No. 674,268. Patented May 14, 1901.

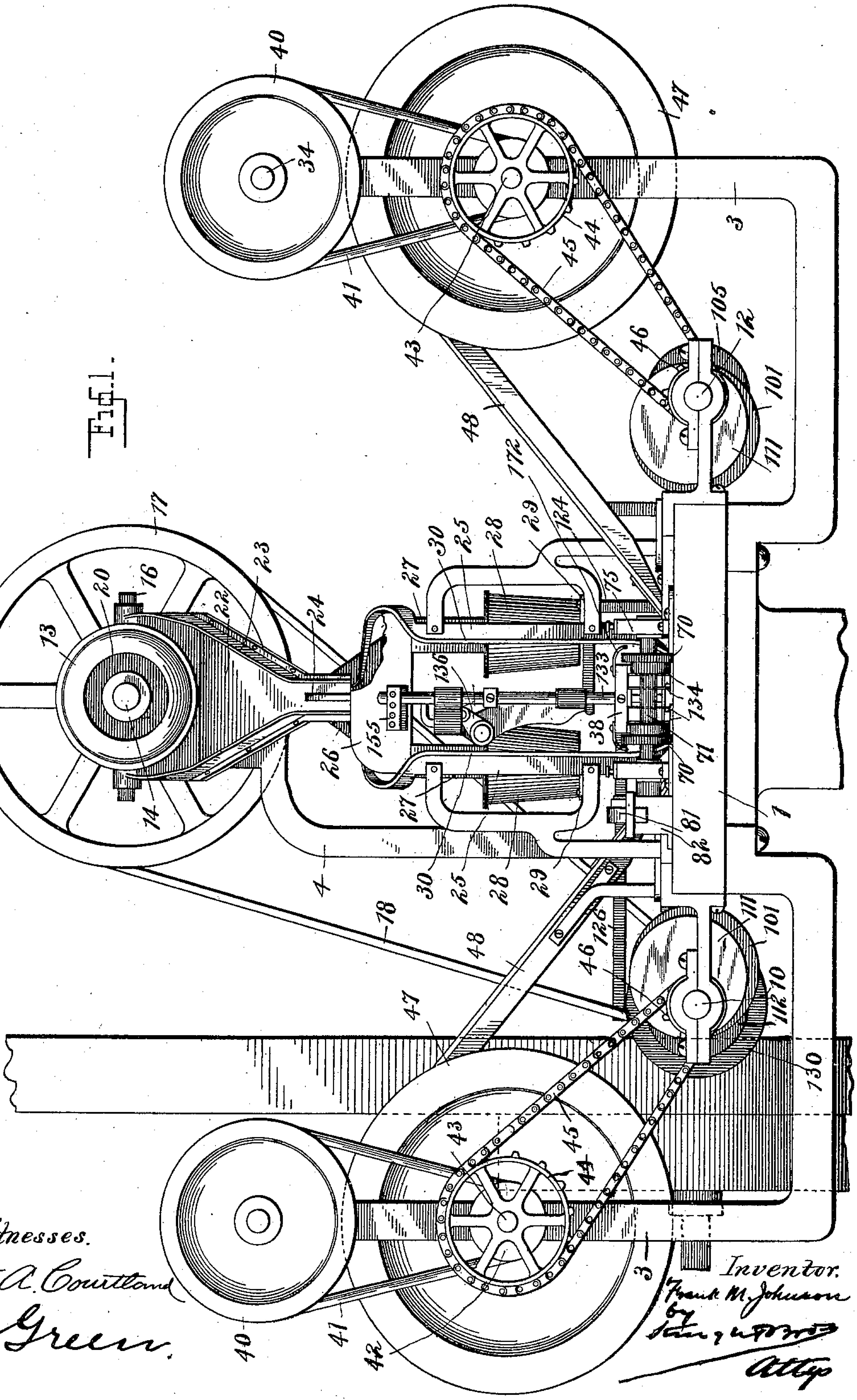
F. M. JOHNSON.

MACHINE FOR SEWING HOOKS AND EYES ON CARDS.

(Application filed Nov. 15, 1899.)

(No Model.) 11 Sheets—Sheet 1.

Fig. 1.



Witnesses.
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by
Stanley ... Attys

No. 674,268. Patented May 14, 1901.

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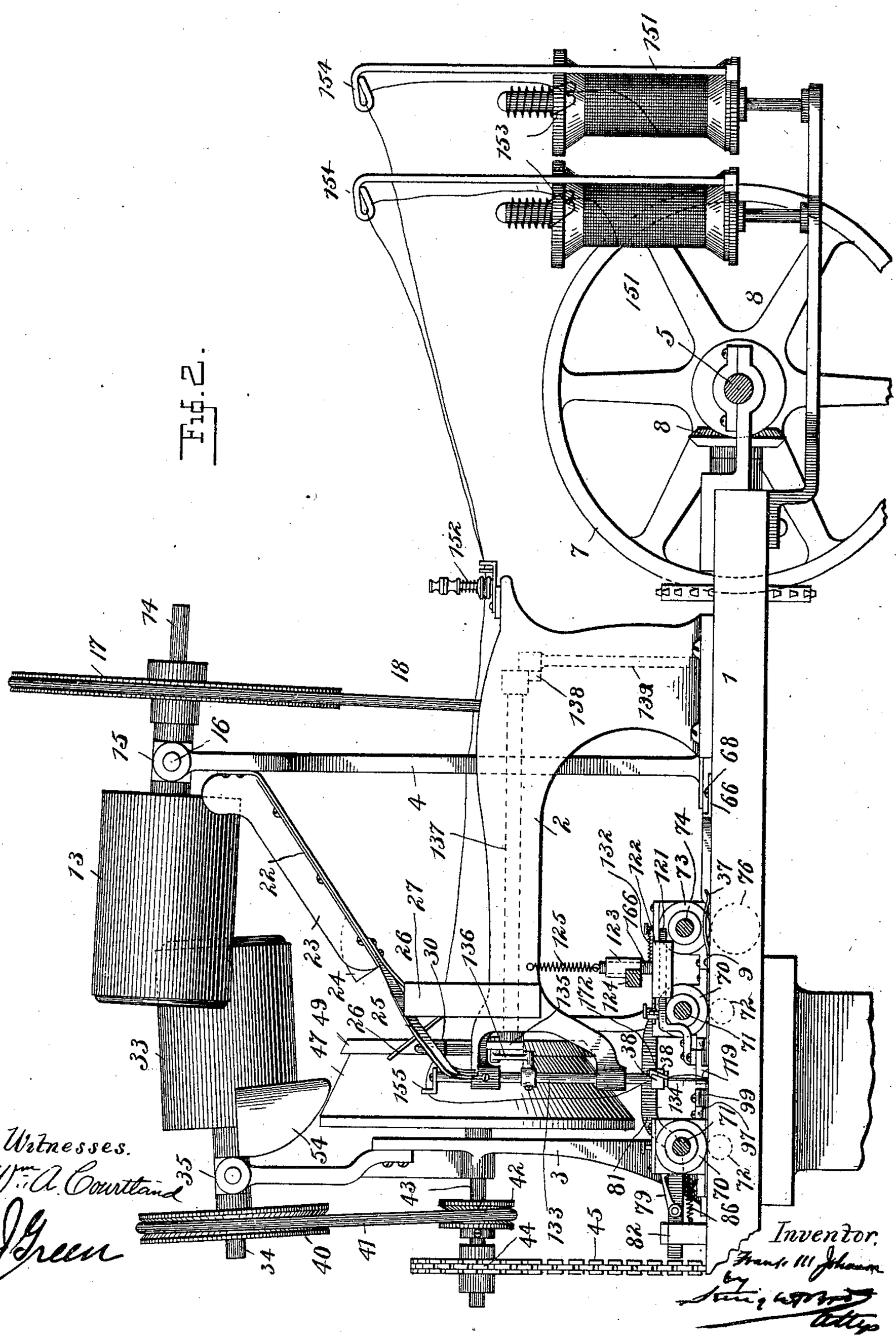
Fig. 2.



Witnesses.
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11 Sheets—Sheet 3.

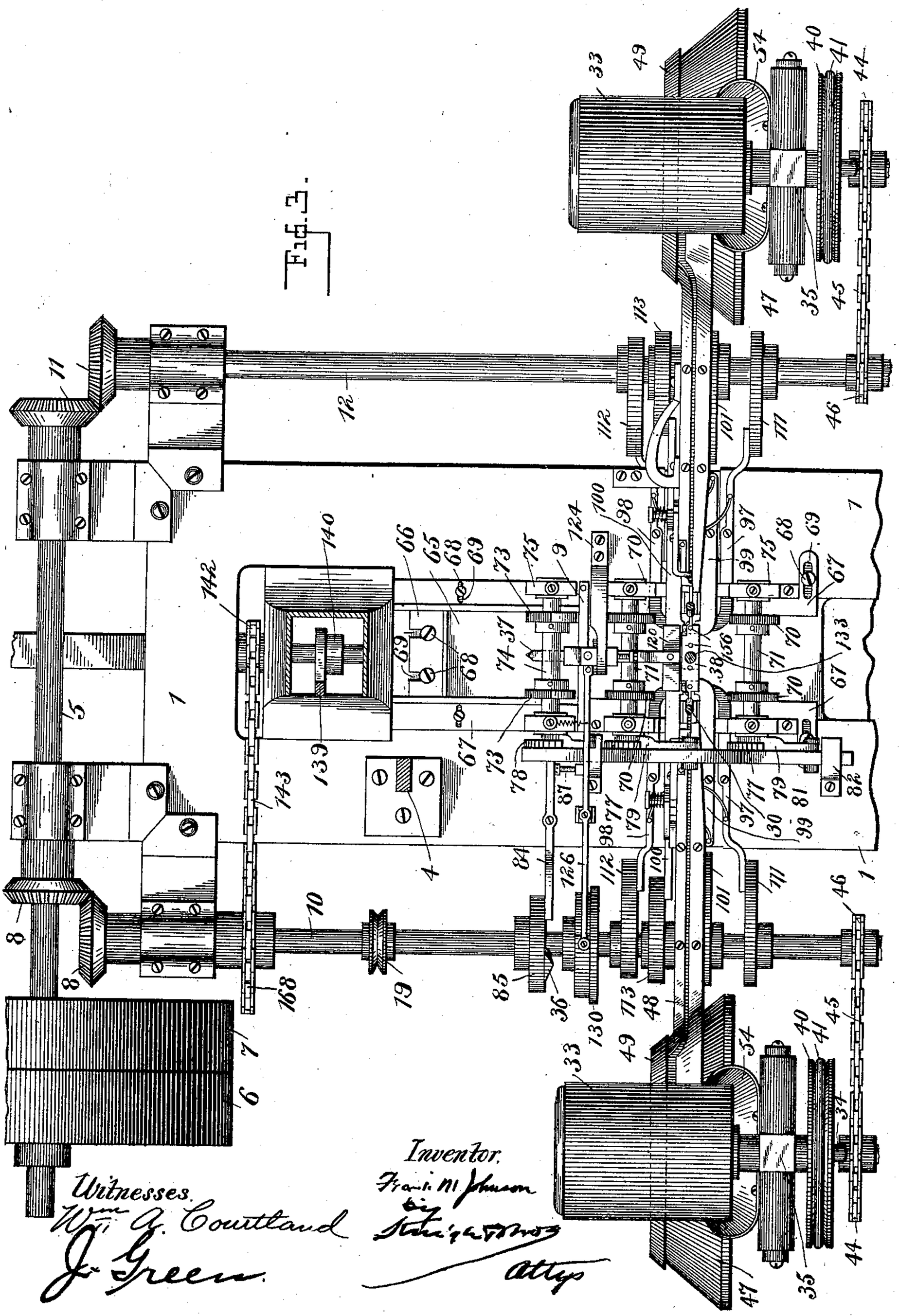

FIG. 3.

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Fig. 4.

