 6^a and 7^a, and designed for co-operation therewith. To facilitate the perforation of the stencil, I print it in the manner shown in Fig. 5. Holes cut above the longer lines control the action of one series of dogs, while those cut above the shorter lines control the other series. As a matter of convenience I set apart the two outer spaces of each row to represent and control the direction of movement of the tambour-frame, while the remaining spaces represent and control the extent of the movement, in this instance the spaces above the longer lines representing and controlling, through the selectors 6, the extent of movement in horizontal directions, and those above the shorter lines representing and controlling, through the selectors 7, the extent of movement in vertical directions. By cutting holes in such manner as to cause the action of selectors of different series at the same time a diagonal movement of the tambour-frame may be produced.

Extending from one side frame to the other and between the shell 9 and the cross-head 4 is a cross-bar 22, bearing a series of stop-pins 23, with which the horizontal arms of the selectors come in contact as they descend, and by which the outer ends of said arms are raised and the pins 6^a 7^a therein are lifted from the shell and stencil.

The operation of this portion of my device is as follows: Just before the cross-head 4 reaches the lowest point in its reciprocations the extending arms of the selectors 6 7 strike the pins 23, causing the other arms of said selectors to swing back from the vertical plane in which they stand normally and raising the pins 6^a 7^a away from the stencil, leaving it free to move. Immediately the cam 15 strikes the lever 16 and the bolt 18 is thrown forward into engagement with the ratchet-wheel, driving the stencil forward a distance equal to the width of the two rows of perforations, and thus bringing a new set of perforations beneath the pins 6^a 7^a. As the cross-head rises the selectors will tend to resume their normal position with their upwardly-extending arms substantially vertical; but as the pins 6^a 7^a strike the stencil-sheet the selectors will be held back, except as the pins of certain of them find perforations in the stencil-sheet, when such selectors will swing forward, bringing their upwardly-extending arms into vertical and operative position. The continued upward movement of the cross-head causes such selectors to effect certain results, as hereinafter described.

Above each series of selectors is placed a sliding bracket moving in ways in the side frames, wholly independent the one of the other, and acting to produce independent results, the one 24 effecting the horizontal movement of the tambour-frame and the other 59 effecting the vertical movement thereof. Each of said sliding brackets has pins 24^a 59^a projecting from the under side thereof and standing in a vertical plane over its corresponding series of selectors 6 7, and each receives loosely through itself the headed bolts 24^b and 59^b, which are secured to the cross-head and are designed to draw the bracket down to its initial position after it has been pushed up. The pins projecting from the brackets are of different length, as shown, the end pin of one series and the opposite end pin of the other series representing in length a unit of movement of the pantograph, and the successive pins in each series representing successive multiples of such unit. As the pins stand in the path of the selectors 6 7 when the latter are in operative position, it will be seen that the brackets will be moved upward with each reciprocation of the cross-head, and that the extent of movement will be a unit or some multiple thereof, according to the selector which is allowed by the stencil to stand in operative position. The means for imparting the movement of these brackets to the pantograph have now to be described.

As in my said former patent, the motor-arm A of the pantograph carries in its extremity a pin *a*, which projects on both sides of the arm and has one end lying in the slot of a vertical arm and the other in a slot of a horizontal arm. Movement of the tambour-frame is effected through the pantograph-arm by the movement of one or both of these cross-arms, and the direction and extent of movement of the frame will be determined by the direction and extent of movement of the cross-arms, movement of one or the other of the cross-arms giving movement to the frame in a horizontal or a vertical direction, and movement of both cross-arms together giving movement to the frame in a direction other than the vertical or the horizontal. The cross-arm 25, which effects the horizontal movement, is carried by a slide-bar 26, which moves in a horizontal slideway 27, being held frictionally thereto by the bolt and spring-washer indicated at 28. The bar is formed near one end with two racks or sets of ratchet-teeth, the one 29 being adapted for its propulsion to the right (in Fig. 1) and the

other 30 for its propulsion to the left. Fulcrumed to the frame is the elbow-lever 31, having at one end the spring-pressed pawl 32 for engagement with the rack 30 and carrying at the other end a rod 33, which may be caused to stand in the path of movement of a pin 34, attached to the sliding bracket 24, and so transmit the movement of said bracket to the slide-bar and arm. A similar elbow-lever 35 carries a spring-pressed pawl 36 for engagement with the rack 29, and a rod 37, having a projection 38, which may be caused to stand in the path of a second pin 39, also attached to the sliding bracket. A pin 40, attached to rod 37 in the plane of rod 33, prevents the simultaneous engagement of both rods with the pins 34 and 39. Relief-plates 42 are secured to the slideway to support the pawls 32 and 36 when the elbow-levers are at rest. These pawl-carrying levers, with their immediately-connected parts, constitute feeders for the slide-bars and their arms.

It will be seen readily that the movement of the sliding bracket 24, the extent of which is determined by the selectors 6 and the pins 24^a, will cause the movement of the bar 25 to the right or left, according as one or the other of the rods 33 or 37 is brought into the line of movement of its respective pin 34 or 39. The means for controlling the rods 33 and 37 will now be described.

