(No Model.) 7 Sheets—Sheet 1.

H. HILL.

WORK FEEDING MECHANISM FOR EMBROIDERING MACHINES.

No. 603,953. Patented May 10, 1898.

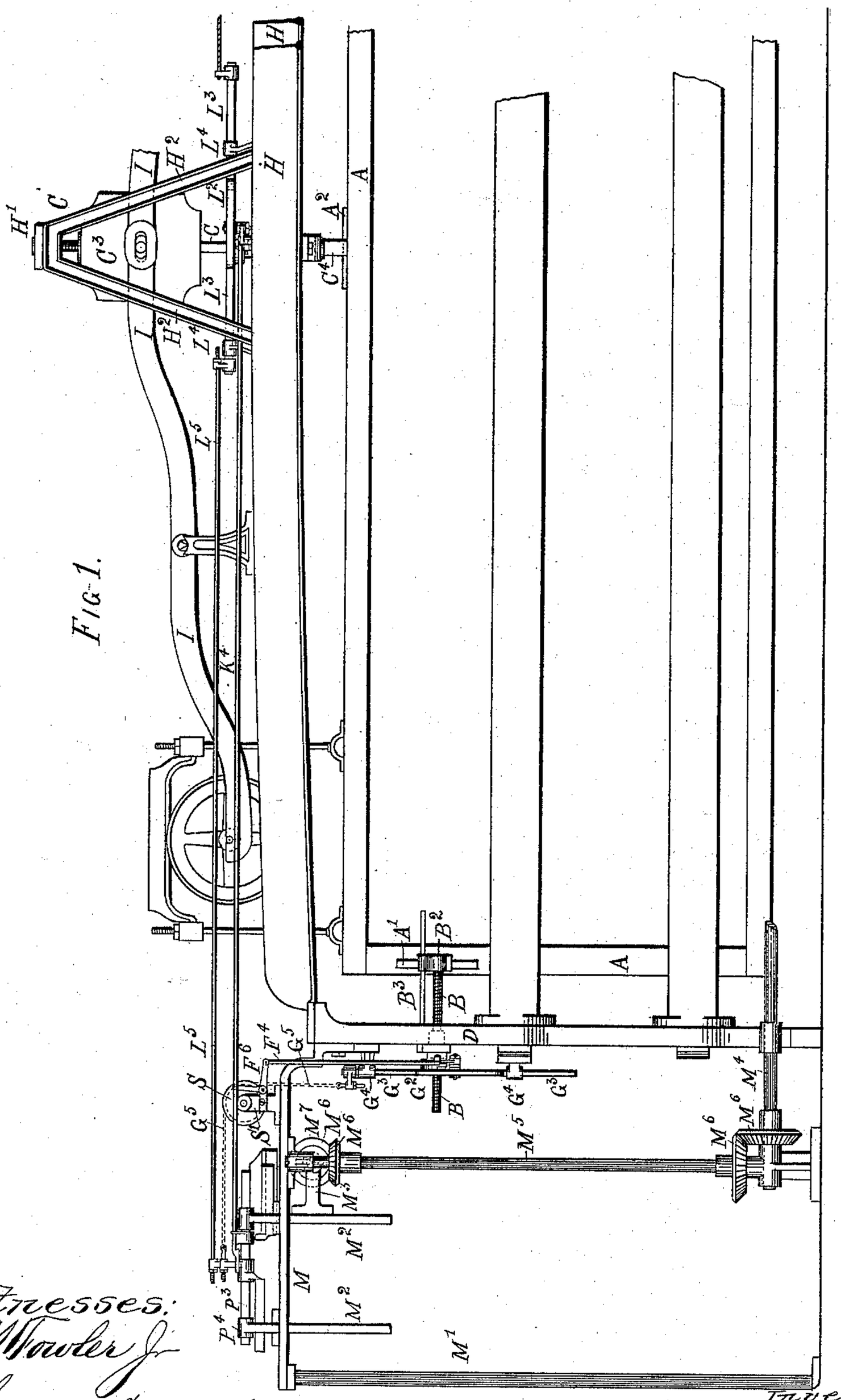

FIG. 1.

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(No Model.) 7 Sheets—Sheet 2.

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Fig 2.