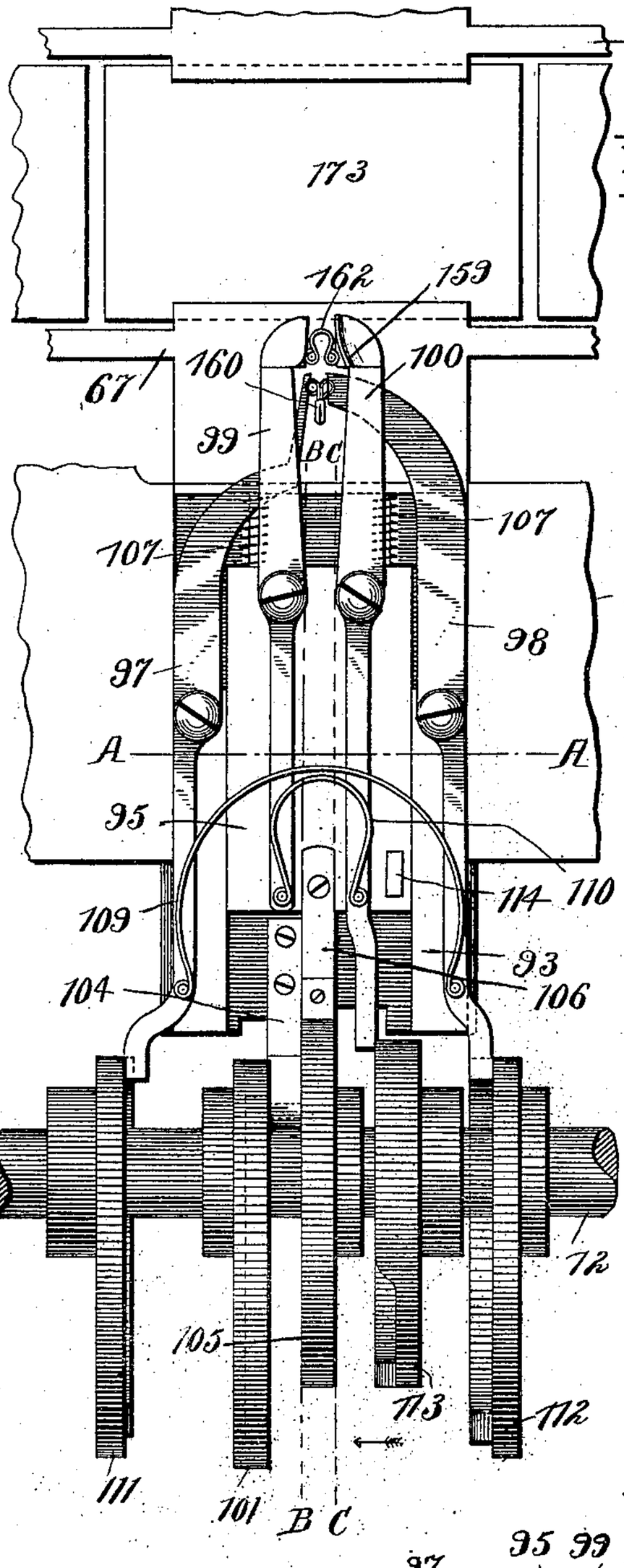

Fig. 5.

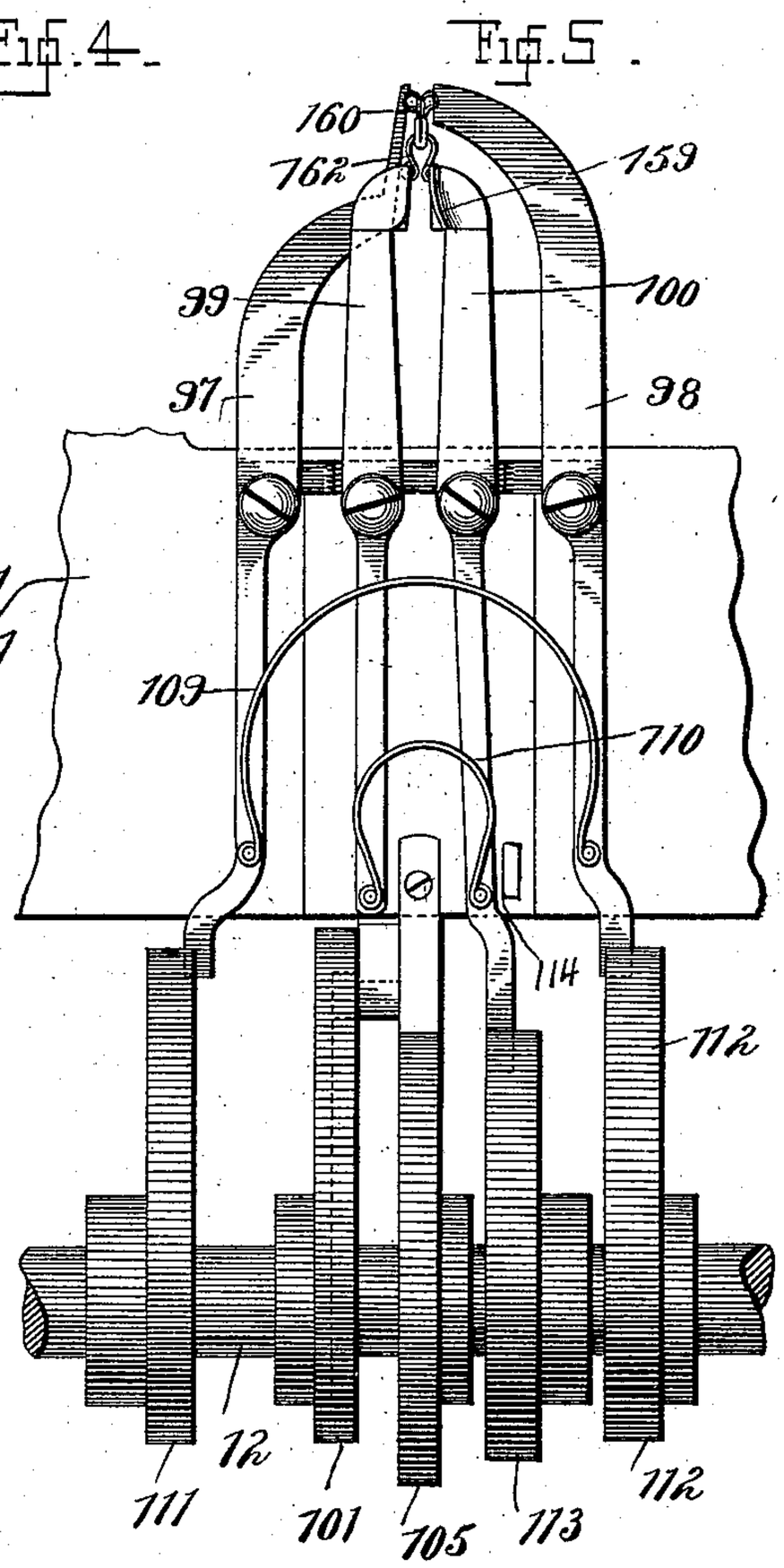

Fig. 6.

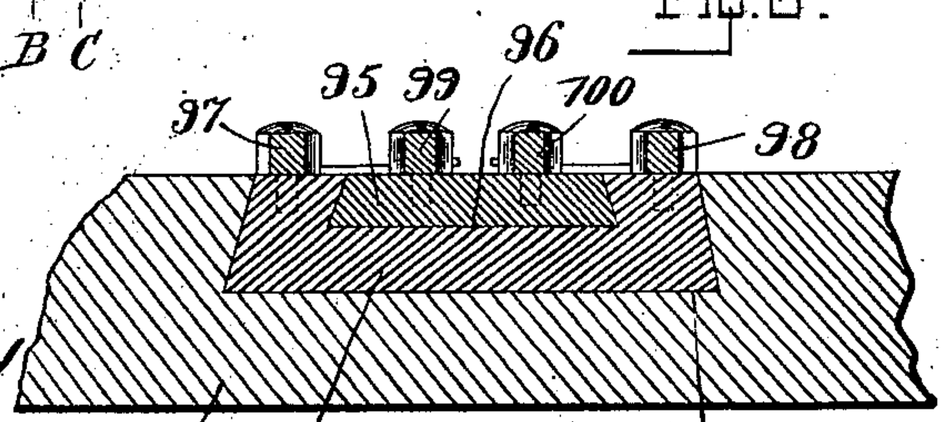

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Fig. 7.

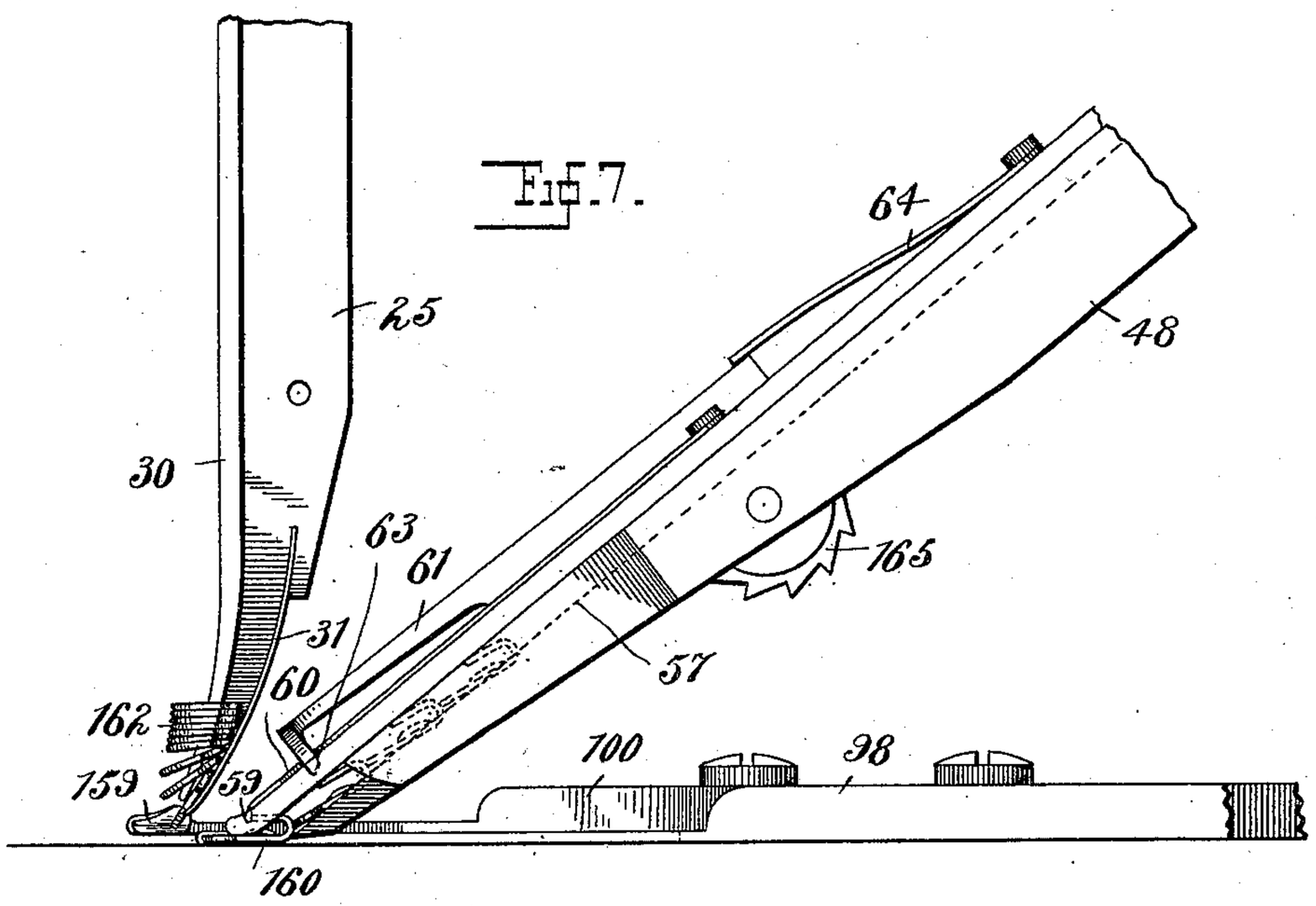


Fig. 8.

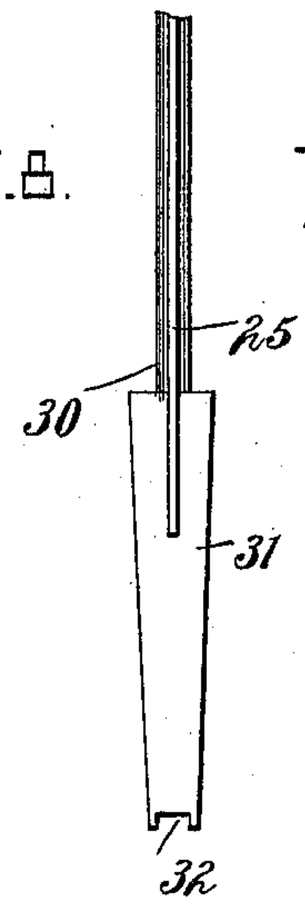


Fig. 9.

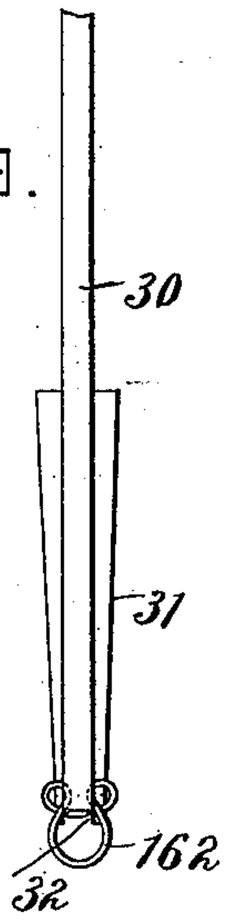


Fig. 10.