Over the two right-hand selectors of the series 6, I place the two rods 43 and 44, which slide freely in bearings in the sliding bracket 24 in a bracket 45, attached to the side frame, and in the upper cross-tie. The rods are held from falling too far by the nuts 46, and are pressed downward by the springs 47, acting upon nuts 48. Both rods are provided with the oppositely-set cams 49. Pivoted to the bracket 45 are the arms 50 51, having cams corresponding to the cams 49, and having the slides 52 and 53 pivotally and loosely secured to their upper ends. The slides are slotted and held to the slideway 27 by screws which pass through the slots, so that they may move freely thereon. The slide 52 is formed with a shoulder 54 to engage with the rod 33, and the slide 53 with a shoulder 55 to engage with the rod 37. A spring 56, having its ends secured to the arms 50 and 51, insures the return of the slides to normal position after movement. If the selector beneath rod 43 finds a perforation in the stencil for its pin 6^a, as the cross-head moves upward the selector will strike said rod and push it upward, thrusting the arm 50 and slide 52 to the right and bringing rod 33 into the path of pin 34, and thereby causing a movement of the slide-bar 26 and arm 25 to the left. If the selector beneath rod 44 finds a perforation, the slide-bar and arm would be moved to the right.

The cross-arm 60, which effects the vertical movement of the pantograph-arm, is carried by a slide-bar 61, which moves in a vertical slideway 62, being held frictionally thereto by a bolt and spring-washer 63. The means for imparting the movement of the sliding bracket 59 to the slide-bar 61 and arm 60 are similar to those for imparting the movement of the sliding bracket 24 to the slide-bar 26 and arm 25, but will be described in detail. The bar 61 is formed with two racks 64 and 65, adapted for its propulsion in opposite directions. A lever 66, fulcrumed at one end to the frame, carries at the other end a spring-pressed pawl 67 for engagement with the rack 64 and the rod 68, which may be caused to stand in the path of movement of a pin 69, carried by an arm 70, extending downwardly from the sliding bracket 59 into convenient position. An elbow-lever 71, fulcrumed to the frame, carries at one end a spring-pressed pawl 72 for engagement with the rack 65, and has its other end connected by a rod 73 with one end of a reversely-set elbow-lever 74. The other end of the latter lever carries a rod 75, which may be caused to stand in the path of a second pin 76, also carried by the arm 70. A pin 77^a prevents the simultaneous engagement of both rods with the pins 69 and 76. Relief-plates 78 are provided for the pawls 67 and 72.

It will be seen that the movement of the sliding bracket 59, the extent of which is determined by the selectors 7 and the pins 59^a, will cause the movement of the bar 60 up or down, according as one or the other of the rods 68 or 75 is brought into the path of movement of its respective pin 69 or 76. The means for controlling the rods 68 and 75 also are similar to those for moving the rods 33 and 37. Over the two left-hand selectors of the series 7 are placed two rods 77 and 78, which slide freely in bearings in the sliding bracket, in a bracket 79, attached to the side frame, and in the upper cross-tie. These rods are also provided with nuts 80 81 and springs 82 and have the oppositely-set cams 83. Two slotted slides 84 and 85, held to the frame by bolts through the slots, have rigidly attached thereto, respectively, the arms 86 and 87, formed with cams corresponding to the cams 83. Levers 88 and 89, fulcrumed to the bracket 79, are pivoted loosely at their upper ends to the slides 84 and 85, respectively, and at their lower ends to slides 90 and 91, respectively. The slides 90 and 91 are in all respects similar to the slides 52 and 53, the slide 90 being formed for engagement with the rod 77 and the slide 91 for engagement with the rod 68. The rods stand normally out of the path of the pins 69 and 76, and the slides and levers connecting them are restored to normal position after movement by a spring 92, the ends of which are connected to the slides 84 and 85. If the selector beneath rod 77 finds a perforation in the stencil for its pin 7^a, as the cross-head moves upward the selector will strike said rod and push it upward, thrusting the arm 87, slide 85, and upper end of lever 89 to the right and the lower

end of lever 89 and the slide 91 to the left, bringing the rod 68 into the path of pin 69, and thereby causing an upward movement of the slide-bar 61 and arm 60. If the selector beneath rod 78 finds a perforation, the slide-bar and arm would have a downward movement. It will be understood that both slide-bars are held frictionally, so that they will remain in whatever position they are caused to assume by the pawl-carrying levers.

The object in view in attaching the pins 69 and 76 to the downwardly-extending arm 70 is to leave the plane of movement of the pantograph-arm entirely unobstructed while keeping the selectors of both series and their associated parts in immediate juxtaposition.