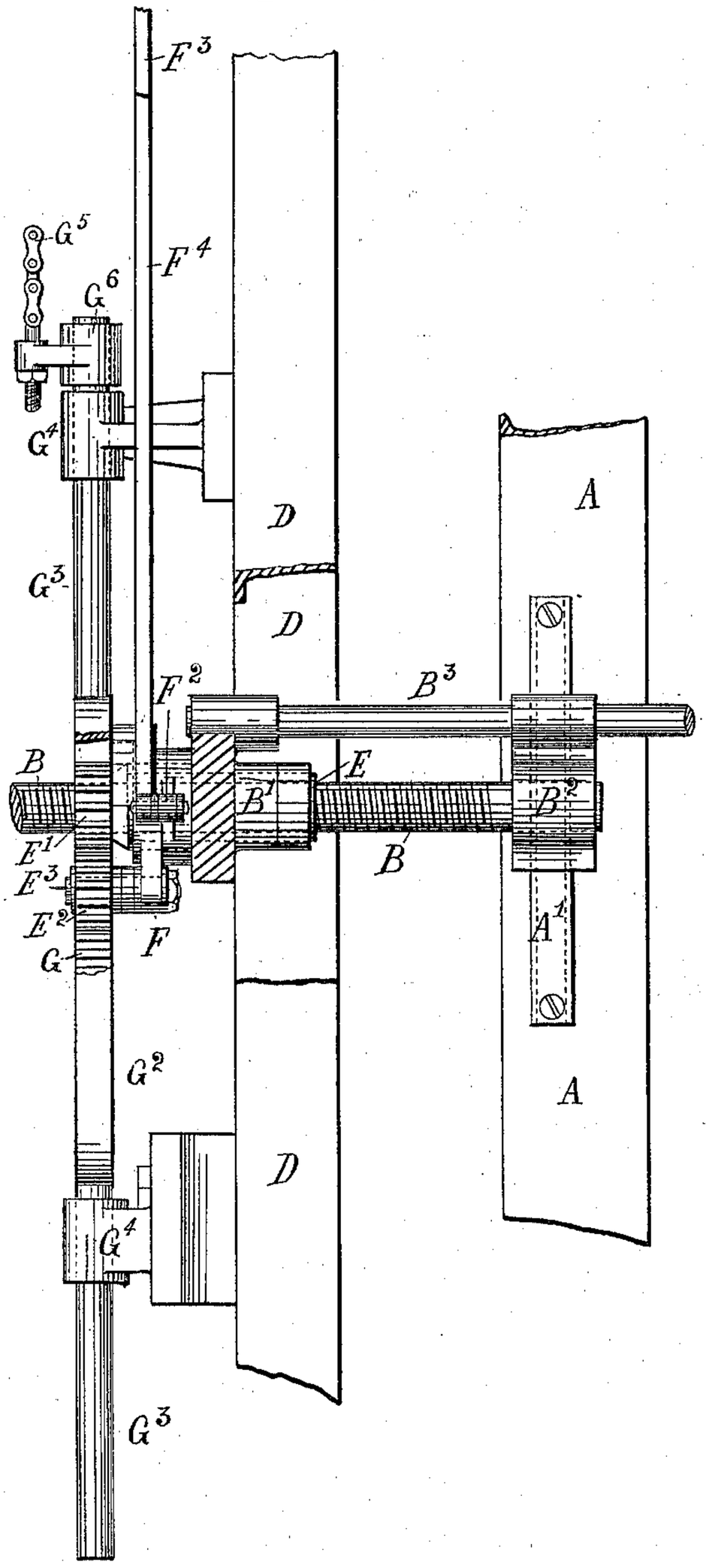
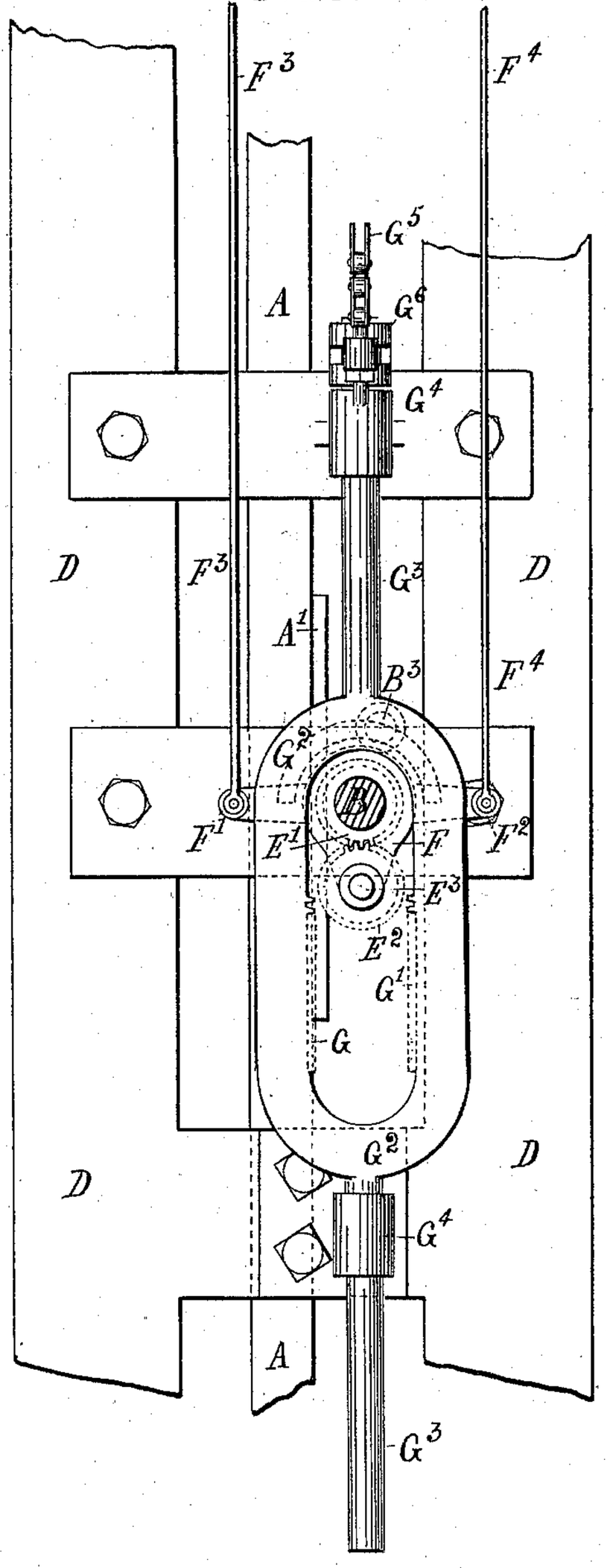


Fig 3.



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7 Sheets—Sheet 3.

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Fig. 4.