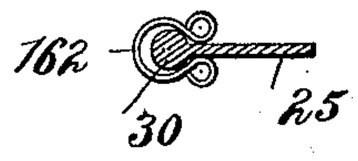


Fig. 11.

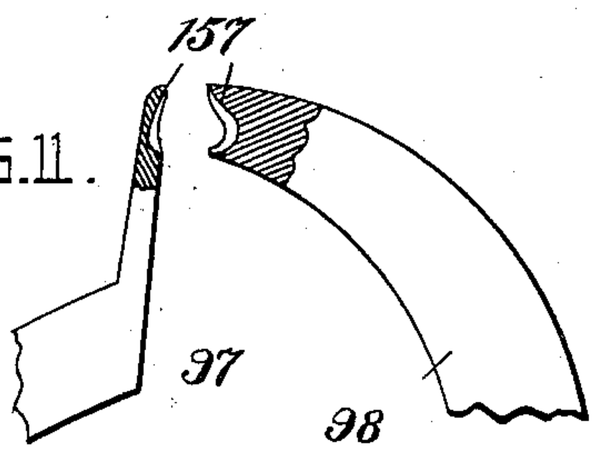
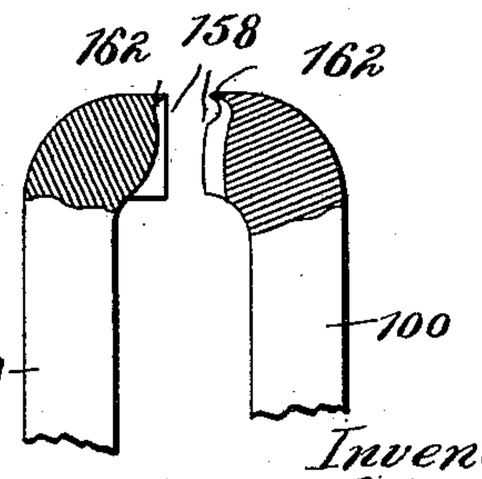


Fig. 12.



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MACHINE FOR SEWING HOOKS AND EYES ON CARDS.

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Fig. 13.

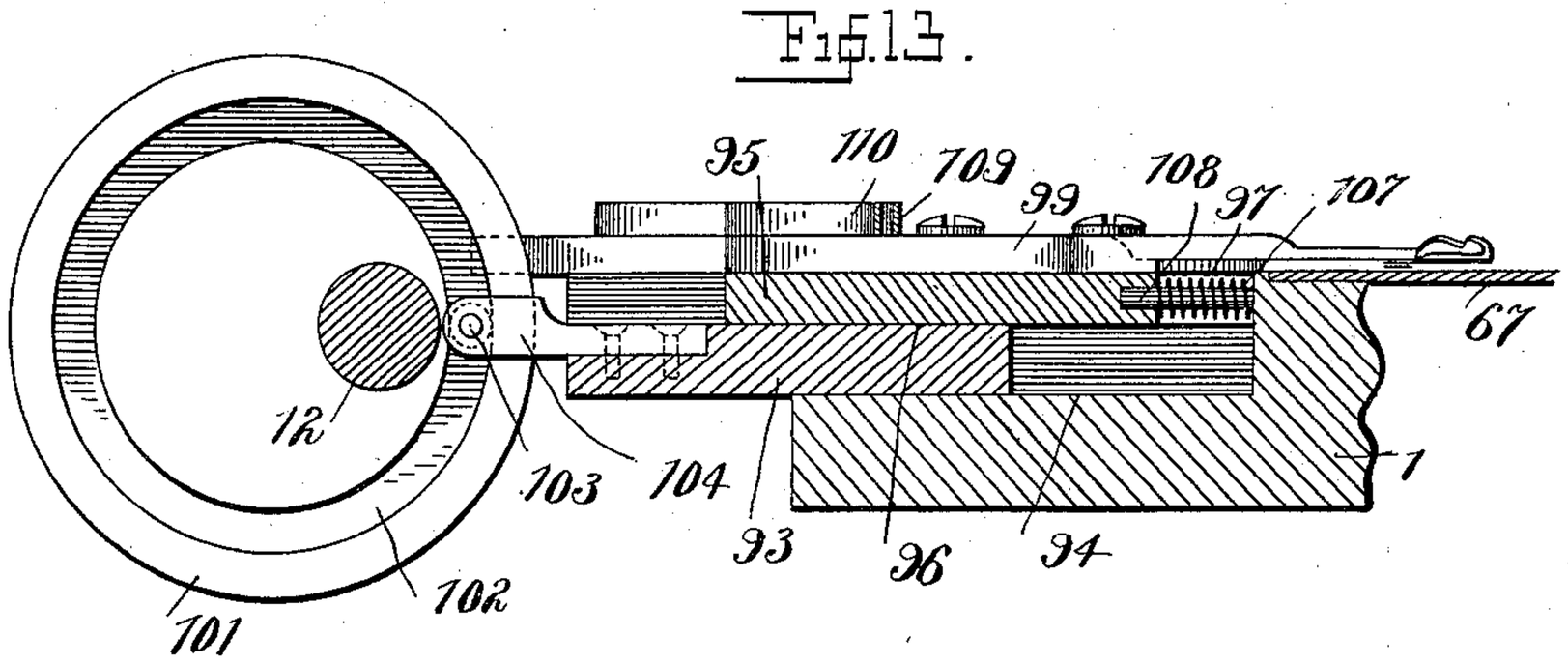


Fig. 14.

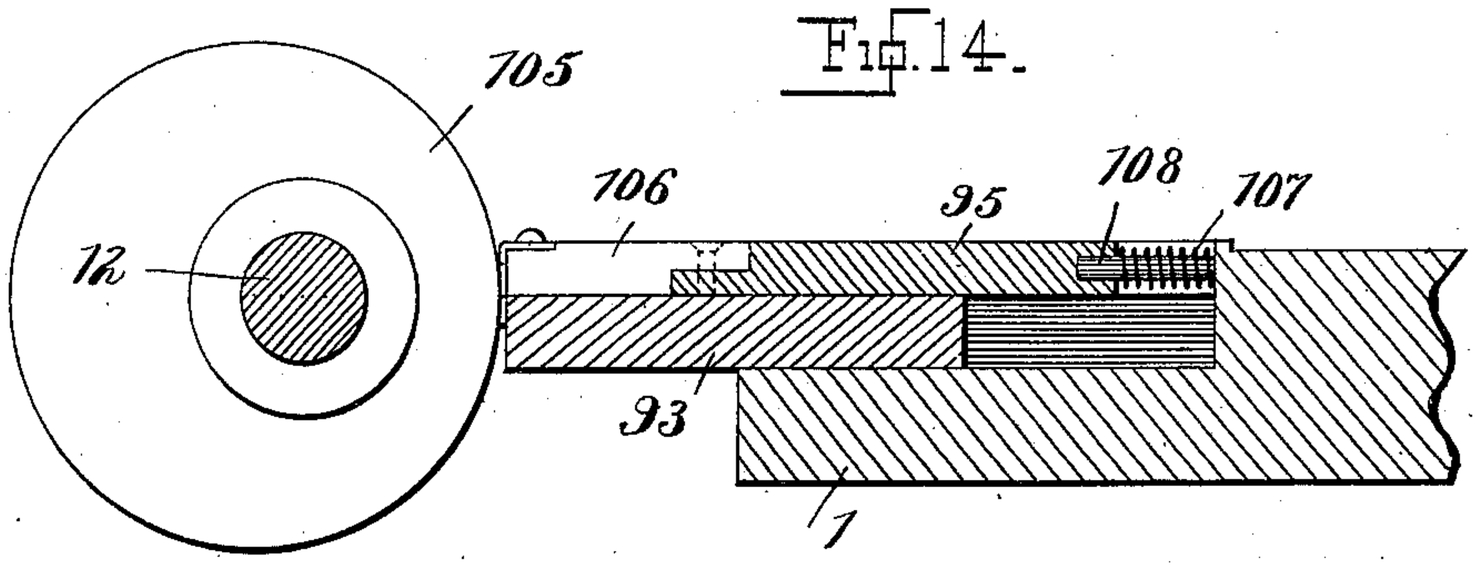


Fig. 15.

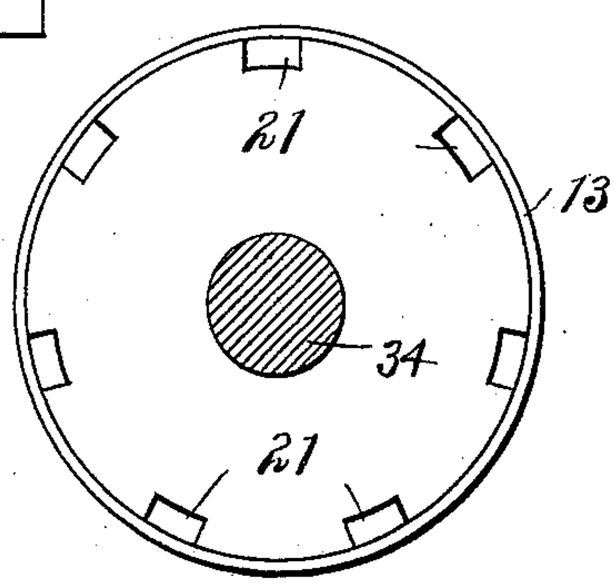
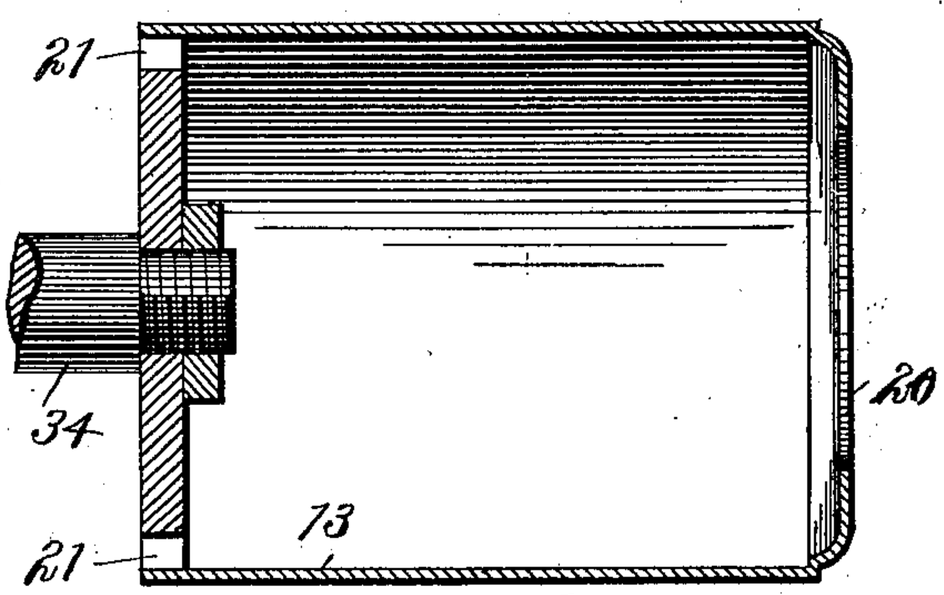


Fig. 16.



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No. 674,268. Patented May 14, 1901.

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MACHINE FOR SEWING HOOKS AND EYES ON CARDS.

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Fig. 17.

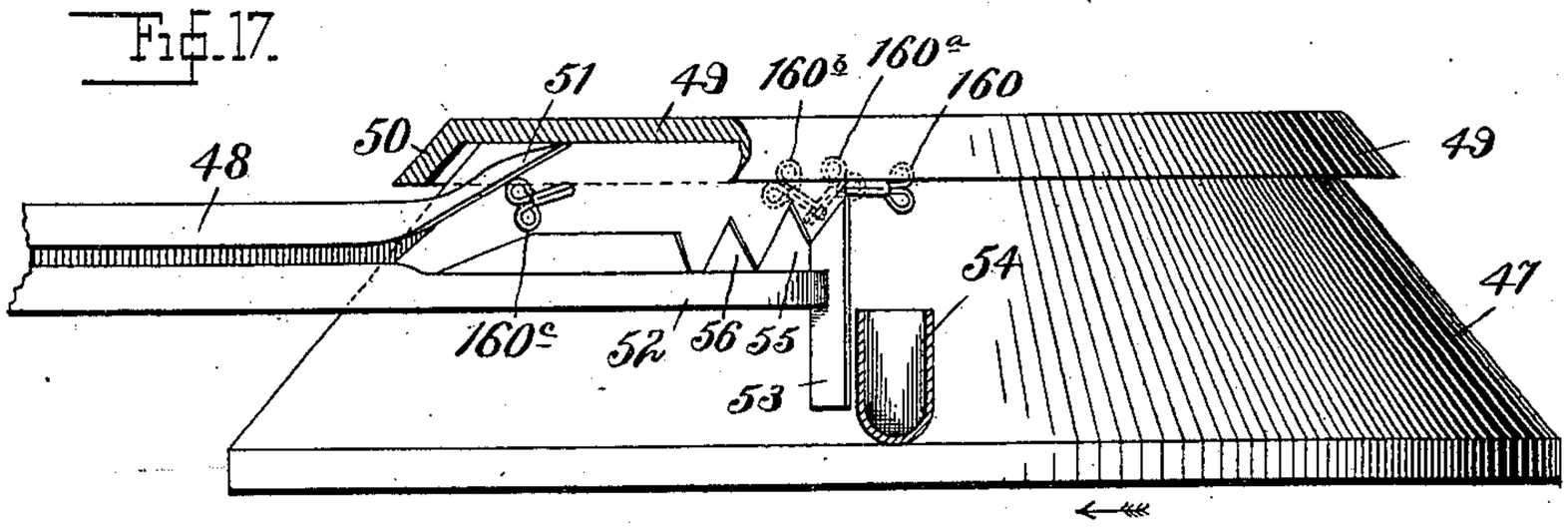

Fig. 18.

