

No. 675,444.

Patented June 4, 1901.

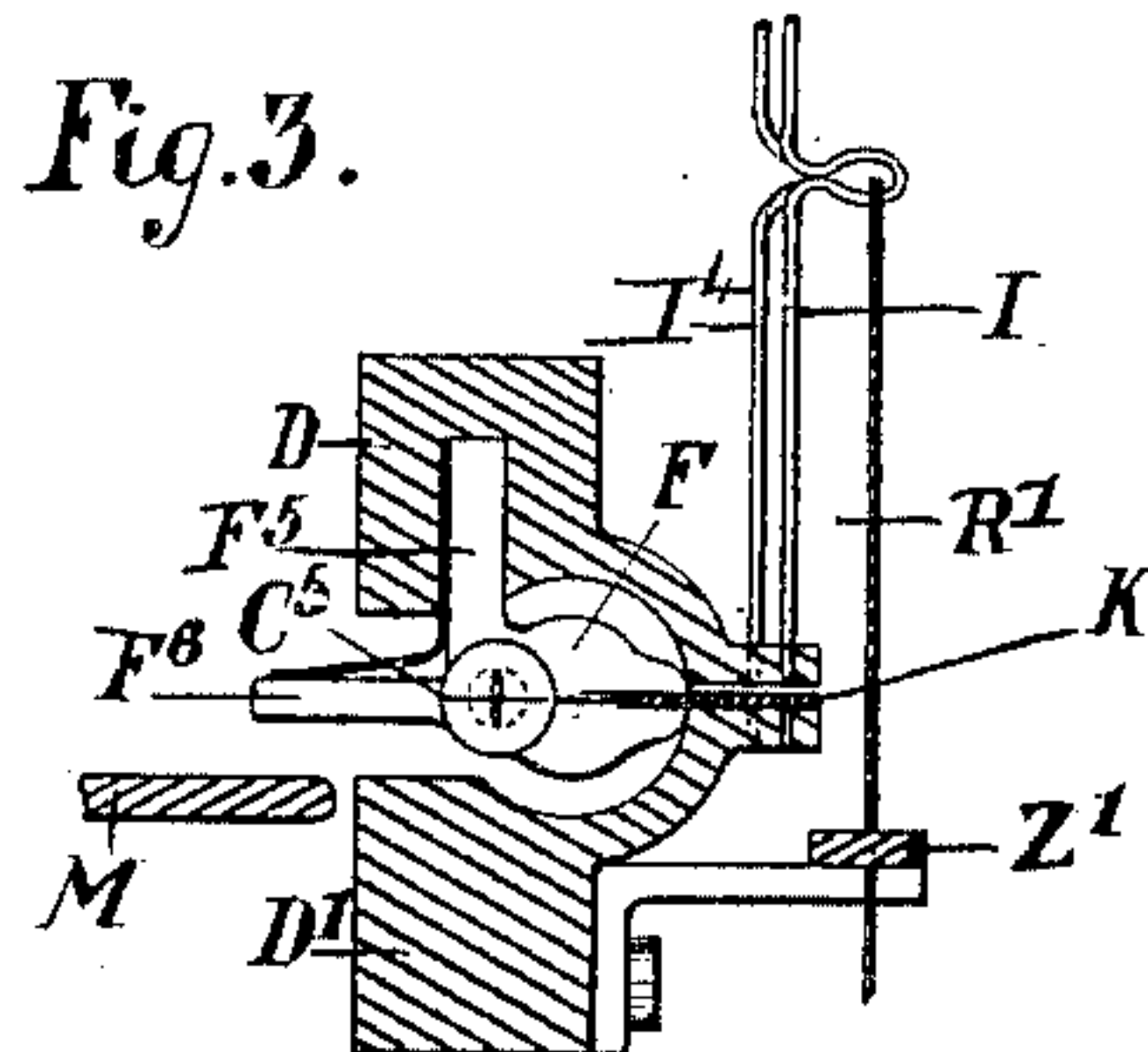
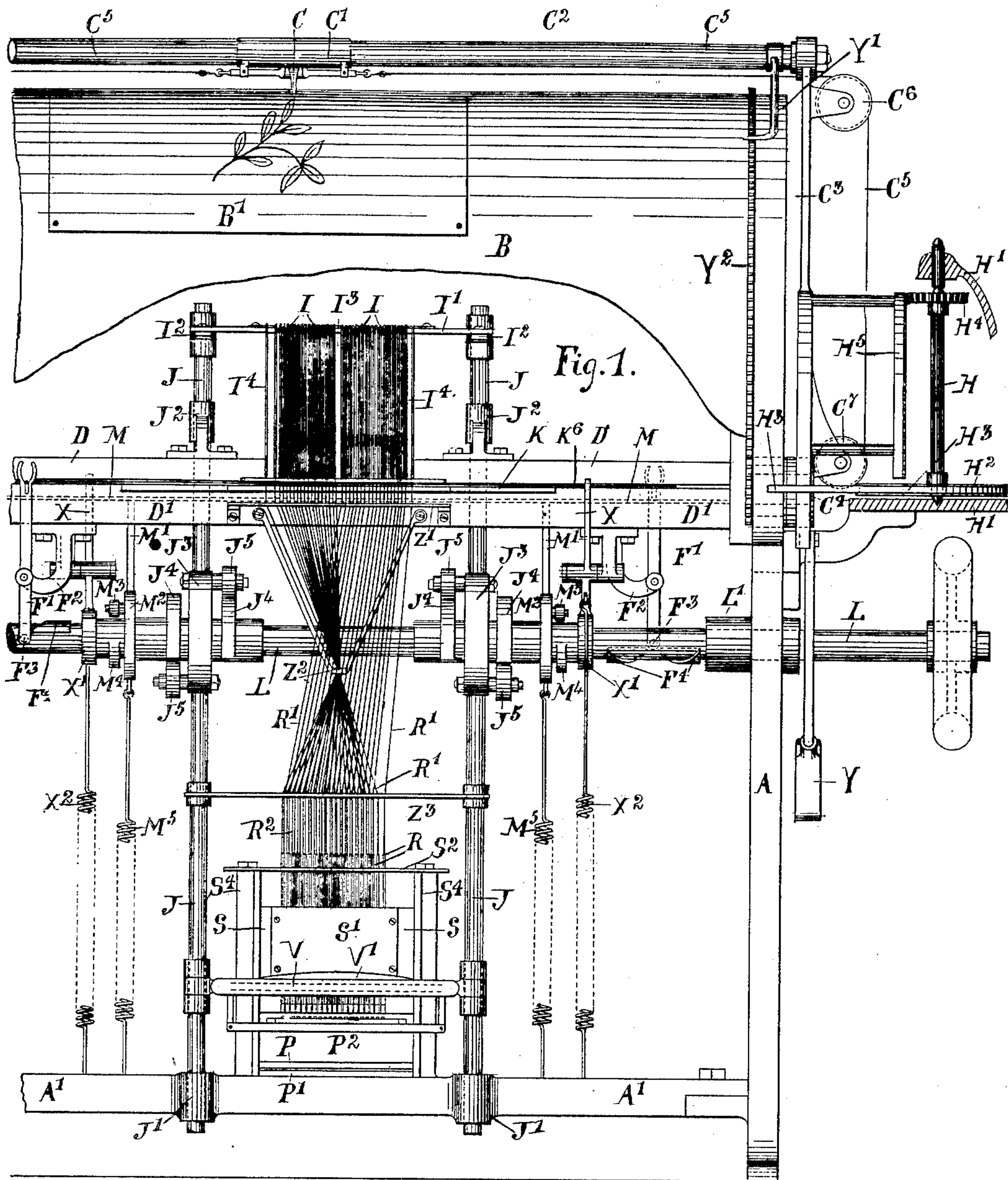
H. HILL.