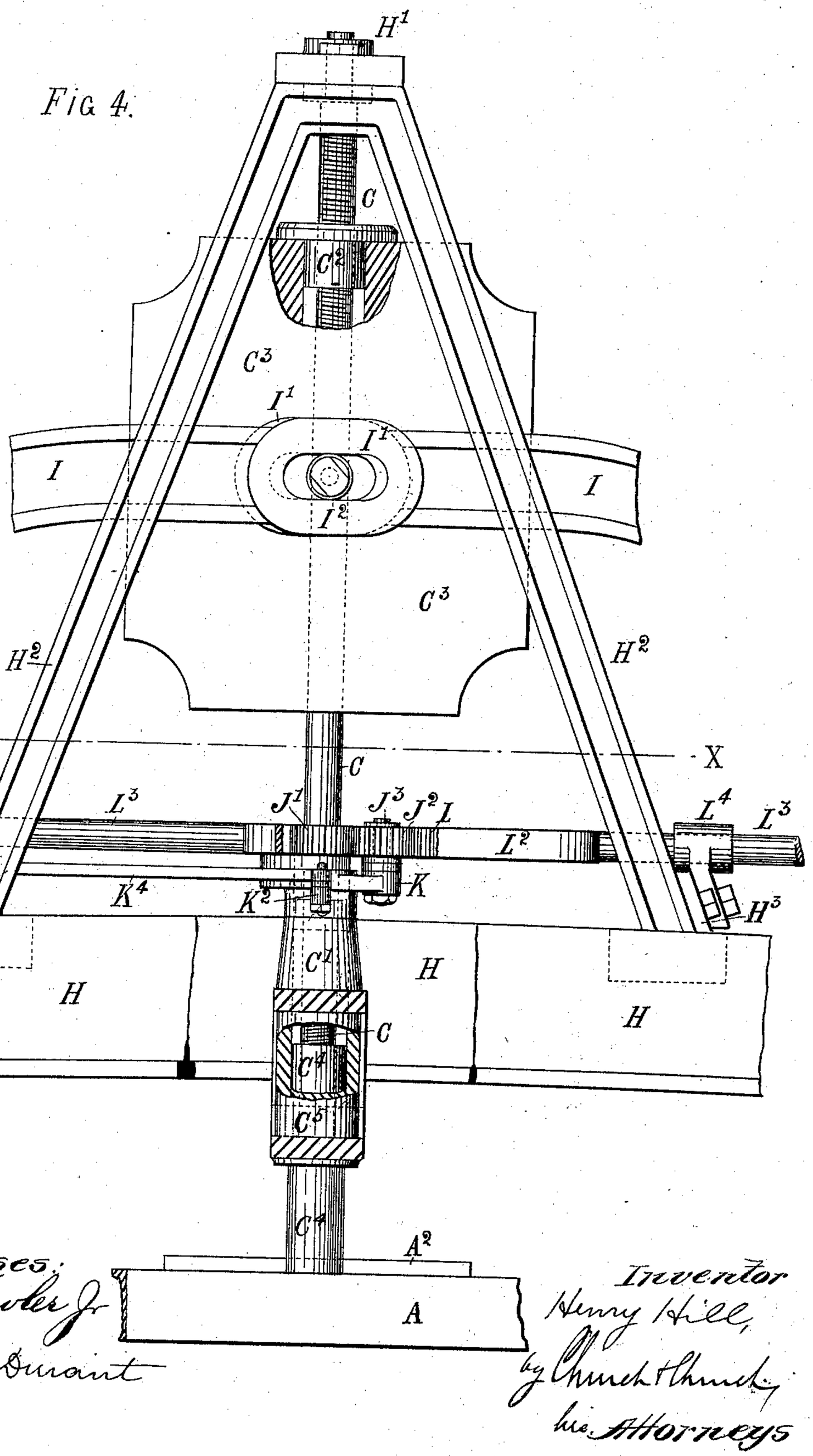

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Fig 5.

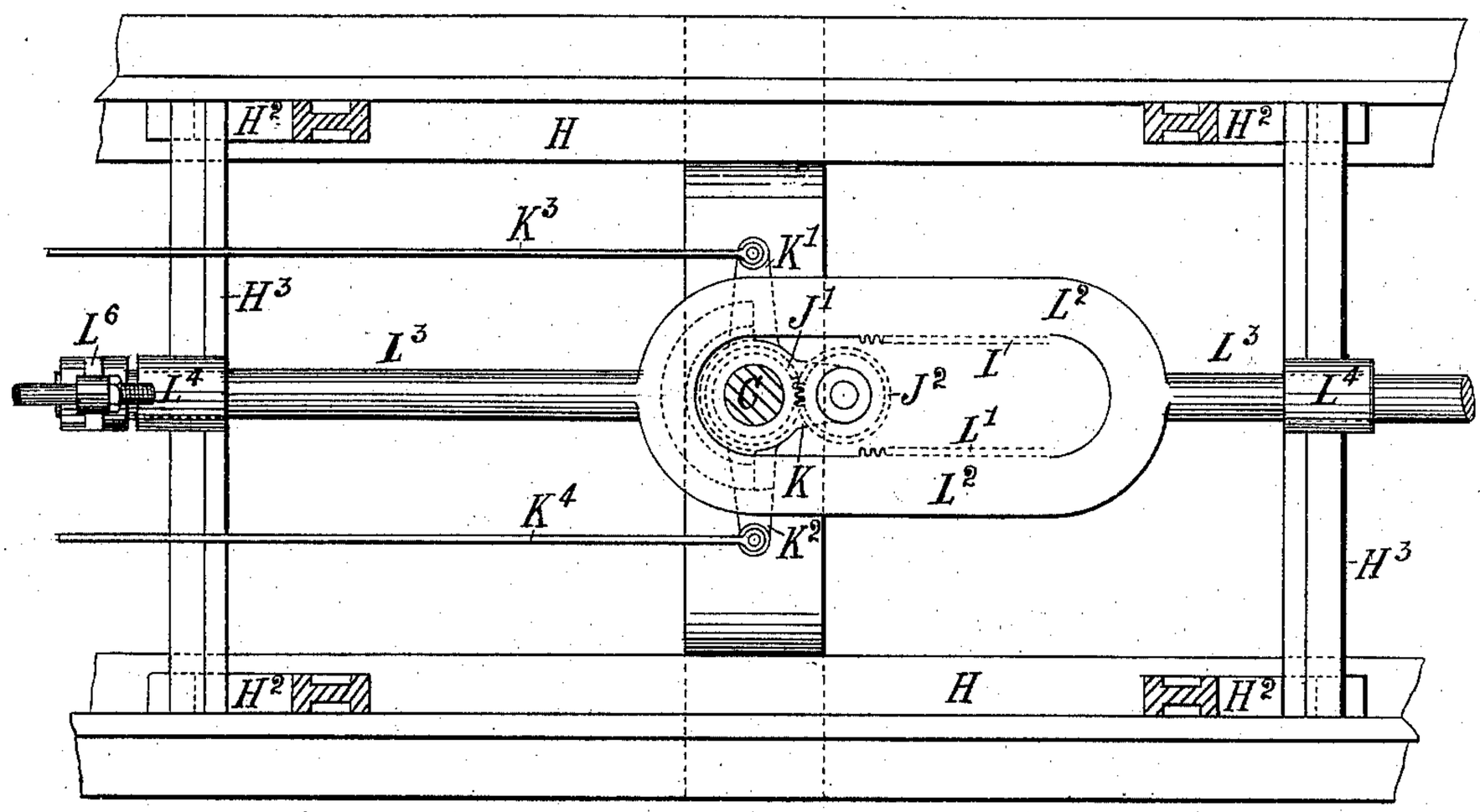

Fig 6.