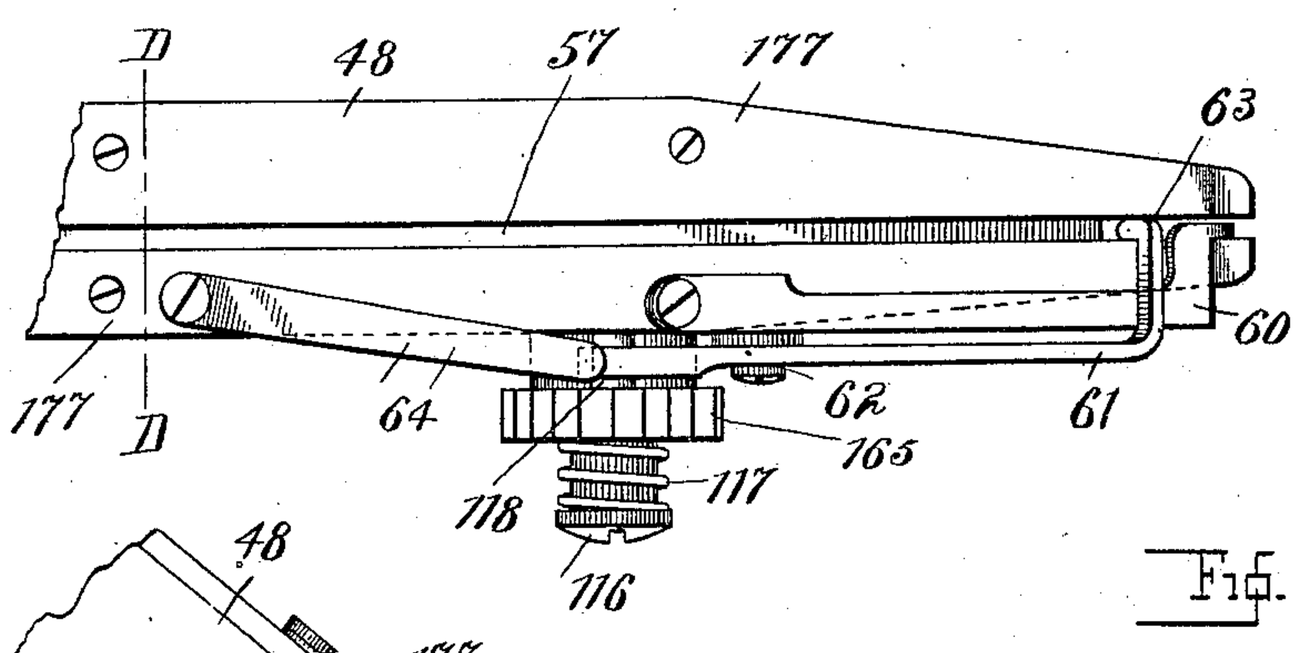

Fig. 20.

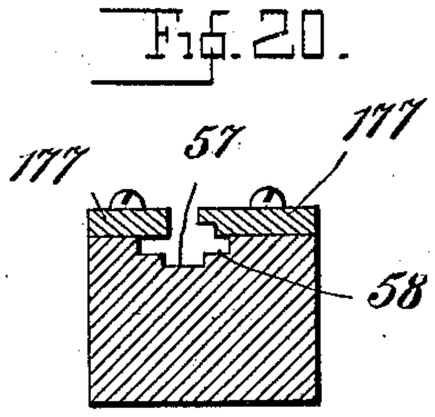

Fig. 19.

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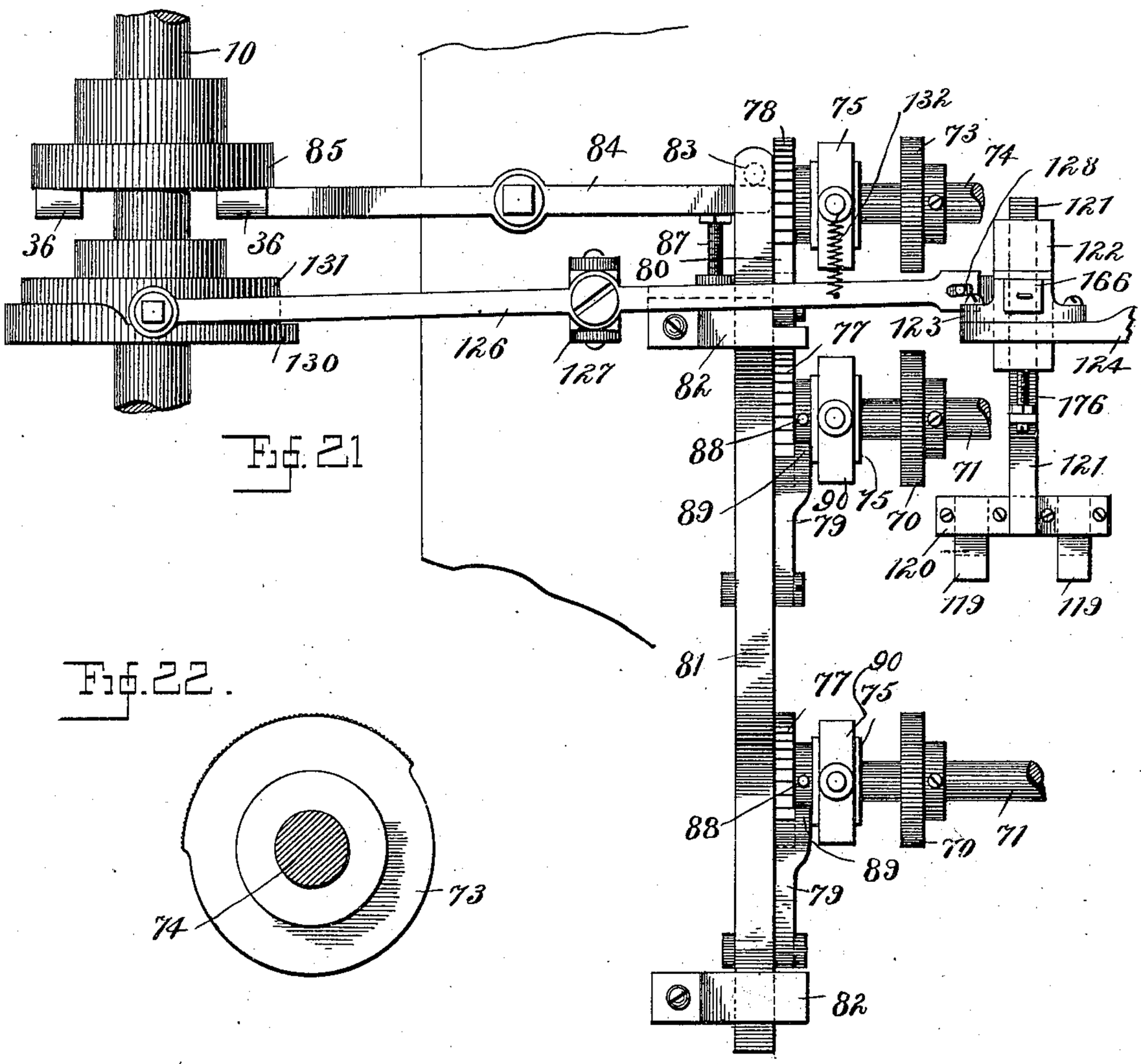

Fig. 21

Fig. 22.

Fig. 23.

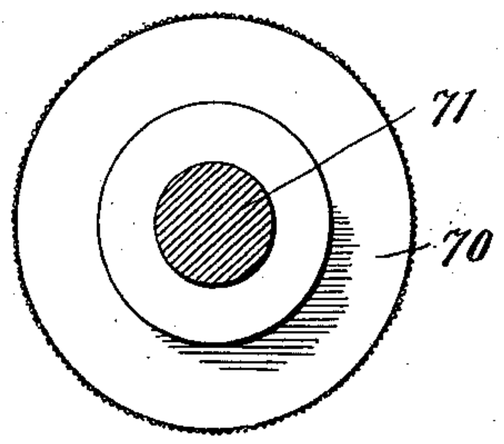

Fig. 24.

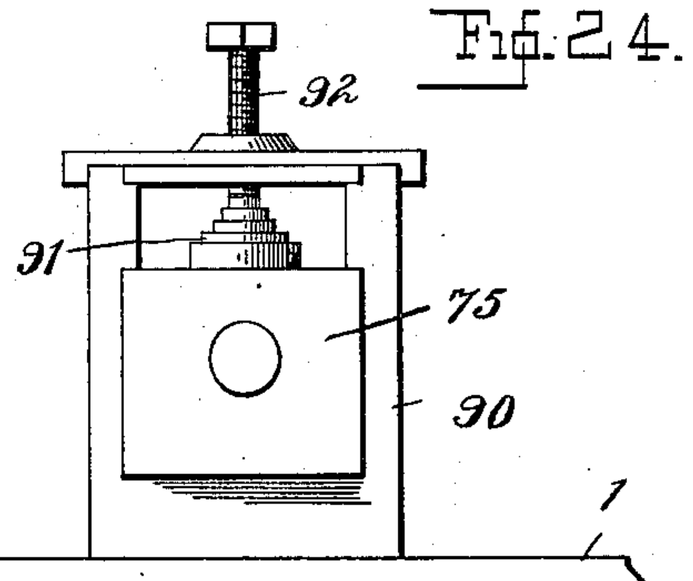

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Fig. 25.

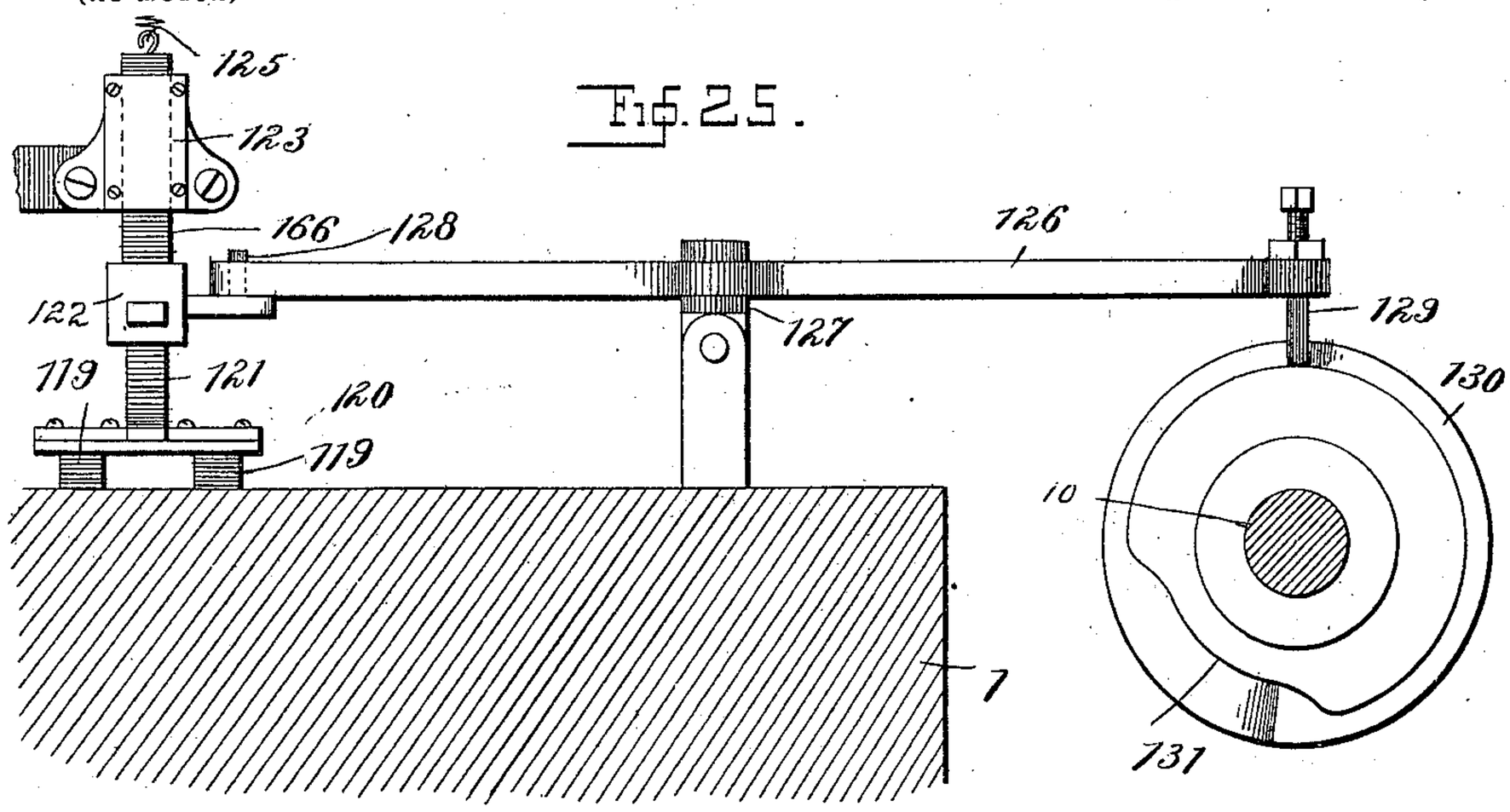

Fig. 26.