READING AND PUNCHING APPARATUS FOR EMBROIDERING MACHINES, &c.

(Application filed July 6, 1900.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses;  
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Henry Hill  
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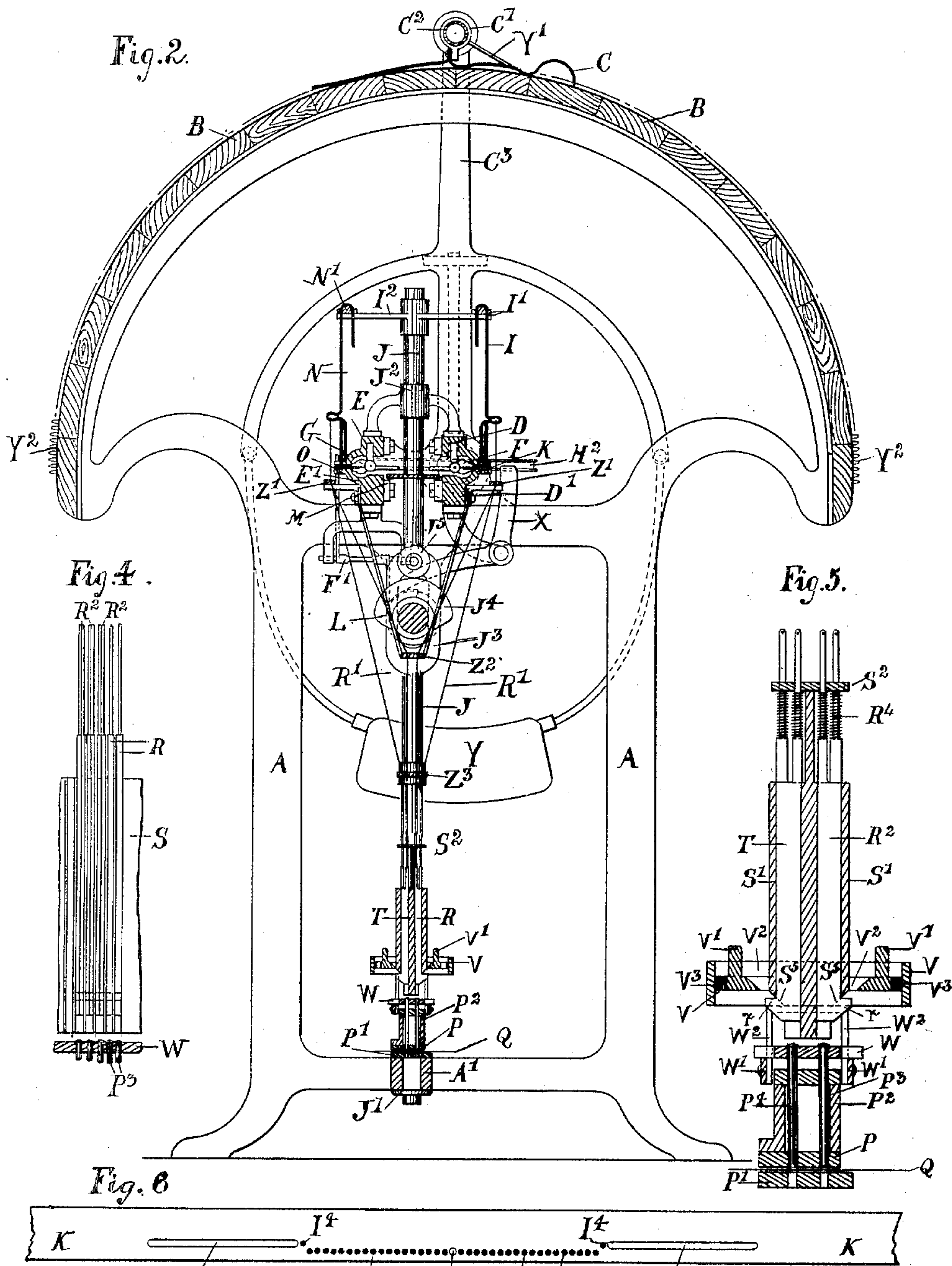
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READING AND PUNCHING APPARATUS FOR EMBROIDERING MACHINES, &c.