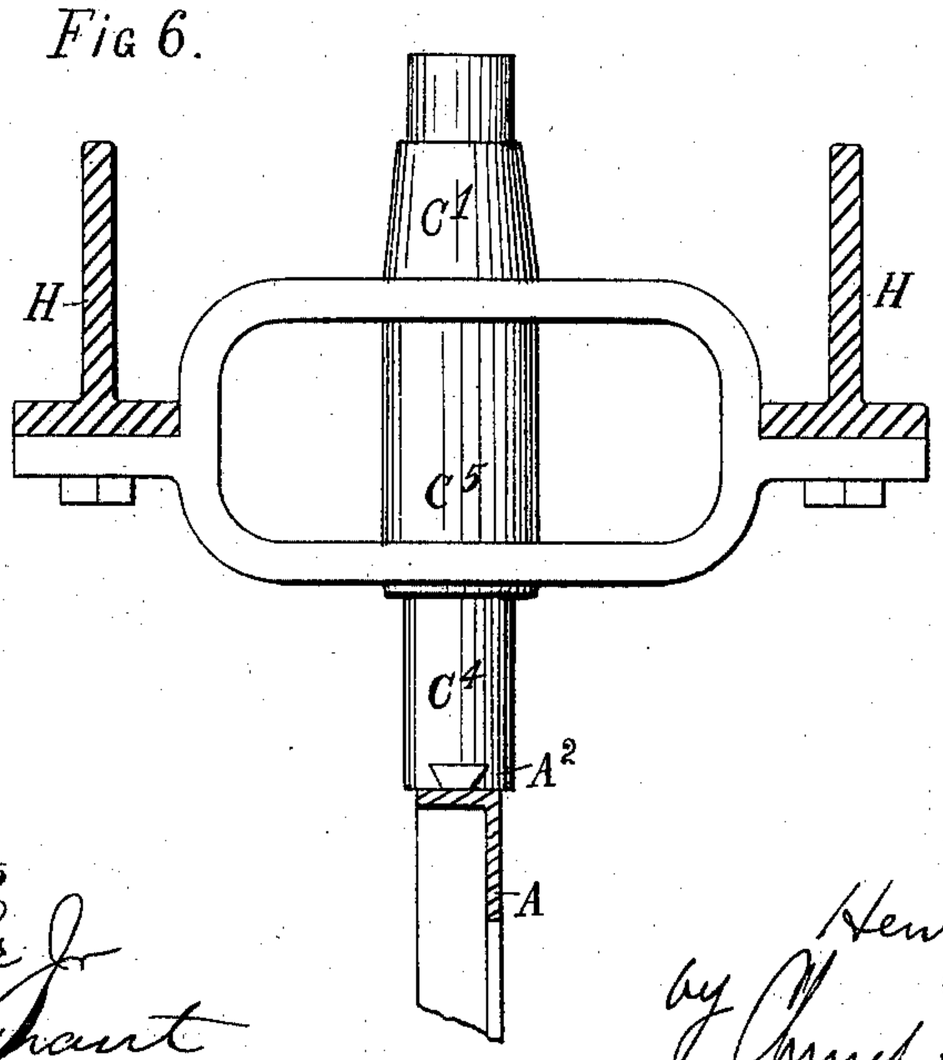

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Fig 7.

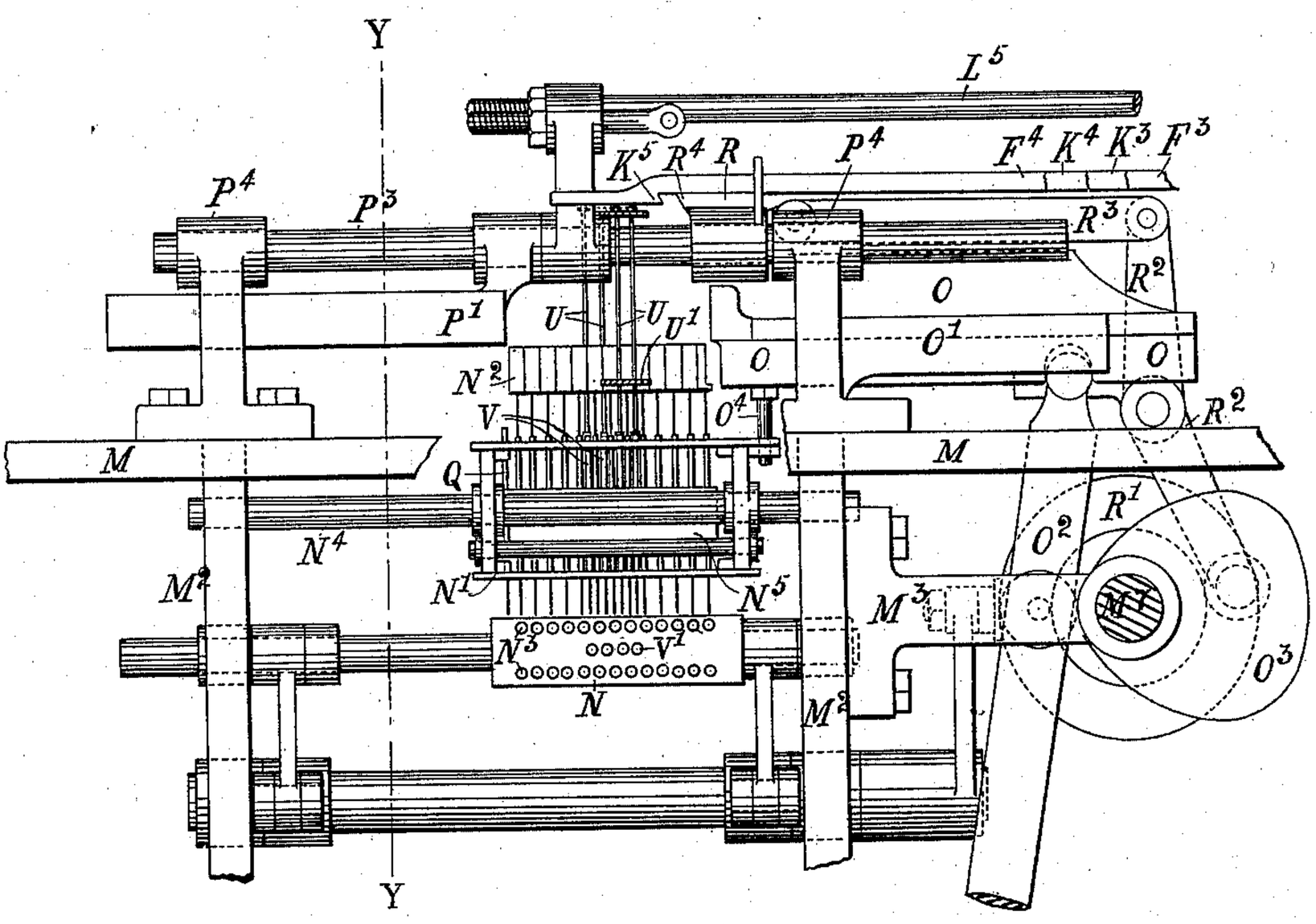

Fig 8.