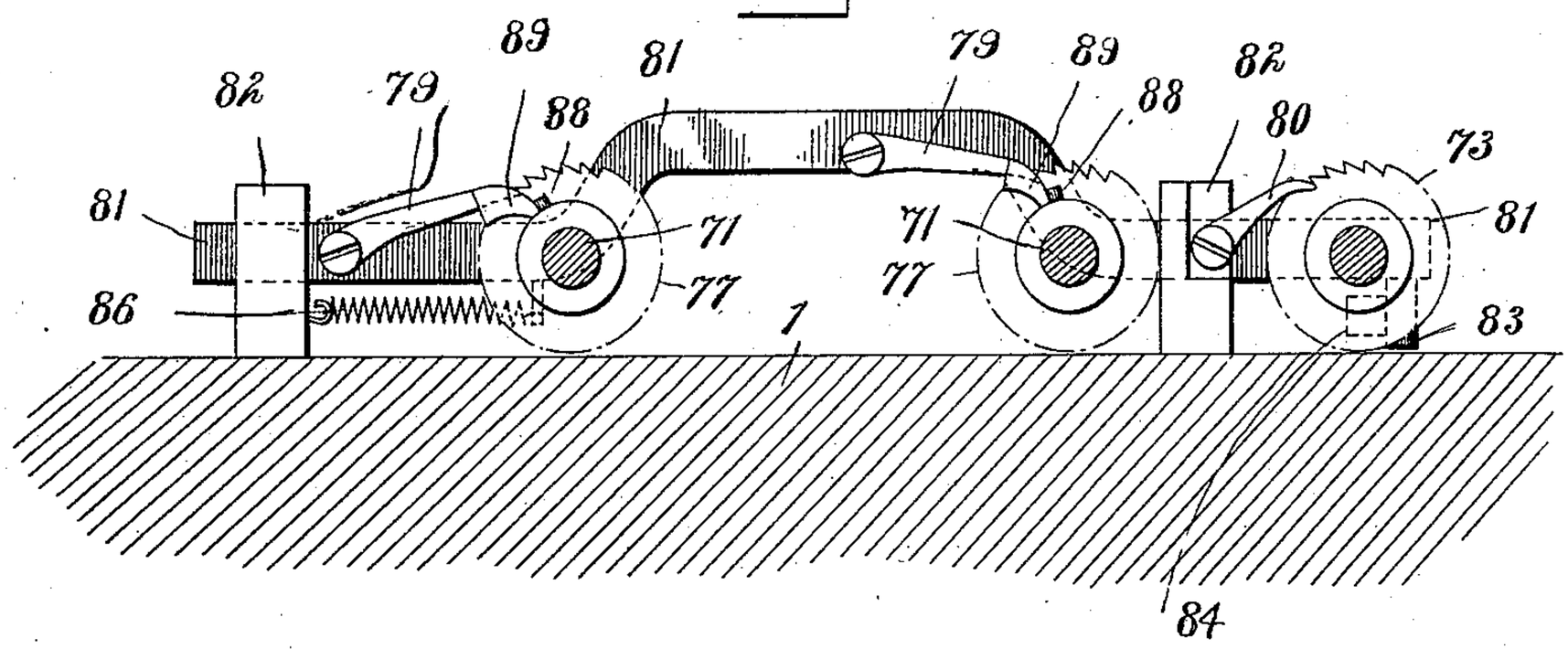

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Fig. 27.

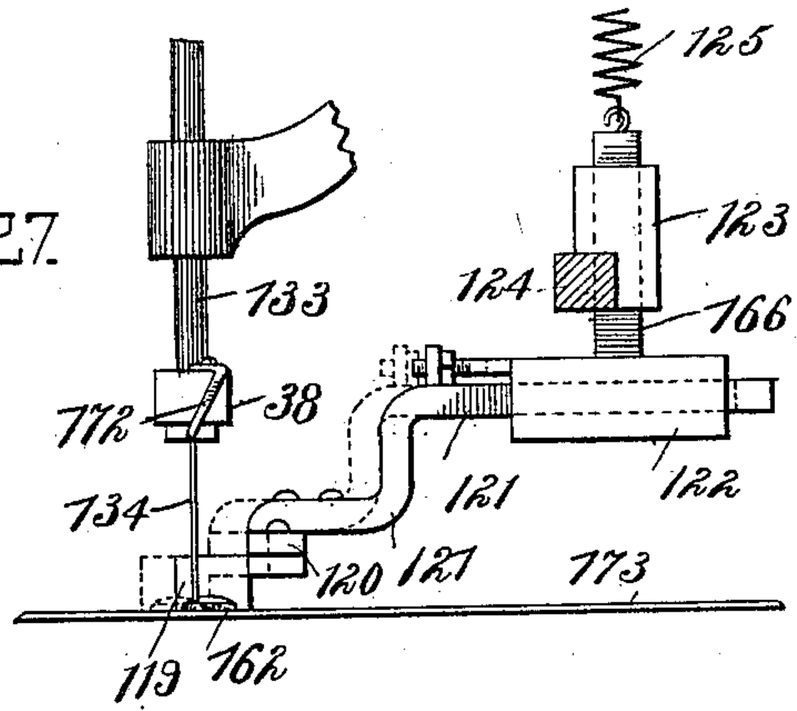


Fig. 29.

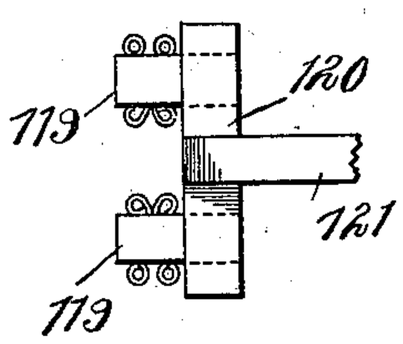


Fig. 28.

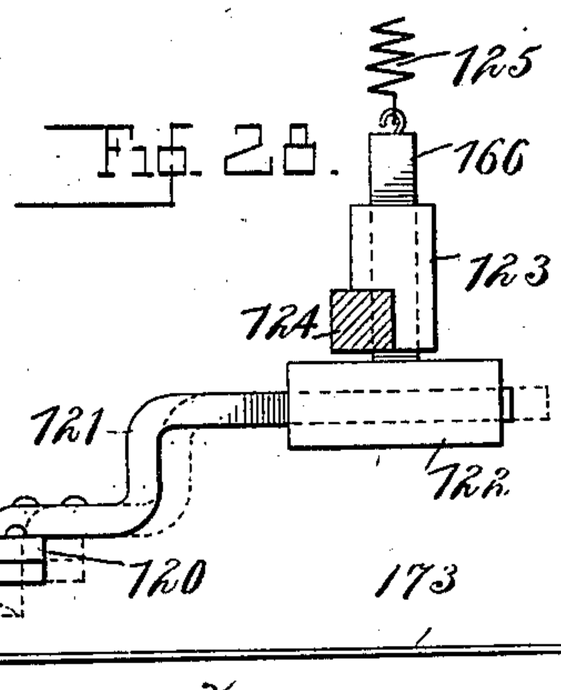


Fig. 30.

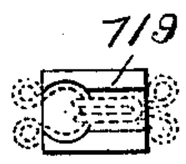
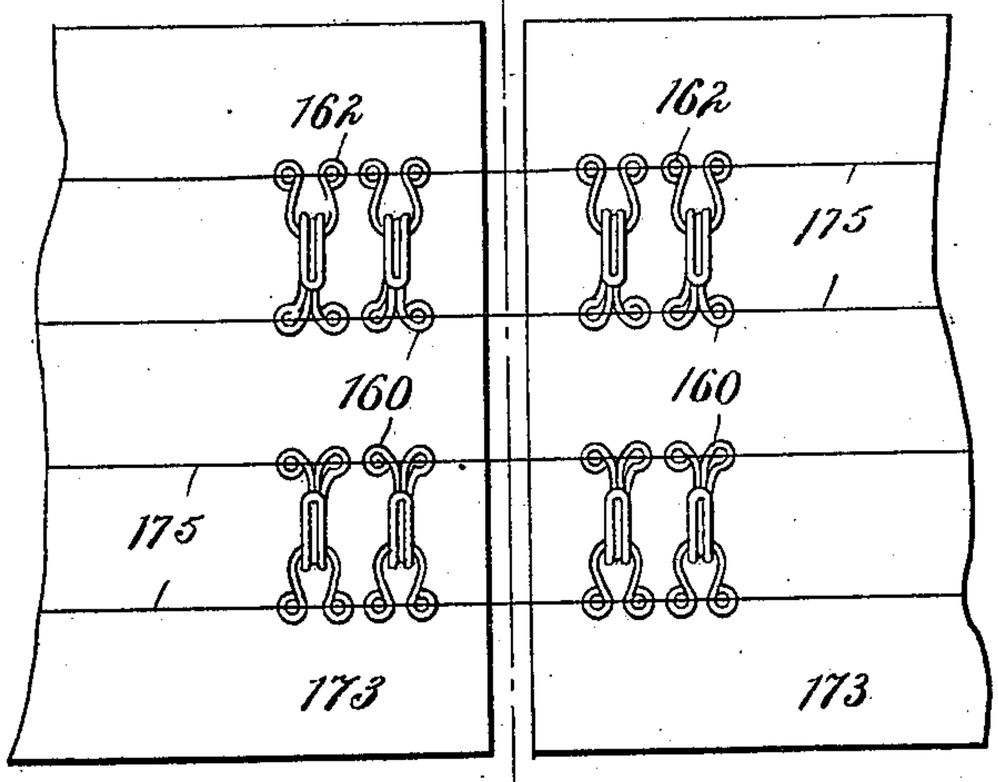


Fig. 31.



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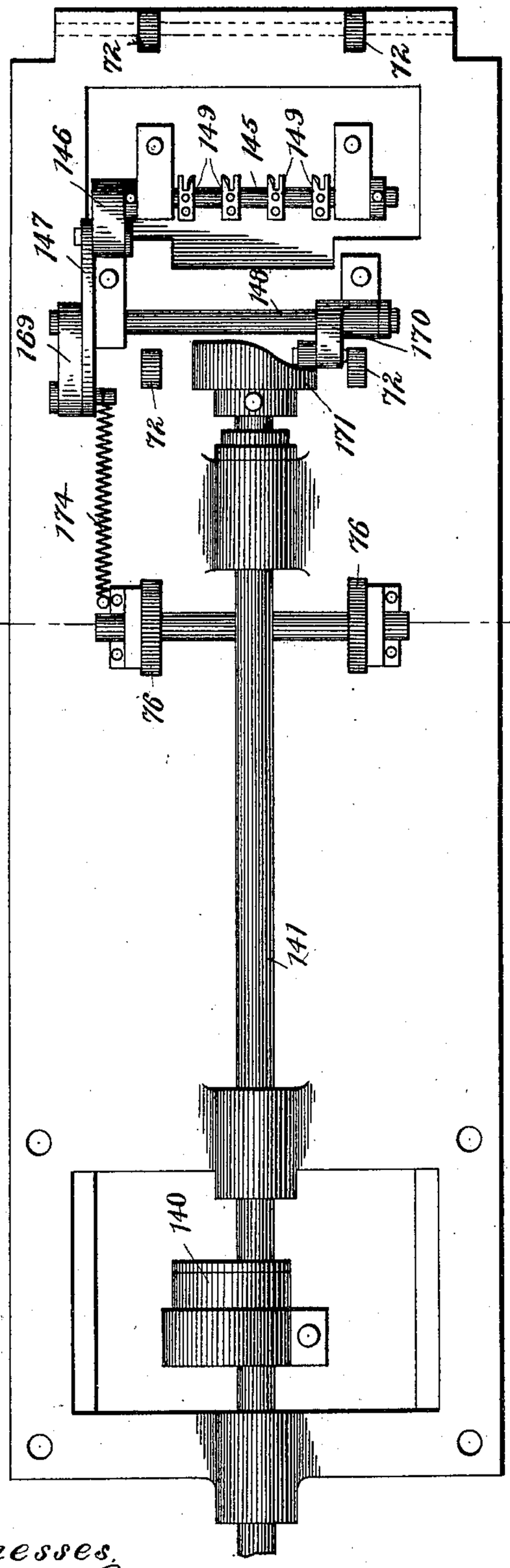


Fig. 32.