The operation of the mechanism as a whole may be described briefly and generally as follows: The mechanism being set in motion by the application of power to the shaft 2 and the cross-head 4 approaching its lowest position, the pins 6^a and 7^a are raised from the stencil, which is immediately moved forward to bring a new set of perforations into position to allow certain of the selectors to come into operative position on the upward movement of the cross-head. As the cross-head continues its upward movement one of the rods 43 44 77 78 (or one of each pair, if the desired movement of the tambour-frame is to have a direction between the horizontal and the vertical, is first struck by its selector, thereby bringing the rod of one of the pawl-carrying levers into the path of its pin on the sliding brackets. The further upward movement of the cross-head brings the selector which is intended to operate the pin 24^a or 59^a, corresponding in length with the desired pantograph movement, and which selector has been put in operative position by the stencil, into contact with said pin 24^a or 59^a and pushes it to the end of the upward movement, thus giving the desired length of movement to the previously-selected pawl-carrying lever and to the pantograph. If movement either vertically or horizontally is desired, only one selector in one series is operative beneath its pin 24^a or 59^a; but if movement in any other direction is desired then one selector 6 is operative beneath its pin in the series 24^a and one selector 7 is operative beneath its pin in the series 59^a. After the cross-head has completed its upward movement it again moves downward and near the end of its stroke begins again the round of operations described, and at the same time draws the sliding brackets to their initial position by means of the loose bolts 24^b and 59^b.

By the term "selectors," as used throughout this specification, I refer to the dogs 6 and 7, which are carried by the cross-head and impart the motion thereof to the sliding brackets under the control of the stencil-sheet.

I have shown a single stencil or pattern sheet and have described it as made of paper and perforated; but it is evident that one stencil might be used to give direction to the pantograph movements and another to determine their extent, and that the sheet may be made of other material or otherwise formed to have the desired action upon the selectors.

I claim—

1. In an embroidering-machine, the combination, with a pantograph-arm, of a vertically-moving bar and a horizontally-moving bar, reciprocating feeders having direct engagement with said bars, respectively, reciprocating selectors and sliding brackets for actuating the pantograph-arm through said feeders, and means intermediate said selectors and said brackets whereby the extent of movement of the brackets may be varied, other reciprocating selectors and intermediate devices for moving certain of said feeders into or out of engagement with said sliding brackets, a stencil-sheet reciprocating with said selectors and co-operating directly therewith to control their action, and a reciprocating cross-head carrying said selectors, substantially as specified.

2. The combination, with a pantograph-arm, of independent arms having cruciform arrangement and independent connection with said pantograph-arm, slide-bars carrying said arms, reciprocating devices for moving said bars in vertical and horizontal directions, reciprocating selectors and sliding brackets for reciprocating said devices and thereby actuating the pantograph-arm, and means intermediate said selectors and said brackets whereby the extent of movement of the brackets may be varied, other reciprocating selectors, and intermediate means to move certain of said reciprocating devices into or out of engagement with said sliding brackets, a reciprocating cross-head carrying said selectors, a stencil co-operating directly with said selectors and controlling their action, and means for advancing said stencil intermittingly, substantially as specified.

3. The combination, with independent horizontally and vertically moving bars, of reciprocating devices for moving said bars in horizontal and vertical directions, reciprocating selectors and sliding brackets for reciprocating said devices and thereby actuating said bars, and means intermediate said selectors and said brackets whereby the extent of movement of the brackets may be varied, other reciprocating selectors and intermediate means to move certain of said reciprocating devices into or out of engagement with said sliding brackets, a reciprocating cross-head carrying said selectors, a stencil-sheet reciprocating with and controlling the action of said selectors, and means for advancing said stencil-sheet intermittingly, substantially as specified.

4. The combination, with a pantograph-arm, of independent arms having connection therewith, slides carrying said arms and having double racks, reciprocatory pawl-carriers for

imparting to said slides vertical and horizontal movement alternately or simultaneously, reciprocating selectors and sliding brackets for actuating said pawl-carriers, and means intermediate said selectors and said brackets whereby the extent of movement of the brackets may be varied, other selectors and intermediate means for causing the engagement of certain of said pawl-carriers with said sliding brackets to determine the direction of movement of said slides, a stencil-sheet for controlling the action of said selectors, and means for advancing the stencil-sheet after every presentation and withdrawal of the selectors, substantially as specified.

5. In an embroidering-machine, the combination, with a pantograph-arm, of a slide-bar to which said arm is connected, a sliding bracket, means intermediate said bracket and bar to actuate the latter, a series of pins of different lengths carried by said bracket, a series of reciprocating selectors for imparting movement to said sliding bracket through said pins, and a reciprocating stencil-sheet to co-operate directly with said selectors and control their action, substantially as specified.

6. In an embroidering-machine, the combination, with a sliding bracket for actuating the pantograph-arm, a series of reciprocating selectors for actuating said bracket, and a pantograph-arm, of a slide to which said arm is connected, devices for moving said slide in one direction and including an arm adapted to be moved into or out of the path of a projection on said bracket, similar devices for moving said slide in the opposite direction and including a similar arm adapted to be moved into or out of the path of a projection on said bracket, devices for moving one or the other of said arms into the path of said projection, other reciprocating selectors for actuating said devices, and a stencil-sheet to co-operate with all of said selectors and control their action, substantially as specified.

ROSWELL T. SMITH.

Attest:

CHAS. B. BEASOM,

A. T. SMITH.