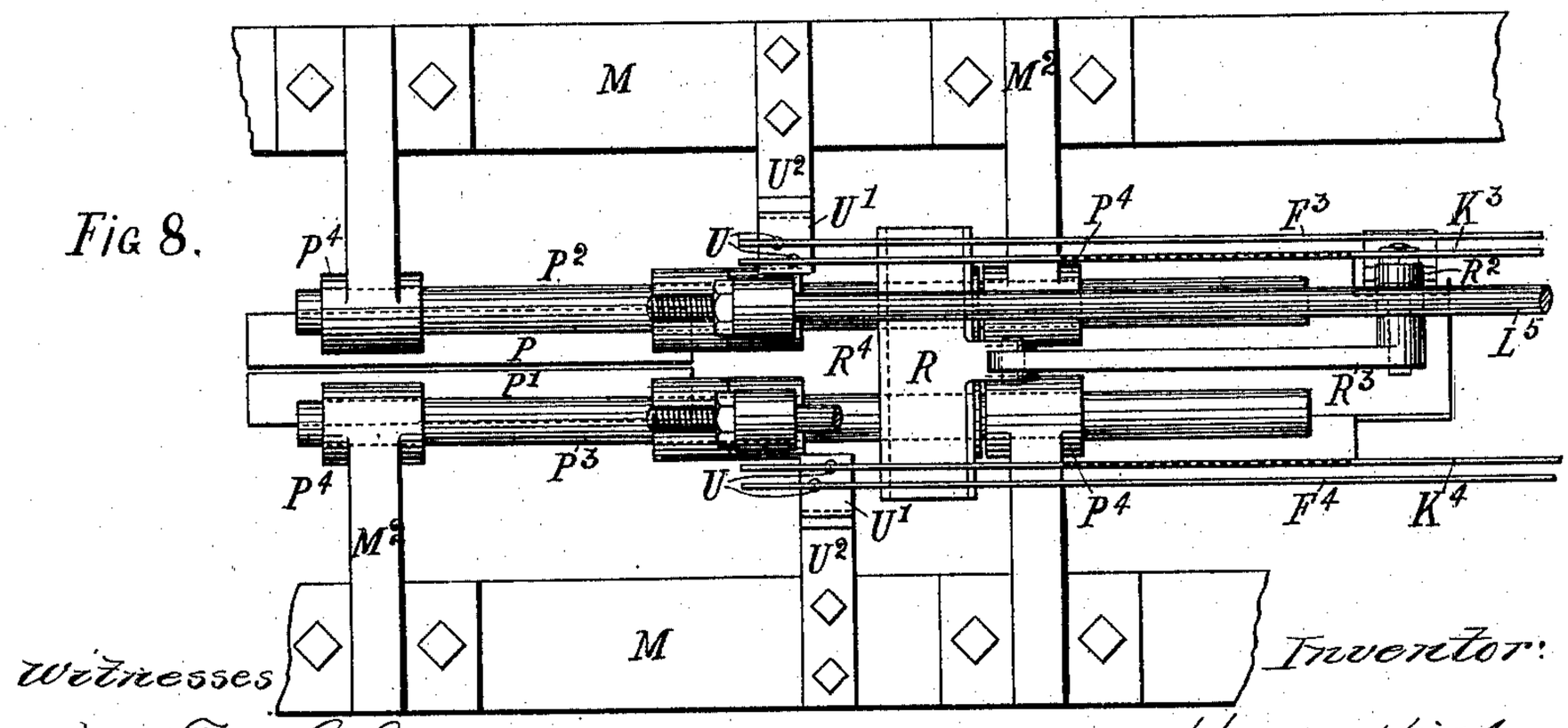

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Fig 9.

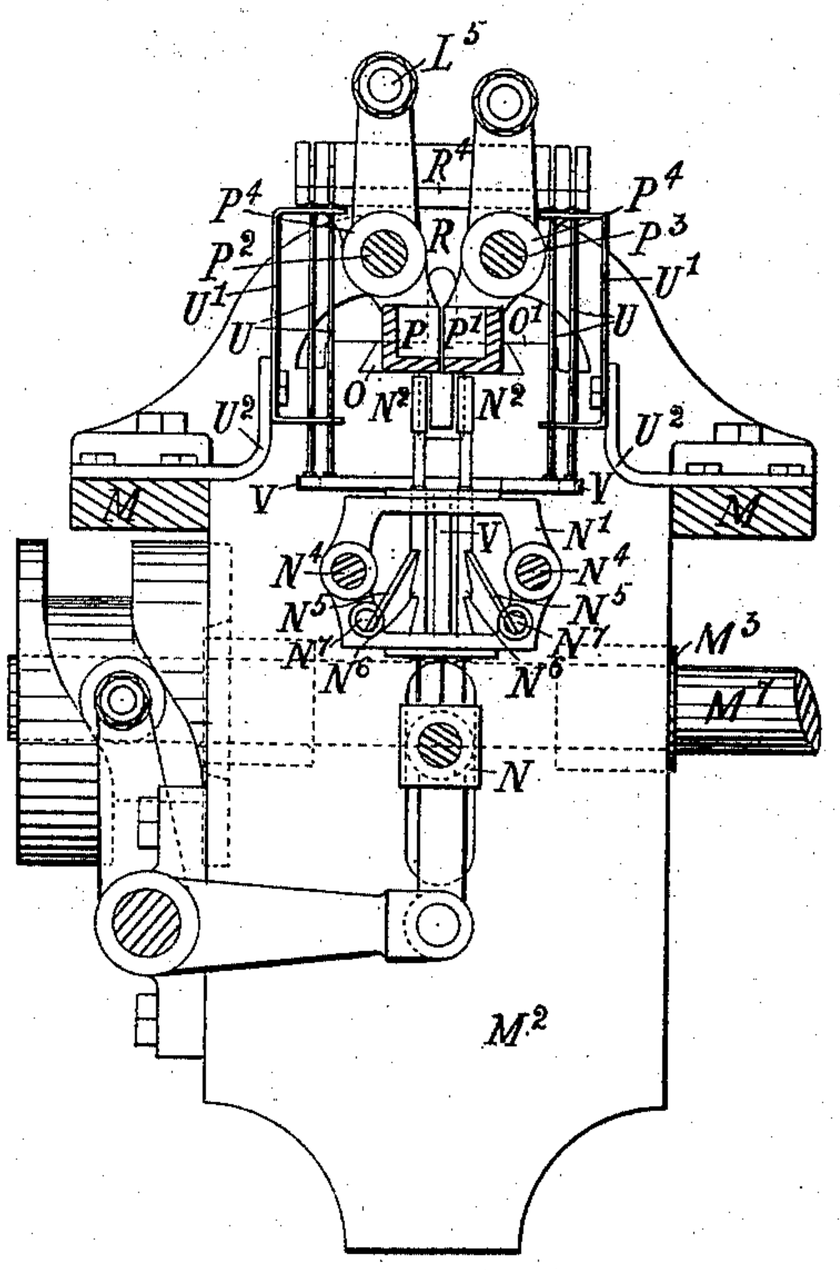

Fig 10.

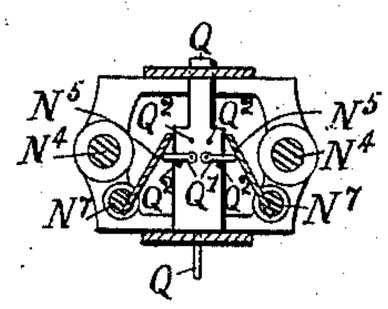

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Fig 11.