Fig. 34.

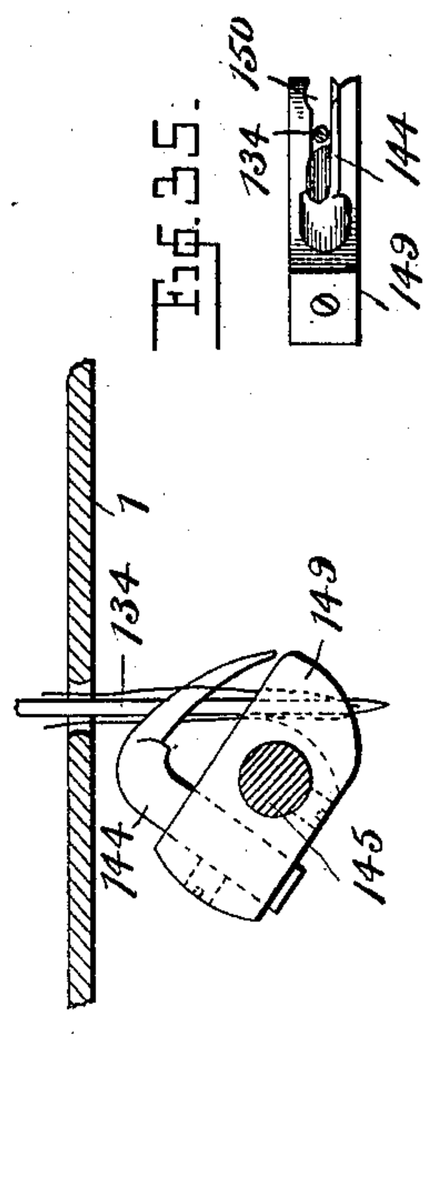
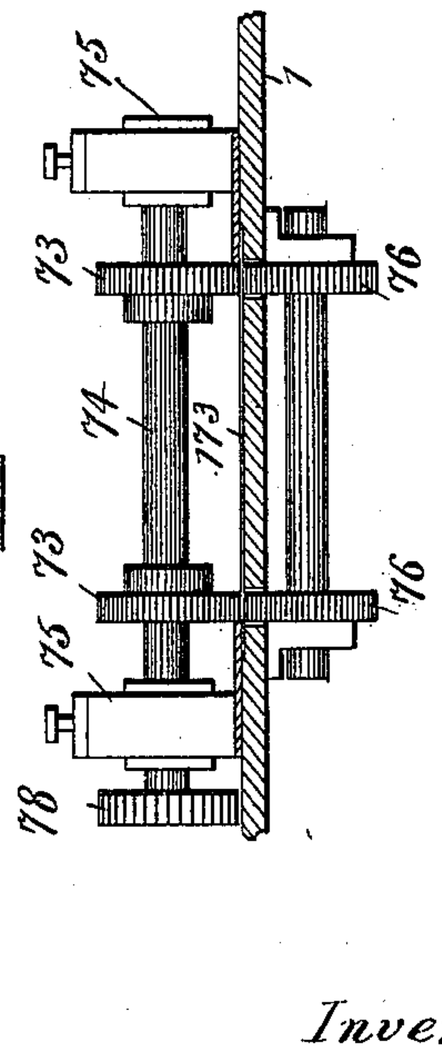


Fig. 33.



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UNITED STATES PATENT OFFICE.

FRANK M. JOHNSON, OF WATERBURY, CONNECTICUT, ASSIGNOR TO THE AMERICAN PIN COMPANY, OF SAME PLACE.

MACHINE FOR SEWING HOOKS AND EYES ON CARDS.

SPECIFICATION forming part of Letters Patent No. 674,268, dated May 14, 1901.

Application filed November 15, 1899. Serial No. 737,101. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. JOHNSON, a citizen of the United States, residing at Waterbury, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Machines for Fastening Hooks and Eyes on Cards, of which the following is a specification.

This invention relates to improvements in machines for fastening hooks and eyes on cards; and its object is to provide a machine which is capable of feeding the hooks and eyes to a card from receptacles containing, respectively, hooks and eyes in bulk, fastening them to the card in proper order and engagement, and feeding the card itself, the operations being all performed in continuous and automatic repetition, so as to reduce to a minimum the amount of hand-labor involved.

Hooks and eyes are generally prepared for the market by securing them, generally by sewing, on a suitable card, with each hook engaged with an eye and the engaged hooks and eyes arranged in rows running longitudinally of the card, each row containing, say, one dozen engaged pairs of hooks and eyes. Machines for sewing hooks and eyes onto the cards in this manner have generally involved the use of a suitable carrier or holder on which the hooks and eyes are secured in engaged pairs by hand, such carriers, together with the card, being then placed in a machine which sews the hooks and eyes to the card. The labor of so securing the hooks and eyes in the carrier is slow, arduous, and expensive, and the main object of my invention is to avoid the expenditure of time and cost therein involved by providing means for feeding the hooks and eyes automatically in proper order and engagement.

Other features of my invention relate to the provision of means whereby a continuous series of cards can be filled with hooks and eyes in succession and to suitable arrangement of the sewing and feeding means with the hook-and-eye feeding and holding means, the sequence of operation being such that, speaking in a general manner, the hooks and eyes are fed to the card and engaged with one another in pairs, and the machine then sews the hooks and eyes to the card and feeds the card into position to receive the next sequential set of hooks and eyes.

In the accompanying drawings, Figure 1 is a front view of a machine embodying my invention. Fig. 2 is a side view of same with parts removed. Fig. 3 is a plan view of the machine with the arm of the sewing-machine and some other parts broken away. Figs. 4 and 5 are detail plan views showing different positions of grippers for placing the hooks and eyes in proper position on the card, and Fig. 6 is a transverse section on the line A A of the supporting-slides for same. Fig. 7 is a side view of the lower ends of the hook-and-eye chutes or races and the gripper mechanism. Figs. 8, 9, and 10 are respectively front and rear views and a horizontal section of the lower portion of the eye-race. Figs. 11 and 12 are details, respectively, of the gripper-jaws for the hooks and those for the eyes. Figs. 13 and 14 are longitudinal sections on the lines B B and C C of Fig. 4. Figs. 15 and 16 are respectively a back view and a longitudinal section of one of the eye-containing receptacles. Fig. 17 is a top view, partly broken away, of the hook-delivery wheel and the upper end of the hook-chute. Figs. 18 and 19 are top and side views of the lower end of the hook-chute. Fig. 20 is a section on line D D of Fig. 18. Fig. 21 is a plan view of the card-feeding and presser-foot mechanisms. Figs. 22, 23, 24, 25, and 26 show details thereof. Figs. 27 and 28 are detail views of the presser-foot mechanisms and adjacent mechanisms, showing different positions thereof. Fig. 29 is a top view of the presser-feet and adjacent portions of the presser-bar, and Fig. 30 is a bottom view of the presser-foot with the hook and eye in position. Fig. 31 shows adjacent portions of two cards with attached hooks and eyes Fig. 32 is an under side view of the sewing mechanism. Fig. 33 is a section on line E E of Fig. 32, and Figs. 34 and 35 are detail views of the hook of the sewing mechanism.

The machine as hereinafter described involves the following essential and principal elements: hoppers respectively adapted to receive hooks and eyes in bulk, hook-feeding mechanism, eye-feeding mechanism, grippers for carrying the hooks and eyes into engage-

ment and into proper position to be secured, presser-foot mechanism for holding the hooks and eyes in position to be sewed, sewing mechanism, and card-feeding mechanism. It being desirable to sew the hooks and eyes to the card in two parallel rows, it will be understood that the mechanism is arranged in duplicate.

Referring to Figs. 1, 2, and 3, the bed of the machine (indicated at 1) supports the arm 2 of the sewing-machine, the standards or brackets 3 3, carrying the hook-feeding means, which are located to the outside on each side of the machine, and the standard 4 for the eye-feeding means, which is located between the two hook-feeding means.

The main driving-shaft 5, carrying the ordinary fast and loose pulleys 6 7 for the reception of the driving-belt, is connected by miter-gears 8 to a shaft 10 and by miter-gears 11 to a shaft 12, these shafts 10 and 12 being parallel and extending from the back to the front of the machine and all of the above-named shafts being journaled in suitable bearings in the machine-frame.

The eye-feeding means comprises a drum or hopper 13, carried by a shaft 14, mounted to rotate in a bearing 15, swiveled at 16 on the top of standard 4, this shaft carrying a pulley 17, connected by a belt 18 with a pulley 19 on the secondary driving-shaft 10. Drum 13 (see Figs. 15 and 16) has a central aperture 20 in the end farthest from its bearing-support to enable the eyes to be introduced into same and apertures 21 in the other end, near the outer edge thereof, through which the eyes are dropped or shaken out slowly and a few at a time in the rotation of the drum, the driving devices 19 18 17 being such that the drum rotates rather slowly, so as to give a tumbling effect. The tilting or swiveled support of the drum enables it to be turned up temporarily for filling or inspection and also causes the belt 18 to be maintained taut. A chute 22 is arranged with its upper end below the delivery end of the drum 13 and inclines downwardly and forwardly, as shown in Fig. 2, the side guards or walls 23 thereof converging toward the bottom and terminating in parallel portions forming a contracted mouth, along the middle of which extends a partition 24, parallel with the said side guards. The eyes falling in the chute 22 slide down same, and as the partition 24 is placed centrally in said chute the eyes are so deflected by the partition 24 that substantially equal numbers thereof pass on opposite sides of the said partition. Leading, respectively, from the two halves of the mouth of the chute are rails 25, which curving around on either side of the needle-bar end of the sewing mechanism lead first forward and downward, then directly downward into close proximity with the table or bed 1 of the machine near the points at which the two rows of eyes are to be applied to the cards. The said rails (see Figs. 7, 8, 9, and 10) are in the form of strips sufficiently thin to enable such of the eyes as fall in proper position on same to straddle the with deflecting wings extending in front and strip and ride down on same. A trough 26, back of the end of chute 22, receives such of the eyes as do not remain on the rail and directs them through chutes 27 to suitable receptacles, such as pails 28, which are placed on suitable supports 29 and may be removed from time to time. Beginning at a point somewhat below the upper end of each rail 25 and on the upper edge thereof is a bead 30, which tapers to a point at its upper end and gradually enlarges below that point, so that along the vertical edge of the rail it is large enough to prevent the eye from slipping off, while, however, permitting free downward movement of the eye at the rail. The eyes are thus caused to pass downward in definite position with regard to the rail, and when they reach the lower end of the rail they are arrested by a leaf-spring 31, whose end bears normally against the tip of the rail, as shown in Fig. 7. The rail-tip and the spring aforesaid are so inclined and formed that when the eye falls down to the bottom of the rail and is caught by the spring—that is, between the spring and the rail-tip—it assumes an inclined position with the loop of the eye presented downwardly at an angle, this effect being due to the spring 31 coming in contact with the sewing-eye ends of the eyes and retarding same, thus tipping the eyes, as stated. The bead 30 is made thin at this part to facilitate such tipping action. The lower end of spring 31 has a central notch 32, so as to leave the loop of the eye fully exposed, as shown in Fig. 9, while engaging with the sides of the eye.