(Application filed July 6, 1900.)

(No Model.)

3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

Fig. 7.

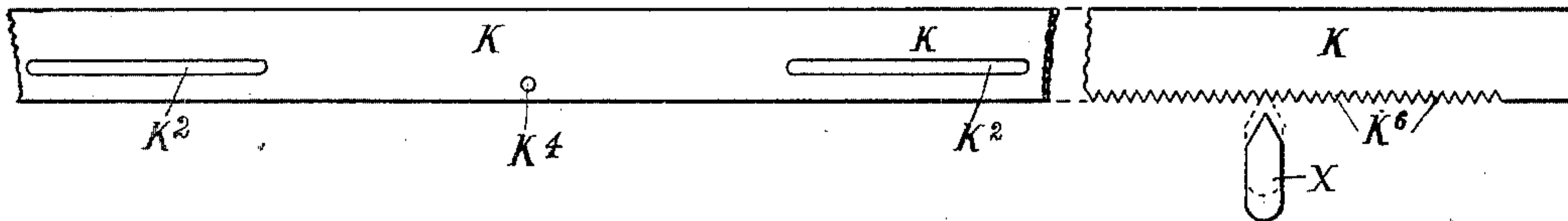


Fig. 8.

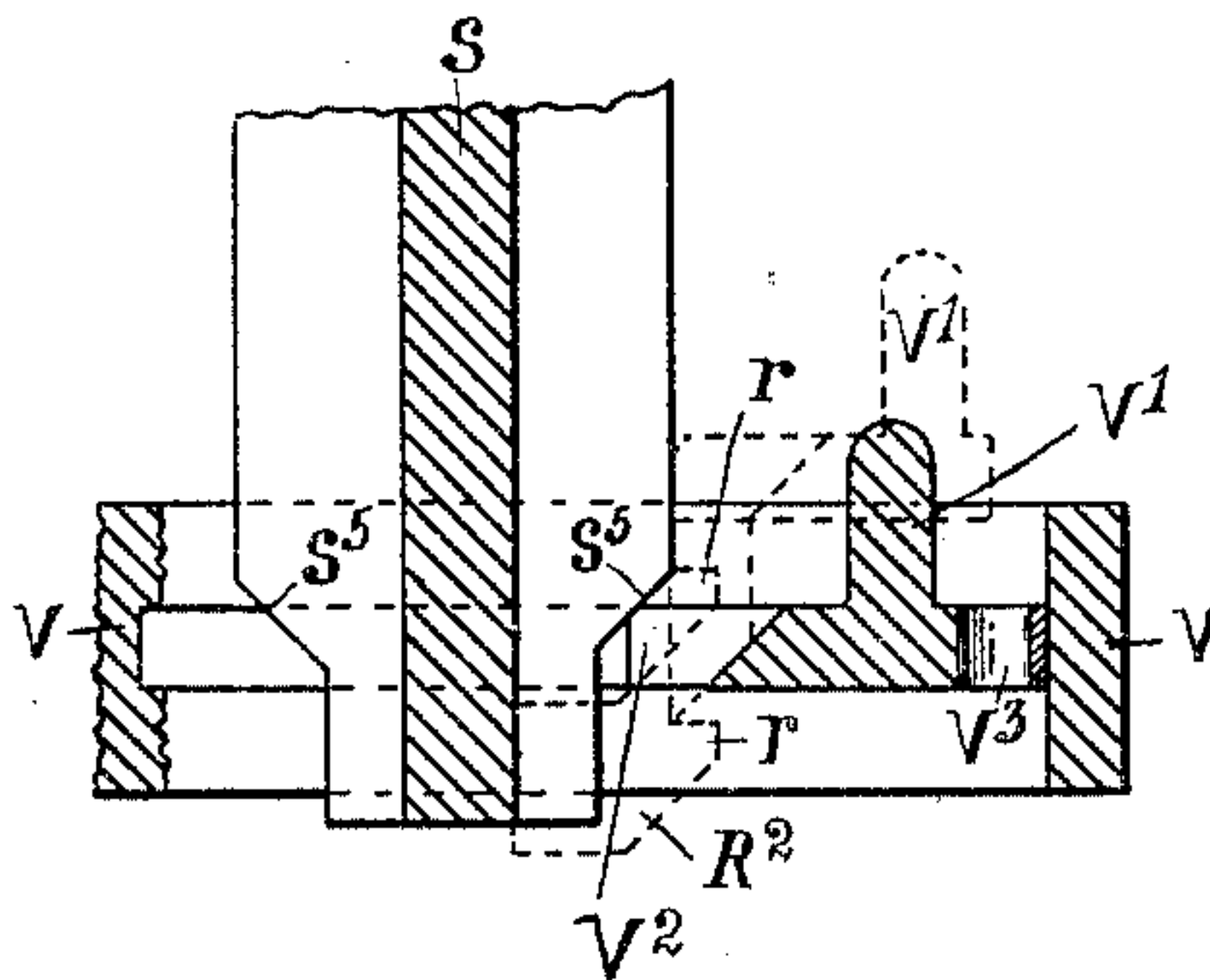
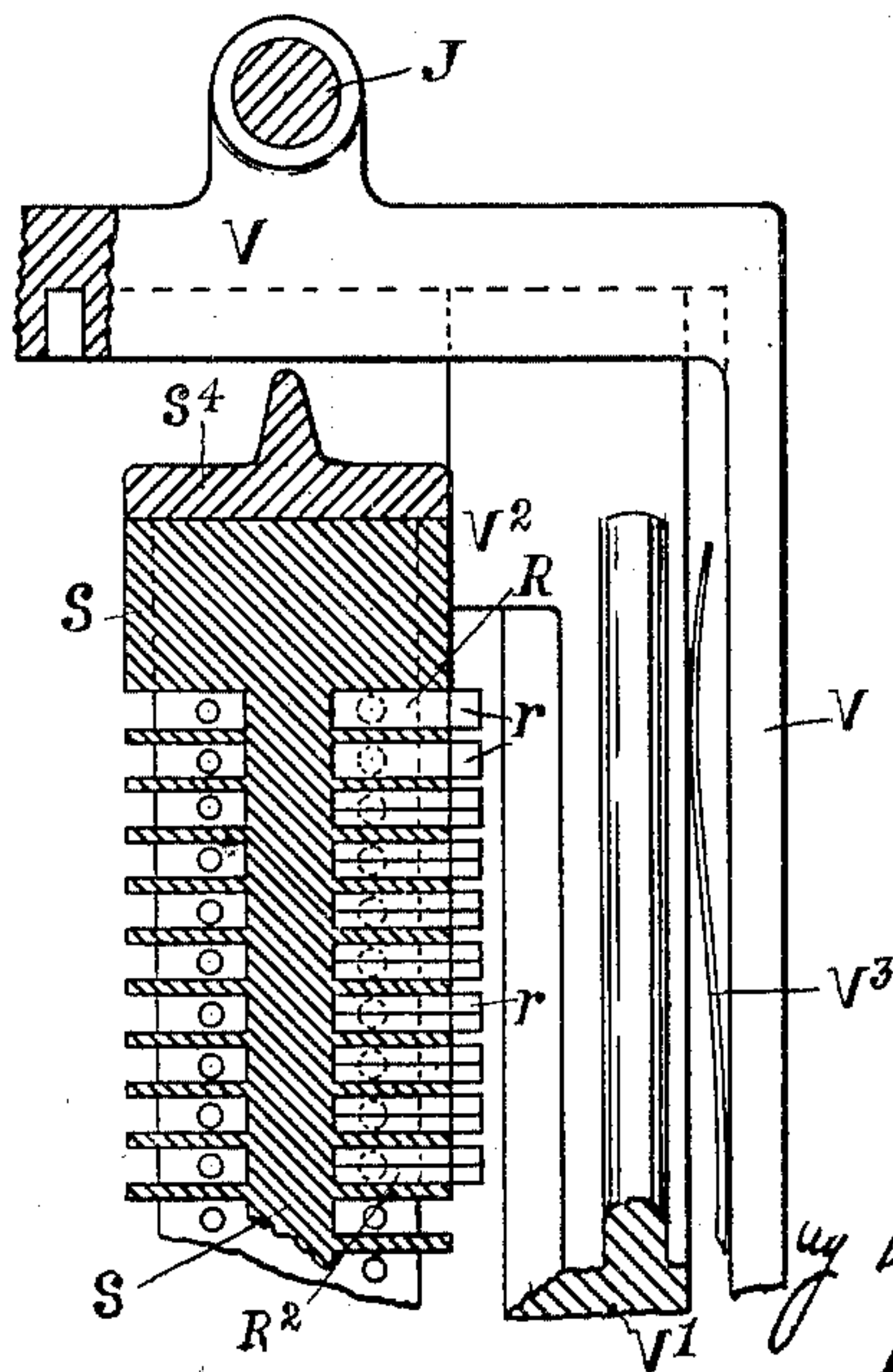


Fig. 9.



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# UNITED STATES PATENT OFFICE.