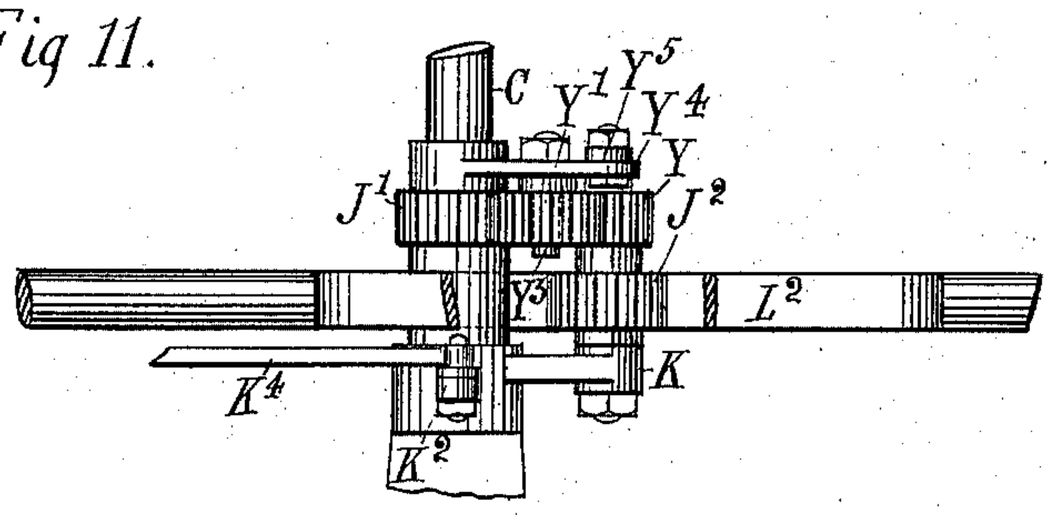
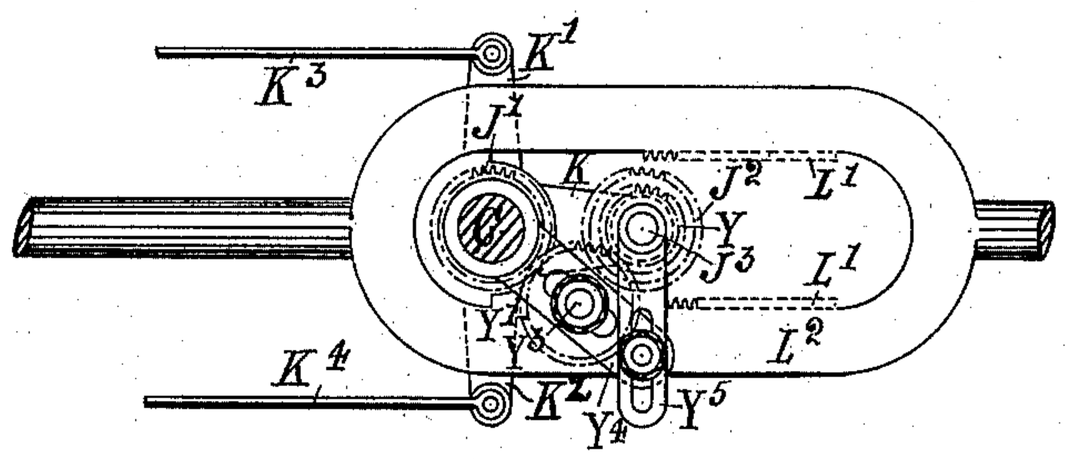


Fig 12.



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UNITED STATES PATENT OFFICE.

HENRY HILL, OF NOTTINGHAM, ENGLAND.

WORK-FEEDING MECHANISM FOR EMBROIDERING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 603,953, dated May 10, 1898.

Application filed July 14, 1896. Serial No. 599,129. (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 Improvements in Work-Feeding Mechanism for Embroidering-Machines, of which the following is a specification.

This invention relates to what are known as "multiple" embroidery-machines, in which the fabric to be embroidered is mounted on a vertical frame which is moved each stitch, the needles being stationary.

In the present invention the embroidery-frame is moved each stitch in the required direction by the action of two screws, one screw being arranged to move the frame in a direction which is at right angles to the direction of the movement imparted to the said frame by the other screw. The frame is moved any intermediate distance between two extremes in any direction by rotating either one of the screws or both screws together through the required angular space and also in the requisite direction. The amplitude of the movement of the screws determines the length of the movement of the frame, while the amplitude of the movement of one screw in relation to that of the other and the direction in which each screw is rotated determine the direction in which the frame is moved.

The main object of this invention is to provide improved means for automatically imparting the requisite movement to each screw at each stitch.

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

Figure 1 is a front elevation showing my invention applied to a multiple-shuttle embroidery-machine, parts only of the latter being shown. Fig. 2 is a front elevation, and Fig. 3 a side elevation, of the horizontal screw and operating mechanism. Fig. 4 is a front elevation, partly in section, and Fig. 5 a plan taken on line X X of Fig. 4, showing the vertical screw and operating mechanism. Fig. 6 is a side elevation of the lower part of Fig. 4. Fig. 7 is a front elevation of the jacquard. Fig. 8 is a plan of the upper portion of the jacquard. Fig. 9 is a vertical cross-section of the jacquard, taken on line Y Y of Fig. 7. Fig. 10 is a vertical cross-section showing detail of the jacquard construction. Fig. 11 is an elevation, and Fig. 12 a plan, showing change-gear applied to the screw-operating mechanism. Figs. 2 to 12, inclusive, are drawn to a larger scale than Fig. 1.

Like letters indicate like parts throughout the drawings.

The embroidery-frame A, Fig. 1, is moved in a horizontal direction by a horizontal screw B and in a vertical direction by a vertical screw C and in any other direction intermediate between the horizontal and vertical by the combined action of both screws. In the latter case the frame A makes a movement which is the result of the action of the two screws, one moving the frame at right angles to the other.

The horizontal screw B, Figs. 1, 2, and 3, is preferably placed at one end of the embroidery-frame and is carried in a threaded nut or sleeve E, which in turn is mounted in a bearing B′, secured to the end standard D of the machine. The screw B is preferably fixed against rotation and the nut or sleeve rotated as shown, although this order may be reversed, if desired.

Secured to the end of the screw B is a block B^2, which engages with a vertical slide A′ on the embroidery-frame A. This block B^2 is also supported by mounting it loosely on a fixed rod B^3 or a slide placed parallel to the screw. With this arrangement the embroidery-frame A may be moved horizontally by rotating the nut or sleeve E without limiting or interfering with its vertical movement by reason of the vertical slide A′ on the frame A being free to slide in the block B^2 at the end of the screw B. Secured to or formed on the end of the nut or sleeve E is a pinion E′, and engaging with this pinion E′ is a second intermediate pinion E^2. The latter is on a pin or axle E^3, secured to one arm F of a three-armed lever F F′ F^2, pivoted on the exterior of the bearing B′.

The arms F′ F^2 are connected by rods F^3 F^4 to the jacquard, hereinafter described, so that the intermediate pinion E^2 may be moved from its normal position in which it is shown into engagement with the teeth of either of the two racks G G′, which are on opposite sides of the pinions E′ E^2.

The racks G G′ are secured to or formed on

a frame G^2, provided with shafts G^3 G^3, which are carried by and slide longitudinally in bearings G^4 G^4, secured to the standard D of the machine. The frame G^2 is connected to the jacquard by a chain G^5, attached to a boss G^6, secured on one of the shafts G^3.