The two hook-feeding means being duplicates of each other symmetrically arranged on opposite sides of the machine, a description of one will suffice for both. Each hook receptacle or hopper 33, Figs. 2 and 3, is a drum similar in all respects to the eye-receiving drum 13, Figs. 15 and 16, above described, and is provided with similar charging and delivery apertures. Said drum 33 is mounted on a shaft 34, swiveled at 35 on standards 3. The hooks being placed in the two side drums or receptacles 33 are gradually fed from the apertures 21 by the rotation of said drums. Such rotation of the respective drums is effected by pulleys 40 on the drum-shafts connected by belts 41 with pulleys 42 on shafts 43 43, which are journaled in the respective standards 3 3 and carry sprockets 44 44, connected by sprocket-chains 45 45 to sprockets 46 46, respectively, on the shafts 10 and 12. Each shaft 43 carries a wheel 47, Figs. 1, 2, 3, and 17, adapted to receive the hooks falling from the drum 33 and deliver them in proper position to the hook-chute 48. The hook-chutes 48 lead tangentially from the upper periphery of the wheels 47 downwardly at an angle and toward one another, so as to deliver the hooks to the card. It is necessary

that each hook should be presented to the chute in a certain definite manner or direction—that is, with its hook side up—the hook being directed along the length of the chute and with the sewing-eyes foremost. The wheels 47 are conical, and each of them (see Fig. 17) has on its smaller end a cap-plate 49 with a conical rim or flange 50, which surrounds the conical face of wheel 47 and is concentric and parallel therewith. A finger 51, projecting from one edge of the chute, enters between this flange and the cone-wheel 47 and extends close to the cap-plate 49. Another finger 52 on the other side of the chute 48 extends circumferentially around the conical wheel-surface and parallel therewith to a point nearly over the axis of the wheel and is there provided with a blade 53, adapted to lie close to and sweep the conical surface of the wheel. A chute 54 with a funnel extending under the delivery end of hook-receptacles 33 extends downwardly with its delivery-mouth adjacent to the wheel 47 directly in front of the blade 53, so that the motion of the wheel 47 in the direction of the arrow, Fig. 17, will tend to carry the hooks toward the said blade, and by means of the sweeping action of the latter, together with the conical shape of the wheel-surface, the hooks will be certain to slide down onto the smaller part of the conical wheel and to pass between the blade 53 and the cap-plate 49. The flange 50 on said cap-plate is so near to the conical wheel-surface that it will strike the upraised tongue portion of each hook, thus limiting the movement of the hook in that direction. The distance between the flange 50 and the wheel being, however, such as to allow the eye of the hook to enter between them, the flange 50 serves as a guide to lead the hooks toward the chute, and the blade or finger 53 is in sufficient proximity to the guide to prevent the hook from passing sidewise—that is, with its length directed transversely to the direction of motion of the wheel. Said blade or finger is also sufficiently close to the wheel 47 to prevent the passage of a hook turned upside down, as the tongue of such hook will then strike the finger in such manner as either to turn the hook over or eject it from the machine. This effect is also aided by the guide or flange 50, which does not permit a hook turned in this manner to enter fairly between the finger and the guide. The end of blade 53 nearer the cup-plate flange is pointed, as shown, and additional pointed blades or fingers 55 56 are arranged in rear of same on the main finger 52, and the blades by engaging with the hook portions or tongues of the hooks will draw the hooks into proper position. In case the hook falls onto the wheel upside down—that is, with the tongue toward the wheel—and does not right itself it will not be able to enter between the blade 53 and the flange 50, as such entrance requires passage of the sewing-eyes of the hook beneath the said flange, which cannot take place when the eye is tipped up, owing to the hook lying on its back. Such wrongly-placed hooks will therefore be carried over the top of the blade and flange by the rotation of the flange, slip over the edge of the rim or flange 50, and will fall into a suitable receptacle, (not shown,) together with any hooks that slip over the front side of the wheel. Such of the hooks as fall right side up against the flange 50 will, if their tongues or hook portions are at their rear ends, pass along beside the flange 50, there being just sufficient room between the flange and the finger or blade 54 to enable the tongues to pass, and the impact of the sewing-eyes of the hook against the finger 53 55, &c., only serving to hold the hook more closely to the rim 50; but if they enter the other way around, as indicated at 160 in Fig. 17, so that the hook portion comes first, the first finger or blade 53 or, if that fails, one of the other fingers 55 56 striking on a sewing-eye of the hook engages the hook, as indicated in dotted lines at 160^a, and turns its tongue between the fingers or blades 53 55 or between the blades 55 56, and it is thrown around by the next finger, as indicated at 160^b, finally coming into correct position, as indicated at 160^c. As the hooks thus brought into proper position along the edge of flange 50 are carried along by said flange they encounter the finger 51, which leads or directs them into the chute 48. Said chute (see Figs. 3, 7, 8, 19, and 20) is constructed with a central longitudinal depressed portion or groove 57, elevated flanges or slide-rails 58 on each side thereof, and guard-rails 177 above each of the slide-rails 58, so that as the hook descends tongue rearmost in the chute its thread-eyes lie on the said slide-rails 58 and below the guard-rails 177, and its hook portion trails behind, dropping, by reason of its weight, in the central groove 57. The hooks descend along the chute by their own weight until they are near the bottom thereof, where they are stopped by the downturned lug 59 (see Fig. 7) on a leaf-spring 60, said lug extending through the slot or space between the guard-rails into the path of the hooks. This spring has sufficient strength to resist the weight of the hooks, but permits the hooks to be snapped or forced beyond same by the positive action of the machine, as hereinafter described. When the lowermost hook is removed, the hooks then remaining in the chute or race 48 will all slip down until the forward hook comes against the spring-lug 59. A special mechanism is, however, provided for preventing such downward movement at times when the hooks should not be delivered, such mechanism comprising a lever-stop 61, pivoted at 62 to the side of the chute-body and having a projection 63, which is adapted to enter between the guard-rails and in the path of the tongues of the hooks, so as to arrest the movement of same. Normally this stop-lever is withdrawn from such engaging position by means of a spring 64, bearing on the tail of said lever, the lever, however, being operated in opposi-

tion to such spring at certain times by mechanism hereinafter described.

Referring now to Figs. 2 and 3, it will be seen that in the center of the machine is arranged a track or way 65 for the cards, a back guide or stop 66 being arranged at the back of this track and guide-plates 67 being arranged at the side thereof, all of the guides being fastened adjustably to the bed-plate by set-screws 68 passing through slots 69 in said plates. The cards are placed in the space so defined and are fed forward by means hereinafter described. A spring-finger 37, supported on a bridge 9, extending across the card-track from one of the guide-plates 67, serves to hold the front end of the card down when thus inserted on the track 65.

The lower ends of the hook-chutes approach close to the table or bed 1, directly behind the eye-delivering rails, (see Fig. 7,) so that the hooks as they are held in the lower end of the chute are directed with their tongues presented toward the loop of the eyes as held on the lower end of the eye race or rail, the said chutes and rails being so disposed that the lower ends of the eye-chutes are directly adjacent to the respective sides of the cards, while the lower ends of the hook-chutes are somewhat farther away from the center of the machine.

The means (see Figs. 2, 3, and 21 to 26) for feeding the cards between the lower ends of the respective pairs of hook and eye feeding devices comprises two sets of rolls 70, with knurled peripheries, Fig. 23, adapted to engage the upper faces of the card near the outer edges thereof, said rolls being mounted on shafts 71, journaled in bearings 75. Corresponding rolls 72 are provided in the table 1, directly below the rolls 70, so as to press the card into engagement with the rolls 70. An additional set of rolls 73 is mounted on a shaft 74 behind the rolls 70, said shaft being journaled in bearings 75. Rolls 76 are also provided in the table 1 below the rolls 73 for pressing the card into engagement therewith. The faces of rolls 73, Fig. 22, are knurled for only a portion of their periphery, the remainder of the roll-faces being of smaller diameter, so as not to touch the card in the rotation of the roll. When the card is placed in the card-receiving space or way 65 against the back-stop 66, its front end comes into position to be engaged by the knurled larger portions of rolls 73. The rolls 70 73 are operated step by step by a ratchet mechanism, Figs. 21 and 26, consisting of ratchet-wheels 77 on the shafts 71 and ratchet-wheels 78 on shaft 74. Said ratchet-wheels are engaged by pawls 79 79 80 on a reciprocating bar 81, sliding in bearings 82 on the table and engaging by a pin 83 with one end of a lever 84, pivoted to the table, and engaged at its other end by two cam projections 36 on a cam-disk 85 on the operating-shaft 10. A spring 86 is connected to this sliding bar to hold the lever 84 toward the cam 85, the movement of the bar under the influence of this spring being, however, limited by an adjustable screw-pin 87, acting as a stop. Each rotation of the cam 85 will cause two reciprocations of the bar 81, with a consequent advance of each of the ratchet-wheels the space of two teeth. The parts are so adjusted that the movement thus imparted to the card by the rolls 70 will correspond to the distance between the successive sewing-eyes of the hooks and eyes as placed upon the card. The roll 73 is intended only to pick up the card and feed it into the bight of the first set of rolls 70 72, whereupon the smaller-diameter portions of said rolls 73 come next the rolls 76 and release the card, which is then fed forward by the rolls 70 72 alone. On each of the shafts 71 of rolls 70 is a pin 88, which once in a revolution of the rolls comes into engaging relation with a projection 89 on the corresponding pawl 79. This pin is so much nearer the axis of the roll than are the ratchet-teeth that the movement thus imparted to the rolls and through them to the card is greater by any desired amount than the regular ratchet feed, thus giving an extra length of feed when the end of a card is reached, so as to enable the next sewing action to take place on the next card. In order to give a certain amount of elasticity to the support of the rolls 70 73, their bearings 75 are in the form of boxes, Fig. 24, sliding vertically in slots in guide-supports 90, and a spring 91 is interposed between the top of the box and a pressure-screw 92, by the adjustment of which the pressure of the rolls on the card can be fixed at any desired amount, while the spring allows for lack of uniformity in the card.

Gripper mechanism is provided on each side of the machine for taking the hooks from the respective hook-chutes and carrying them into engagement with the eyes and then carrying them to proper position over the card, the hooks and eyes being held in such position by presser-foot mechanism during the securing operation.

The gripper mechanism is shown in the general plan view, Fig. 3, and more in detail in Figs. 4 to 8 and 11 to 14 and comprises a slide-plate 93, traveling in a groove or track 94, formed in the bed-plate 1, in the direction of a line joining the lower ends of the hook-chutes and the eye-rails, a slide-plate 95, traveling in a groove 96, extending along the top of slide-plate 93 and in the aforesaid direction, gripper-levers 97 98, pivoted on the respective sides of slide-plate 93, gripper-levers 99 100, pivoted to the upper slide-plate 95, and cams adapted to operate said grippers and their carrying-plates, all of said cams being mounted on and adapted to rotate with the operating-shaft 10 for the grippers on one side of the machine or the shaft 12 for the grippers on the other side. The lower slide 93 is operated by a cam 101, whose cam-groove 102 (see Fig. 13) engages a pin or roll 103 on a stud 104, projecting from said slide.

This slide is thus positively operated in both directions. The upper slide 95 is operated in one direction by a cam 105, engaging by its periphery with a stud 106 on said slide, and in the other direction by springs 107 between said slide and the end of the slot or track 94. Fixed pins 108 are provided to hold said springs in place, which pins slide freely in suitable channels in the upper slide-plate. The gripper-levers 97 98 are provided with jaws 157, Fig. 11, adapted to engage the sewing-eyes of the hook, and the gripper-levers 99 100 are provided with jaws 158, Fig. 12, adapted to engage with the sewing-eyes of the eye. The respective tracks 94 96 for the slide-plates 93 95 are shown as undercut to hold the plates in place. A loop-spring 109 is connected to the outer ends of levers 97 98, so as to press their inner or gripper ends toward one another and their outer ends against the lateral faces of cams 111 112, and a loop-spring 110 performs a similar function for levers 99 100. The gripper-levers 97 98 are moved in opposition to said spring 109, so as to move the grippers apart by the side cams 111 112, and a side cam 113 operates to move lever 100, so as to separate its gripper-jaw from that of lever 99. The construction of the cams is such that during each rotation of shaft 10 the slides will be reciprocated once and each set of grippers will be opened and closed once, the grippers 99 100 being held closed at first while the grippers 97 98 are brought toward one another and then both the slides being moved toward the center of the machine, the under slide moving more rapidly, so that the gripper-jaws 97 98 overtake and pass the gripper-jaws 99 100, and all the gripper-jaws then opening simultaneously, after which the slides recede to their original positions, the gripper-lever 100 being closed again during this return movement. On the upper slide-plate 95 is fixed a standard 114, carrying a pawl 115, (see Figs. 18 and 19,) which engages with a ratchet-wheel 165, mounted to turn on a pivot-stud 116, fixed on the side of the hook-chute 48, rotating said wheel step by step one tooth at each operation of the gripper mechanism. A pressure-spring 117 prevents the ratchet-wheel from being dragged back in the return movement of the pawl. Rigidly connected to ratchet 165 is a collar carrying a cam projection 118, engaging with a tail of lever 61, which dogs the passage of the hooks down the chute and by such engagement bringing the lever into dogging position. Thus once in each revolution of the ratchet-wheel 165, at times corresponding to the passage of the sewing apparatus from one card to another, the hooks are held from passing to the extreme bottom of the chute. In order to insure that this operation shall occur periodically at the proper times, it is necessary that the means for controlling the dogging-lever should be in mechanical connection with the card-feeding means. As herein shown, I obtain this result by actuating both this controlling means and the card-feeding means from the same shaft—*i. e.*, the shaft that operates both the gripper mechanism and the feeding mechanism.