HENRY HILL, OF NOTTINGHAM, ENGLAND.

READING AND PUNCHING APPARATUS FOR EMBROIDERING-MACHINES, &c.

SPECIFICATION forming part of Letters Patent No. 675,444, dated June 4, 1901.

Application filed July 6, 1900. Serial No. 22,742. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY HILL, a subject of the Queen of England, residing at Nottingham, England, have invented certain new and useful Improved Reading and Punching Apparatus for Embroidering-Machines or Like Jacquards, (for which I have applied for Letters Patent in Great Britain under No. 24,525, dated December 9, 1899,) of which the following is a specification.

This invention relates to improved apparatus for reading a pattern, selecting and operating the punches, and thus perforating pattern cards or bands for controlling the jacquards of multiple embroidering-machines or the like.

The pattern cards or bands thus produced when placed in the jacquard impart through the latter the requisite movements to the frame of the embroidering-machine necessary for the reproduction in embroidery of the pattern read in the reading and punching machine.

The invention will be best understood by reference to the accompanying drawings, in which—

Figure 1 is a front elevation, and Fig. 2 a vertical cross-section, of apparatus constructed according to my invention. Fig. 3 is an enlarged sectional view showing one set of selector-needles and the corresponding selecting-plate and guide-bars for supporting the same. Fig. 4 is a front elevation, and Fig. 5 a vertical cross-section, showing detail of the punch-depressing mechanism. Fig. 6 is a plan of one of the needle-selecting plates. Fig. 7 is a plan showing one of the selecting-plates, the teeth on its edge, and the adjusting-finger. Fig. 8 is a vertical cross-section, and Fig. 9 is a sectional plan, showing details of the punch-operating mechanism. Figs. 3 to 6 are drawn to a larger scale than Figs. 1 and 2.

Like letters indicate like parts throughout the drawings.

According to my invention the body of the apparatus is comprised of two end standards A, (see Figs. 1 and 2,) connected by a cross-stay A'. These standards form a support for the semicylindrical pattern-board B, of any suitable radius and length, which is mounted on the said standards with its convex face upward, as shown.

In the front elevation shown in Fig. 1 the part of the apparatus on the extreme left is not shown; but it will be understood that this end is precisely the same as the right-hand end, which is shown, in every essential particular.

The pattern B' to be read, which is drawn, as usual, on paper, is placed on the upper cylindrical surface of the pattern-board B and may be secured in position by straps, pins, or other suitable devices. In order to read the pattern, it is followed stitch by stitch by means of a pointer C on the carriage C', which latter is mounted loosely on and travels along the carriage-bar C<sup>2</sup>, which is placed above or externally to the pattern-board B and parallel to the axle of the cylindrical surface of the said board. The ends of the carriage-bar C<sup>2</sup> are secured to the outer free ends of the two arms C<sup>3</sup>, which latter are pivoted on hollow pivots to the end standards A at C<sup>4</sup>, (see Fig. 1,) a point which coincides with the axis of the cylindrical surface of the pattern-board B. The carriage-bar C<sup>2</sup> may thus be bodily moved angularly parallel to the cylindrical surface of the pattern-board B, and in following a pattern with the pointer C this angular movement of the carriage-bar C<sup>2</sup> is combined with the movement of the pointer-carriage C' along the said bar.

On the under side of the pattern-board B are two guide-bars D D' of the section shown in Figs. 2 and 3, the bar D' being placed directly below the bar D. At the side of the pair of bars D D' is a corresponding pair of guide-bars E E', (see Fig. 2,) placed parallel to the former. The whole of these bars are placed parallel to the axis of the pattern-board B, and their ends are secured to the end standards A. In the space between the guide-bars D D' is a spring-clip F, (see Figs. 2 and 3,) and in the corresponding space between the two guide-bars E E' is a second spring-clip G. (See Fig. 2.) The pointer-carriage C' is connected by an endless band C<sup>5</sup> (see Fig. 1) or the like to the spring-clip F, said band being carried over pulleys C<sup>6</sup> at the ends of the said bars, down the arms C<sup>3</sup>, over pulleys C<sup>7</sup> on the said arms at the point where they are pivoted, and through the hollow pivots at C<sup>4</sup>, hereinbefore referred to, to the spring-clip F. Any movement of the



pointer-carriage C' along the bar C<sup>2</sup> is thus communicated by the endless band C<sup>5</sup> to the spring-clip F, and the latter is thus moved a corresponding distance along the guide-bars DD', but in the reverse direction to the movement of the pointer-carriage C' along the bar C<sup>2</sup>. The angular movement of the carriage-bar C<sup>2</sup> is communicated to the spring-clip G by the following arrangements:

At each end of the apparatus is a vertical shaft H, (see Fig. 1,) which is carried, preferably, in centers in a bracket H', secured to the corresponding standard A. Mounted on each shaft H is a pulley H<sup>2</sup>, and over these pulleys is carried an endless band H<sup>3</sup>, which is connected to the spring-clip G. Each of the vertical shafts H is also provided with a bevel-toothed wheel H<sup>4</sup>, which engages with a toothed quadrant H<sup>5</sup>, secured to the corresponding arm C<sup>3</sup> of the carriage-bar C<sup>2</sup>.