The vertical screw C, Fig. 1, is preferably arranged centrally above the embroidery-frame A, and it may be mounted and connected to the frame in the same manner as the horizontal screw, the bearing for the nut or sleeve being in this case secured to the top stays H of the machine. To reduce vibration, however, I preferably employ a vertical screw to move both the frame and counterweight C^3 simultaneously, as shown, one part of the screw having a right-hand thread and the other a left-hand thread, so as to raise the frame and at the same time lower the weight, and vice versa.

The vertical screw C, Figs. 1; 4, and 5, is mounted near the middle in a bearing C', secured to the two top stays H, and at the upper end in a second bearing H', carried by two standards H^2 H^2, secured to the before-mentioned stays H.

On the upper part of the screw C is a nut C^2, secured to the upper part of the counterweight C^3, the latter being formed with an axial hole for the passage of the screw. The levers I are formed with forked and slotted ends I', which engage with pins I^2 on each side of the weight, or the levers may be connected to the weight by links preferably arranged in the form of a parallel motion.

On the lower end of the screw C is a threaded sleeve or plunger C^4, carried by and sliding in an extension C^5 of the bearing C'. The lower end of the sleeve C^4 engages with a horizontal slide A^2, Figs. 4 and 6, secured on the frame A, so that it may raise or lower the frame A without interfering or limiting its horizontal movement to the right or left. The vertical screw C is operated by an arrangement which is a duplicate of that employed for operating the nut or sleeve E of the horizontal screw, and comprises a pinion J', secured to the screw C, an intermediate pinion J^2, mounted on a pin or axle J^3, secured to one arm K of a three-armed lever K K' K^2, which is pivoted on the exterior of the bearing C', rods K^3 K^4 for connecting the arms K' K^2 to the jacquard, and racks L L', carried by a frame L^2, provided with shafts L^3 L^3, mounted in bearings L^4, secured to the cross-stays H^3 of the standards H^2.

The rack-frame L^2 is connected to the jacquard by a rod L^5, attached to a boss L^6, secured to one of the shafts L^3 in the same manner as the rack-frame of the horizontal screw.

The racks and screws are operated by the jacquard as follows: In order to move the frame A horizontally to the right or left, the pinion E^2 is moved into engagement with one of the racks G G'. The rack-frame G^2 is then moved from its normal position in which it is shown to a point which is determined by the length of movement it is desired to give the frame A. The pinion E^2 is then first returned to its normal position, followed by a like movement of the rack-frame G^2, ready for the next movement. The return movement of the rack-frames G^2 and L^2 may be performed by weights or springs, which are not shown. In order to raise or lower the frame A in a vertical direction, the pinion J^2 and rack-frame L^2 are operated in like manner. In order to move the frame in a diagonal direction, both pinions E^2 and J^2 and both rack-frames G^2 and L^2 are operated, and the frame A will be moved in a direction which is diagonally across a rectangle the two sides of which correspond to the direction of and length of the two movements imparted to the frame by the horizontal and vertical screws.

It will be seen that the direction of the movement of the frame A is determined by moving the intermediate pinions E^2 and J^2 into engagement with one of the two corresponding racks and that the extent of such movement of the frame is determined by the length of the traverse of the rack-frames G^2 and L^2. These movements are given by a jacquard of special construction which is placed at the end of the machine and is carried on two horizontal rails M M, Fig. 1, which are secured at their inner ends to the standard D of the machine and supported at their outer ends by a pillar M'.

The frame of the jacquard is formed by two plates M^2 M^2, secured to the before-mentioned rails M M, and the driving-shaft M^7 of the jacquard, which is carried in bearings M^3, secured to one of the plates M^2, is connected to the main driving-shaft M^4 of the embroidery-machine by a vertical shaft M^5 and toothed wheels M^6 M^6 M^6 M^6.

In embroidery-machines which vary in construction from the one shown the driving-shaft M^7 of the jacquard may be connected to the embroidery-machine by other means, if found more convenient.

The jacquard, Figs. 7, 8, and 9, is provided with a pattern-card cylinder N and a dropper-cage N', in which the droppers N^2 are arranged in two rows parallel to the axis of the cylinder N, the latter being formed with two corresponding rows of holes N^3 N^3.

The dropper-cage N' is mounted loosely on two shafts N^4 N^4, which are supported in the two end plates M^2. Above the dropper-cage N' is a horizontal driving-slide O, which is supported in guides O', secured to or forming part of one of the plates M^2. This slide O is reciprocated by a lever O^2, Fig. 7, actuated by a cam O^3 on the main shaft M^7.

The slide O is connected to the dropper-cage N' by a pin O^4 on the former engaging with a slot in the latter, and the cage N' is thus reciprocated longitudinally on the shafts N^4 simultaneously with the driving-slide O.

Opposite to the slide O are two abutments P P', secured to shafts P^2 P^3, respectively. The shafts P^2 P^3 are mounted loosely and are

capable of being moved longitudinally in bearings P^4 P^4 P^4 P^4, secured to or forming parts of the plates M^2 M^2.

The abutments P P′ and corresponding shafts P^2 P^3 are moved longitudinally by the interposition of the two rows of droppers N^2 between the driving-slide O and the abutments, the distance of the movement of each abutment being determined by the number of droppers N^2 raised in each corresponding row by the pattern-card.

The shaft P^2, Fig. 1, is connected by the rod L^5 to the rack-frame L^2 of the vertical screw C and the shaft P^3 by the chain G^5 to the rack-frame G^2 of horizontal screw B, the said chain G^5 being carried over a pulley S, pivoted on a bracket secured to one of the rails M.

The length of the movement of each rack-frame L^2 and G^2 is determined by the number of droppers raised by the pattern-card in each corresponding row.

The droppers N^2 in each row, Fig. 9, are held in their position during the traverse of the cage N′ by longitudinal locking-bars N^5, the upper edges of which engage with the catches N^6 on the droppers.

The locking-bars N^5 are pivoted at N^7 in the frame of the dropper-cage N′ and are opened out in order to release the droppers by a vertical slide Q, Fig. 10, which is raised by the cylinder. This slide Q is provided with two pivoted catches Q′ Q′, the movement of each of which is governed by stops Q^2 Q^2, so that the said catches Q′ Q′ open out the locker-bars N^5 as the slide Q is raised by the cylinder and fold on the slide as the latter returns to its normal position.