The several parts of the arrangement described are so proportioned that the spring-clip G is moved along the guide-bars E E' a distance which is exactly equal to the angular movement of the carriage-bar C<sup>2</sup> relatively to the cylindrical surface of the pattern-board B.

The spring-clips F and G grip and move selecting-plates operating in connection with selector-needles, which I will now proceed to describe.

Above the guide-bar D D' are a set of selector-needles I, the lower ends of which are carried in holes in the guide-bar D, while their upper ends are carried in a slay-bar I', which is carried by brackets I<sup>2</sup>, secured to the two vertical shafts J. The whole of the needles I, with the exception of the two end ones, are arranged in one row, while the two end needles I<sup>4</sup> are set out of line with the remainder.

The guide-bar D' is provided with holes corresponding to those in the guide-bar D, through which holes the lower ends of the needles I can fall when they are released.

Between the guide-bars D D' is a plate K, hereinafter termed a "selecting-plate." This plate is shown in plan in Fig. 6, and it is provided, as shown, with a hole K' and two slots K<sup>2</sup>, one of the latter on each side of the hole K'. Normally the plate K (see Figs. 3 and 6) is in such a position that the hole K' is in the space I<sup>3</sup> in the middle of the row of needles, while the inner end of each slot K<sup>2</sup> is just clear of the corresponding end needle I<sup>4</sup>. The holes in the guide-bars D' are thus entirely masked by the plate K, and none of the needles can fall. This will be best understood by reference to Fig. 6, where the positions of the needles I are indicated by dots on the plate K, the latter being shown in its normal position.

If the needle-selecting plate K is moved longitudinally to the right or left, it will allow a needle I to fall on the right or left of the space I<sup>3</sup>, according to the direction of such movement, and also one of the end needles I<sup>4</sup>. The lower ends of the former will pass through

the hole K', while that of the latter will fall through one of the slots K<sup>2</sup>. For example, (see Fig. 5,) if the needle-selecting plate K be moved to the right, say, a distance equal to a space occupied by nine needles, the ninth needle *i* from the middle space on the right will be selected, while the end needle I<sup>4</sup> on the left will be also selected. If, on the contrary, the needle-releasing plate K is moved to the left, a needle on the left of the middle space is selected and also the end needle I<sup>4</sup> on the extreme right.

The end needles I<sup>4</sup> determine whether the movement is to the right or left, according to which is released, and the remaining needles in the row the extent of such movement—that is, the first needle on the right or left of the middle space indicates one unit of motion, the second needle on the right or left two units, the third three units, and so on up to the full number of needles employed.

The needle-selecting plate K is at the proper time seized and moved longitudinally by the spring-clip F. The length and direction of its movement, and consequently the needles released, are thus determined by the length and direction of the movement of the carriage C' along the carriage-bar C<sup>2</sup>, to which carriage the clip F is connected, as previously described. After each movement the jaws of the spring-clip F are opened, the needle-selecting plate K is released, and is then returned to its normal position again. The selecting-plate K is returned to its normal position again by a lever F', pivoted in a bracket F<sup>2</sup>, secured to the guide-bar D'. The upper end of this lever is provided with a fork which engages with a pin on the needle-selecting plate K, while its lower end is provided with a pin F<sup>3</sup>, which engages with one of two helical cam-surfaces F<sup>4</sup>, fixed on the main cam-shaft L. This shaft L is carried in bearings L', (see Fig. 1,) secured to or formed integrally with the end standards A, and said shaft is rotated one revolution after each movement of the pointer C in order to depress the punches selected, as hereinafter described, and at the same time return certain parts of the apparatus to their normal position again ready for the next movement.

The whole of the selector-needles I are normally held up in the position shown in the drawings by the top slay-bar I', with which their upper hooked ends engage. This slay I' is, however, lowered when the shaft L is rotated, and the whole of the needles I are then held up by the needle-selecting plate F unless the latter has been moved from its normal position. In the latter case the two needles only which are released by the movement of the selecting-plate K, as previously described, are allowed to fall, the whole of the remainder being held up by the said plate K. The slay-bar I', which is carried by brackets I<sup>2</sup>, secured to the vertical shafts J, is raised and lowered by the said shaft. These shafts J are carried and slide vertically in bearings J', formed



in the stay  $A'$ , and bearings  $J^2$ , secured to the guide-bars  $D$  and  $E$ . Near the middle of their length these shafts  $J$  are provided with slotted parts  $J^3$ , which embrace the cam-shaft  $L$ . The shafts  $J$  are raised and lowered by the direct action of cams  $J^4$  on the shaft  $L$ , engaging with antifriction-rollers  $J^5$ , pivoted on the slotted parts  $J^3$  of said shafts.

The jaws of the spring-clip  $F$  are operated to release the selecting-plate  $K$ , as previously described, as follows: The upper jaw of the clip  $F$  (see Fig. 3) is provided with an extension  $F^5$ , which travels in a channel in the guide-bar  $D$ , while the lower jaw is provided with a tail or extension  $F^6$ . The extension  $F^5$  is held firmly by the channel in the bar  $D$ , while the tail or extension  $F^6$  is raised by the releasing-bar  $M$ . The releasing-bar  $M$  (see Figs. 1 and 2) is mounted loosely on the vertical shaft  $J$  and is raised at the requisite time by links  $M'$ , (see Fig. 1,) provided with slotted ends  $M^2$ , embracing the cam-shaft  $L$ . These slotted ends are each provided with an antifriction-roller  $M^3$ , which engages with the periphery of a cam  $M^4$  on the shaft  $L$ . The releasing-bar  $M$  is returned to its normal position, in which it is shown in the drawings, by springs  $M^5$ , connected to the stay  $A'$  and the links  $M'$ , respectively. At the back of the selector-needles  $I$  are a second duplicate set of selector-needles  $N$ , (see Fig. 2,) which are carried and selected in precisely the same manner as the needles  $I$  by the angular motion of the bar  $C^2$  relatively to the pattern-board. The lower ends of the needles are carried in holes in the bar  $E$  and their upper ends in a slay  $N'$ , secured to the bracket  $I^2$ , previously described. Between the guide-bars  $E$   $E'$  is a second selecting-plate  $O$ , which is precisely the same as the one previously described, and shown in Fig. 6. This selecting-plate  $O$  is gripped by the spring-clip  $G$ , which, as previously described, is connected by the band  $H^3$  to the arms  $C^3$  of the bar  $C^2$ , and thus the angular movement of the latter is communicated to the selecting-plate  $O$ , and the needles selected are determined by the angular movement of the said bar in the same manner as described in reference to the movement of the carriage  $C'$  along the bar  $C^2$ . After each movement of the selecting-plate  $O$  it is returned to its normal position again by an arrangement similar to that used for returning the plate  $K$  and is indicated in Fig. 1 of the drawings by the same reference-letters. The spring-clip  $G$  is of the same construction and is also released by the releasing-bar  $M$  simultaneously with the spring-clip  $F$ .

The punching mechanism, which is preferably placed below the selecting-needles, comprises a pair of punch-plates  $P$   $P'$ , (see Figs. 1, 2, and 5,) between which the cards or band  $Q$  is intermittently fed by rollers or the like actuated by rack-wheel and pawl mechanism, which is not shown. The punch-plates are mounted on the stay  $A'$ , and the

punches  $P^3$  are carried in a box  $P^2$ , the base of which is formed by the upper punch-plate  $P$ . The punches are disposed in two rows  $P^3$   $P^4$ , (see Fig. 5,) corresponding to the two rows of selector-needles  $I$  and  $N$ ; but their numbers are less. There are two punches in each row, corresponding to the two end needles in each row of selector-needles, and in addition half the number of punches in each row as there are remaining selector-needles in each row.

I will now describe how the row of punches  $P^3$ , corresponding to the needles  $I$ , are operated so as to punch holes in the band  $Q$  corresponding to the selector-needles which are selected by the movement of the selecting-plate  $K$ . Above the first two punches  $P^3$  on the right of the row (see Figs. 1 and 4) are two vertical slides  $R$  for depressing the said punches, and the said slides  $R$  are connected by cords  $R'$  to the end selector-needles  $I^4$ . Above each of the remaining punches are a pair of slides  $R^2$ , each of which pair depresses the same punch. Each pair of slides  $R^2$  are connected by cords  $R'$  to the corresponding selector-needles  $I$  on each side of the space  $I^3$ —that is, for example, the first pair of slides  $R^2$  next to the slides  $R'$  are connected to the two first needles on each side of the space  $I^3$ , the next pair of slides  $R^2$  to the second selector-needle on each side of the space, and so on throughout. It thus follows that the corresponding needles  $I$  on each side of the space  $I^3$  correspond to the same punch. The slides  $R$   $R'$  are carried in recesses in a block  $S$  and are held in their recesses by a retaining-plate  $S'$ . (Shown removed in Fig. 4.) The block  $S$  is carried by pillars  $S^4$ , secured to the stay  $A'$ . The upper ends of the whole of the slides  $R$   $R^2$  are reduced and passed through a plate  $S^2$ , secured at the upper ends of the block  $S$ . These reduced ends of the slide are provided with a spring  $R^4$ , (see Fig. 5,) placed below the plate  $S^2$ , which spring thus depresses them when they are released by the release, as previously described, of the corresponding selector-needle. At the back of the block  $S$  is a corresponding set of slides  $T$ , which are connected in a like manner to the set of selector-needles  $N$ . These slides operate the second row of punches  $P^4$ . When a slide is released by the release of the corresponding selector-needle, said slide is lowered until its lower end rests on the corresponding punch. It is then further depressed and the punch is forced through the band  $Q$  by the following arrangements:

Mounted in guideways in the ends of the frame  $V$  on each side of the block  $S$  are bars  $V'$ , the ends  $V^2$  of which are of greater width than the middle portion, bear on the face of the block  $S$ , and are forced up to the said block by springs  $V^3$ , placed between the bars  $V'$  and the frame  $V$ . The bars  $V'$  are thus held in their outer position, as shown in dotted lines in Fig. 8, by the block  $S$  itself until they are moved downward by the frame  $V$  and arrive at the inclines  $S^5$  on the block  $S$ .



The ends  $V^2$  of the bars  $V'$  then travel down these inclines to the reduced lower end of the block  $S$ , and said bars are thus permitted to move into their inner position. The ends  $V^2$  of the bars  $V'$  are so disposed that the middle bevel-edged portion of the bars  $V'$  pass the projections  $r$  on these slides  $R$  or  $R^2$ , which are in the normal or raised position, before the ends  $V^2$  begin to travel down the inclines  $S^5$  and permit the bars  $V'$  to move inward or toward the block  $S$  to engage with the slides  $R$  or  $R^2$  in the lower position.