In addition to the parts of the jacquard hereinbefore described for operating the rack-frames L^2 G^2 is the mechanism for moving the intermediate pinions J^2 E^2 into gear with the racks, the latter being arranged so as to be governed by the same pattern-cards as the former. For this purpose mounted loosely on the shafts P^2 P^3 is a block R, Figs. 7 and 8, which is reciprocated longitudinally on the shafts P^3 by a cam R′, Fig. 7, on the cam-shaft M^7 through a lever R^2 and link R^3. Resting on the upper face of this block R are the ends of the rods F^3 F^4 K^3 K^4, previously described, which at this point are each provided with a catch K^5 to engage with the edge R^4 of the block R.

The ends of the rods F^3 F^4 K^3 K^4 may be raised as desired, so that their catches K^5 are not engaged by the block R, by vertical selectors U U U U, carried in the frames U′ U′, supported by brackets U^2 U^2, secured to the rails M. When the dropper-cage N′ is in its normal position, the selectors U U U U engage with the upper end of four corresponding vertical T-shaped slides V V V V, carried in the middle of the dropper-cage. These slides are, together with the selectors, raised by the pattern-card in the same manner as the droppers, holes V′ being formed in the cylinder N corresponding to the position of the said slides. It will be seen that the rods F^3 F^4 K^3 K^4 are arranged in pairs, both F^3 and F^4 operating the pinion E^2 and both the rods K^3 K^4 the pinion J^2. It will thus be understood that by selecting either of the rods in each pair each pinion may be moved into engagement with either of its two operating-racks. For example, if the rod F^4 engages with the block R the pinion E^2 will be moved into engagement with the rack G′. If, on the contrary, the rod F^3 were engaged with the block R, the pinion E^3 would engage with the rack G. It will also be seen, for example, that if the rod F^3 be moved by the block R the rod F^4 will also be moved in the reverse direction. In order, therefore, to return the pinion E^2 to its normal position, it is only necessary for the block R to return until it engages with the rod F^4, which has now been released by its selector U, and by means of the said rod F^4 return the pinion to its normal position before the return movement of the rack-frame G^2 commences. The pinions E^2 J^2 may, however, be returned to their normal position by springs.

The horizontal and vertical parts of the rods F^3 F^4, Fig. 1, are connected by a bell-crank lever F^6, (one only of which is shown,) pivoted to the brackets S′. It may be noted that the racks must be traversed through a space equal to the pitch of the rack or a multiple of the pitch and that each screw will move the frame through a space which is a fraction of the length of movement of the rack. The value of the fraction is constant, it being determined by the pitch of the screw and the number of teeth in the pinion on the screw.

In order that the length of the fractional movement of the frame with respect to that of the rack may be conveniently adjusted to suit different classes of work, the pinion J^2, for example, (see Figs. 11 and 12,) instead of gearing directly with the pinion J′ on the screw C, as previously described, may be connected by two change-wheels Y Y′, as shown.

The pinion Y may be mounted on the same axle J^3 as the pinion J^2 and be connected to the latter or be mounted on a sleeve or boss of the pinion J^2, so as to be readily detached. The pinion Y′ is mounted loosely on an axle Y^3, which is adjustable in a slot in an arm Y^4, and the latter is mounted loosely on the screw C. The arm Y^4 may be held in position by a slotted link Y^5, one end of which is pivoted on the upper end of the axle J^3, and its slotted end is bolted to the arm Y^4. With this arrangement wheels having the requisite number of teeth to give any required result may be substituted for the wheels Y Y′, the position of the axis of the latter being adjustable.

I claim—

1. In a work-feeding mechanism for embroidering-machines, the combination with the jacquard mechanism, of the work-frame, the screw C connected to the frame, for mov-

ing the frame vertically, a pinion secured to the screw, a double rack, the three-armed lever, a second pinion mounted on one arm of said lever, and constantly in gear with the first-mentioned pinion, the rods carried by the other arms of the lever and connected to the jacquard mechanism, whereby the second pinion may be brought into gear with either of the racks; substantially as described.

2. In a work-feeding mechanism for embroidering-machines, the combination with the jacquard mechanism of a screw B for moving the frame pinion E secured to the screw double rack G G′ and pinion E^2, of a lever F F′ F^2 for carrying the axle E^3 of the pinion E the said lever being operated by the jacquard through the rods F^3 F^4 so as to move the pinion E into gear with either of the racks G G′ substantially as described.

3. In a work-feeding mechanism for embroidering-machines, the combination with the work-frame, the counterweight formed with an axial hole, the vertical screw passing through the weight, and engaging the frame at one end and the weight at the other, the threads on the screw at the point of engagement with the weight and frame being oppositely pitched, and connections between the screw and jacquard mechanism for turning the screw whereby as the weight is raised the frame is lowered; substantially as described.

4. In jacquard mechanism for embroidery-machines the combination with a screw C for moving the frame A pinions J and J′ and a double rack L L^2 of change gear-wheels Y Y′ for connecting the pinions J and J′ substantially as described.

5. In jacquard mechanism for embroidery-machines the combination with a screw C for moving the frame A pinions J and J′ and a double rack L L^2 of change gear-wheels Y Y′ for connecting the pinions J J′ and an arm Y^4 for carrying the adjustable axle Y^3 of the pinion Y′ substantially as described.

6. In a work-feeding mechanism for embroidering-machines, the combination with the jacquard mechanism of the dropper-cage and pattern-card cylinder, the droppers carried by the dropper-cage and arranged in two rows parallel to the axis of the card-cylinder and provided with catches, and the pivoted locking-bars extending across the cage for engaging with the catches on the droppers to hold the droppers elevated during the traverse of the dropper-cage; substantially as described.

7. In a work-feeding mechanism for embroidering-machines, the combination with the jacquard mechanism, of the dropper-cage, the droppers provided with catches carried by said cage, the pivoted locking-bars extending across the cage on opposite sides thereof and engaging the catches of the droppers to hold the droppers elevated and the vertically-moving slide at one end of said dropper-cage working between the locking-bars and provided with two pivoted catches adapted to engage with the locking-bars to open the same and permit the droppers to fall; substantially as described.

8. In a work-feeding mechanism for embroidering-machines, the combination with the jacquard mechanism, of the dropper-cage, the vertically-movable T-shaped slides carried at the center of the dropper-cage, the selectors normally resting on the top of said slides, the pattern-card for raising the slides and thus lifting the selectors; substantially as and for the purpose set forth.

9. In a work-feeding mechanism for embroidering-machines the combination with the jacquard mechanism, the work-carrying frame, the screws connected to the frame for moving the frame vertically and horizontally, pinions carried by said screws, the double rack, the three-armed lever, pinion carried by one of the arms in mesh continuously with the pinion on the screw, the bars connected to the lever and to the jacquard mechanism, whereby the pinion on the lever-arm may be thrown into engagement with either one of the racks and the frame thus given a movement in two directions; substantially as described.

In testimony whereof I have hereto set my hand in the presence of the two subscribing witnesses.

HENRY HILL.

Witnesses:
ALFRED C. ROBINSON,
H. C. SHELDON.