The slides  $R$   $R^2$  are provided with extensions  $r$  at their lower ends, and when in their normal position (in which they are shown in the drawings) the bars  $V'$  pass the said extensions; but when a slide is released and is lowered onto a punch the bars  $V'$  reach their inner position before they reach the extension  $r$ . They then engage with the latter, depress the slide and the corresponding punch, and thus perforate the band. After perforating the band the punches are raised again by a plate  $W$ , (see Fig. 5,) which is raised by bars  $W'$ , connected by stirrups  $W^2$  to the frame  $V$ . The punches are thus raised as the frame  $V$  returns to its normal position again.

The cam-shaft  $L$  makes one rotation for each movement of the pointer on the pattern and is preferably actuated by power. The motion may be continuous or intermittent. In the latter case the motion is communicated to the shaft by a clutch of any well-known form operating in conjunction with stop mechanism, the starting-lever being preferably actuated by the foot of the operator.

In order that each selecting-plate may always stop with its hole or opening exactly under a selector-needle, I employ the following correcting device: I form each selecting-plate with teeth  $K^6$  (see Fig. 1) on its outer edge and employ a lever or finger  $X$  or the like device operated by a cam  $X'$  on the cam-shaft  $L$  to engage with the rack after every movement. The finger  $X$  is preferably moved into engagement with the teeth  $K^6$  by a spring  $X^2$  and out of engagement by the cam  $X'$ . The bar  $C^2$  is counterbalanced by a weight  $Y$ . It is also provided with a catch  $Y'$ , which engages with a toothed quadrant  $Y^2$  on the pattern-board  $B$  in order to retain the bar in any desired position. The catch  $Y'$  is secured to the bar  $C^2$  and is released by rotating the said bar. The cords  $R'$  for connecting the selector-needles  $I$  and  $N$  to the slides  $R$  and  $T$  are carried through slay-bars  $Z'$   $Z^2$   $Z^3$ , preferably arranged as shown.

The opening in the selecting-plates, the disposition of the punches and the operating-slides, and the system of connecting the latter to the selecting-needles may, it is obvious, be modified to suit jacquards of various construction or of a different set-out.

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

1. In reading and punching apparatus for embroidering-machine or like jacquards, the

combination with a semicylindrical pattern-board, a carriage-bar moving angularly parallel to the surface of the said board, and a carriage sliding longitudinally on the carriage-bar provided with a pointer to follow the pattern, substantially as described.

2. In reading and punching apparatus for embroidering-machine or like jacquards, the combination with a set of selector-needles, of a selecting-plate provided with an opening for releasing the needle which is determined by the extent of its movement and slots or openings for releasing a needle which is determined by the direction of its movement, substantially as described.

3. In reading and punching apparatus for embroidering-machine or the like jacquards, the combination with a semicylindrical pattern-board, of a carriage-bar moving parallel to the surface of the said board, arms for carrying the carriage-bar, a carriage on the carriage-bar provided with a pointer, two sets of selector-needles, a selecting-plate for each set of needles, and means for connecting and disconnecting the said selecting-plates to and from the carriage and carriage-bar respectively, substantially as described.

4. In reading and punching apparatus for embroidering-machine or like jacquards, the combination with a set of selector-needles and means for selecting the same, of a set of punches, punch-plates for carrying the same, two slides above two of the punches connected to the end selector-needles, a pair of slides above each of the remaining punches connected to the corresponding needles on each side of the central space, and means for positively depressing any of the slides which may be released and lowered onto the corresponding punches substantially as described.

5. In reading and punching apparatus for embroidering-machine or like jacquards, the combination with slides for operating the punches, of a block for supporting the same, a reciprocating frame, bars in the frame which are arranged to move inward as the frame descends and engage with any of the slides which are released and thus allowed to fall, substantially as described.

6. In reading and punching apparatus for embroidering-machine or like jacquards, the combination with the selector-needles and punch-operating slides connected to the said needles, of vertically-reciprocating shafts, cams on the cam-shaft for operating said shafts, slay-bars connected to the said shafts for supporting the said needles and also alternately raising and lowering them, and a frame also connected to the said shafts provided with bars for engaging with and depressing any of the slides which may be lowered, substantially as described.

7. In reading and punching apparatus for embroidering-machine or the like jacquards, the combination with a selecting-plate, of a lever connected to the said plate, and helical cam-surfaces on the cam-shaft, for returning



the plate to its normal position again after each movement, substantially as described.

5 8. In reading and punching apparatus for embroidering-machine or the like jacquards, the combination with a selecting-plate, teeth on the said plate, and a finger or lever to engage with the teeth of said plate and adjust it after each movement substantially as described.

10 9. In reading or punching apparatus for embroidering-machine or like jacquards the combination with the carriage-bar and selecting-plate, of arms for carrying the said bar,

a toothed quadrant on each arm, shafts provided with pinions to engage with the quadrants on the arms, pulleys on the shaft and endless band on the pulleys, and a spring-clip G connected to the said band, substantially as described. 15

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses. 20

HENRY HILL.

Witnesses:

T. B. COX,

ALFRED CLARKE.