The presser-foot mechanism, Figs. 21, 25, and 27 to 30, has the two presser-feet 119 119, each of which is shaped or cut out on its under side to conform to a single hook and eye pair when hooked together, as indicated in Fig. 30. Said presser-feet are carried by a cross-arm 120 at the foot of the presser-bar 121, which extends upwardly and then horizontally. Its horizontal shank slides in a corresponding guide-box 122, which has a vertical stem 166, sliding in a guide 123, fixed on a standard 124, extending up from the table 1. A spring 125, fastened to said vertical stem and to the arm 2 (see Fig. 2) of the sewing mechanism, tends to raise the presser-bar from the table. The downward movement of the presser-bar, as well as its to-and-fro horizontal movement, is effected by a lever 126, which is mounted in a gimbal-bearing 127 on the bed-plate and engages at one end by a pin-and-slot connection 128 with a lug on presser-bar 121, (see Figs. 21 and 25,) so that movement of the lever either horizontally or vertically is transmitted to the presser-bar. The other end of lever 126 carries a stud 129, engaging both with a side cam 130 on shaft 10 and with a peripheral cam 131, formed integrally with said side cam. Thus as the shaft 10 rotates it will cause operation of the lever 126 in two transverse directions and through the said lever will cause the presser-bar to descend, then move it longitudinally of the machine in the direction of the card-feed, then allow it to rise under the influence of the spring 125, and then allow it to move back horizontally to its original position under the influence of a spring 132, this operation being repeated once for each rotation of shaft 10 or 12. A screw-stop 176 on the presser-bar engaging with the end of guide-box 122 limits the back movement of the lever 126 and the presser-bar under the influence of spring 132.

The sewing mechanism, Figs. 2, 3, and 32 to 35, comprises the supporting-arm 2, above referred to, extending upwardly and forwardly from the bed-plate, the needle-bar 133, mounted to slide vertically on said arm and carrying on a cross-bar 38 at its lower end four needles 134 and connected by link 136 and crank 135 to rock-shaft 137 in the upper part of the arm, which shaft is connected by crank 138 and link 139 to an eccentric 140, Fig. 32, on a rotating shaft 141, located below the bed-plate and connected by sprockets 142 168 and chain 143 to the operating-shaft 10. Directly below the needles 134 are provided four oscillating hooks 144, mounted on a rock-shaft 145, connected by crank 146 and link 147 to a crank 169 on a rock-shaft 148, which carries a crank 170, engaging with a side cam 171 on the end of the shaft 141 aforesaid. A spring 174 serves to press the crank-arm

170 against said side cam. The hooks 144 may be of any usual construction. As shown, they are carried by blocks 149, fixed on said rock-shaft 145 and provided with notches or grooves 150, adapted to receive the needle. As each needle descends it passes close to one side of a hook 144 and into the groove 150, and the thread is caught by the hook and held until the next downward movement of the needle, which movement frees the loop from the hook, this operation forming a chain-stitch in a well-known and obvious manner.

Thread-spools 151, Fig. 2, tension devices 152, and thread-guides 153 154 155 are provided, as shown, the threads finally passing through holes 156 in the needle-supporting cross-arm 38 on the needle-bar to the eyes of the needles. Light leaf-springs 172, Fig. 1, are provided at each end of cross-bar 38 of the needle-bar, and in the downward movement of the needle-bar these springs wipe the eyes on the eye-race, so as to prevent same from getting clogged and to insure their descent in close order.

The operation of the machine is as follows: A quantity—say a few handfuls—of hooks being placed in each of the hook-receptacles 33 and an equivalent quantity of eyes in the eye-receptacle 13 and the sewing mechanism being properly threaded, the machine is started in operation by throwing on the power through fast pulley 6. The resulting slow rotation of drums 33 13 will cause the hooks and eyes to be shaken or dropped out in gradual succession, some of the eyes running onto the eye rails or races 25 30, as hereinbefore described, and accumulating at the bottom of said rails, as indicated in Fig. 7, but being held from actually leaving the rail by means of the spring 31. At the same time the hooks, except such as fall off the rims of wheels 47, are carried by the said wheels into the hook chutes or races 48, with their hook ends trailing backwardly, and they descend the hook-races in this manner, the said hook ends lying in the grooves of said races, so as to keep the hooks properly directed. The first hook to reach the bottom of the chute or race will slide onto the table, or more properly onto the adjustable guide-plate 67, Fig. 4, at the side of the card-space and will be stopped there by its tongue striking the lug 59 of spring 60. The next hook will then be stopped in the chute by falling against the first hook, and so on, the hooks thus accumulating in the chute in close order, but prevented from jamming one under the other, because the slanting position taken by the hook brings the sewing-eye end of one hook against the rounded outside of the hook end of the hook below. It is to be understood that at the beginning of the operation the dog 61 is lifted away from the hooks. Thus there is presented at each side of the card-track 65 an eye, which is held with its loop directed downwardly and toward the card-track, and back of each said eye a hook with its tongue extending horizontally toward and in line with the eye-loop, as indicated in Figs. 7 and 4. Assuming that the operator has meanwhile fed a card (indicated at 173, Fig. 4) to the machine, so that the card has been picked up by the rolls 73 76 and forwarded to rolls 70 72 by the operation of the feed mechanism, the operation of affixing the eyes goes on as follows: Each rotation of the shafts 10 and 12 causes a single to-and-fro movement of the gripper mechanism. The grippers start from the position shown in Fig. 4 with their jaws 97 98 on each side of the sewing-eye portion of the hook (indicated at 160 in Fig. 4) and close to such eye portions, but not touching same. The first effect of the cam mechanism is to cause jaws 97 98 to close on the eyes of the hook, the jaws 157 thereof conforming to such eyes so as to securely grip the hook. The slide-plate 93, carrying said grippers, is then quickly thrown forward by the cam mechanism, so as to carry the tongue of the hook through the loop of the eye (indicated at 162, as shown in Fig. 5) and tear the eye from the spring-holder 31 at the lower end of the eye-race, the hook passing through the notch 32 in said spring. The jaws 158 of the gripper-levers 99 100 are also moved forward, but at a slower rate, so that the eye which starts somewhat in their rear is carried forward by the hook and drawn into the rear end of said jaws 158, which are flared and provided with a deflecting-shield 159, Fig. 7, to insure the drawing of the sewing-eyes of the eye into engagement with said jaws. The eye-jaws 158 then close, and the continuation of the movement of the hook draws the eye toward the forward end of said jaws. Finally the eye is drawn up against the lips 162 at the extreme ends of jaws 158, as shown in Figs. 5 and 12, and by that time the hook and eye have been advanced over the card to the proper position for sewing. The grippers are then quickly opened by the cam mechanism and the presser-foot brought down by cam 130, and by reason of the conformity of its lower face to the hook and eye it holds them firmly in position with the sewing-eyes of the hook projecting out on one side of the presser-foot and those of the eye on the other side of said foot, as shown in Fig. 29. The needles now come down and carry the threads through one eye of each hook and of each eye, the loop of the thread being caught by the sewing-hook 144 below the card and the needle rising again. The feed mechanism now comes into operation, one of the cam projections 36 striking the lever 84 and moving all the pawls 79 79 80, so as to turn the knurled feed-rolls one step. The card is thus carried forward a distance sufficient to bring the other sewing-eyes of the hook and eye under the needles, and at the same time the side cam 130 moves the presser-foot by means of the lever 126, so as to cause it to advance with the card. The ratio of chain-gearing between the grip-

per-operating shafts 10 and the sewing-mechanism-operating shaft is as two to one, so that the needle makes two strokes to each action of the grippers. The feed mechanism, however, operates once for every needle-stroke, as there are two cam projections 36. The second eye of each hook and eye having been brought under the needle, the latter descends again, carrying the loop end of the thread through such eye and through the loop held by the sewing-hook beneath the card, the said hook then dropping said loop. The cam 131 then allows the presser-foot to rise under the influence of its spring 125, and the presser-foot bar is then carried back to its original position by the spring 132, this four-motion action of the presser-foot being indicated in Figs. 27 and 28. The movement is from the full-line to the dotted-line positions of Fig. 27 and then successively to the full-line and dotted-line positions of Fig. 28. This completes a cycle of operations. The feed mechanism then acts again to advance the card another space, and the gripper mechanism brings another set of hooks and eyes into position, the operation being repeated intermittently until the end of the card is approached. When this occurs, it is necessary, first, to allow the needle to make a stroke without any hook or eye being supplied, so as to give a terminal stitch to hold the last hook and eye in place. At this time, therefore, the dog-lever 61 is operated by the cam projection 118 and the hooks are prevented from descending into the path of the grippers and a blank stitch is formed. Then the feed mechanism gives an extra feed by means of projections 89 on pawls 79 and pins 88 and carries a card out of the path of the needle, at the same time bringing another card into position, the operator having previously put such card into the card-receiving space 65 and it having been picked up by rolls 73 76. The second card receives a single set of blank stitches, and the regular operation of feeding and of hook and eye delivering and sewing same on the card goes on as before, and so on indefinitely.

The operation as above described results in sewing the hooks and eyes to a series of cards in succession, the consecutive cards being connected by the sewing-thread, which in one stitch spans the space between them. After the cards are passed out of the machine they may be separated by cutting these connecting-stitches, as upon the line indicated at x x in Fig. 31, leaving the two rows of hooks and eyes secured to the card by four rows of stitches 175.

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

1. A machine for fastening hooks and eyes on cards, comprising card-feeding means, hook-feeding means, eye-feeding means, mechanism adapted to receive the hooks and eyes from their feeding means and cause engagement of the hook and eye, and fastening means for fastening the engaged hooks and eyes on the card

2. A machine for fastening hooks and eyes on cards, comprising card-feeding means, a hook-hopper, an eye-hopper, said hoppers adapted to hold hooks and eyes in bulk, means for feeding the hooks and eyes from said hoppers, mechanism adapted to successively engage the hooks with the eyes, and place them in pairs in position to be fastened to the card, and fastening means for fastening the hooks and eyes on the card.

3. A machine for fastening hooks and eyes on cards, comprising card-feeding means, hook-feeding means, eye-feeding means, means for carrying the hook from the hook-feeding means into engagement with the eye, and placing the hook and eye so engaged in position for fastening on the card, and means for fastening the hook and eye, so placed, on the card.

4. A machine for fastening hooks and eyes on cards, comprising card-feeding means, hook-feeding means, eye-feeding means, gripper mechanism and operating means therefor, adapted to take the hooks from the hook-feeding mechanism and convey them into engagement with the eyes, and to place the hook and eye, so engaged, in position for fastening on the card, and means for fastening the hooks and eyes, so placed, on the card.

5. A machine for fastening hooks and eyes on cards, comprising card-feeding means, hook-feeding means, eye-feeding means, gripper mechanism adapted to engage and deliver the hook from the hook-feeding means and carry it into engagement with the eye held by the eye-feeding means, gripper mechanism adapted to receive the eye from the eye-feeding means when so delivered, and fastening means for fastening the engaged hook and eye on the card.

6. In a machine for fastening hooks and eyes on cards, the combination with the hook-receptacle and the hook-chute, of a rotating part adapted to receive the hooks from the hook-receptacle and deliver them to the hook-chute, a guiding-flange adapted to guide the hook toward the chute, and a deflecting-finger arranged sufficiently close to the guiding-flange to prevent the passage of the hook when turned sidewise, substantially as and for the purpose set forth.

7. In a machine for fastening hooks and eyes on cards, the combination with the hook-receptacle and the hook-chute, of a rotating part adapted to receive the hooks from the hook-receptacle and deliver them to the hook-chute, a guiding-flange adapted to guide the hook toward the chute, and a deflecting-finger arranged sufficiently close to the guiding-flange to prevent the passage of the hook when turned sidewise and sufficiently close to the rotating part to prevent passage of the hook when upside down.

8. In a machine for fastening hooks and

eyes on cards, the combination with the hook-receptacle, of a rotating conical part adapted to receive the hooks from the said receptacle, and provided with a flange at its smaller end, a hook-chute leading tangentially from said rotating conical part at a point adjacent to said flange, and means for guiding the hooks from said conical part into said chute.

9. In a machine for fastening hooks and eyes on cards, the combination with the hook-receptacle, and the hook-chute, of a rotating part adapted to receive the hooks from the hook-receptacle and deliver them to the hook-chute, and a deflecting means located adjacent to said rotating part and adapted to deflect the hooks into definite direction relatively to said chute, with the tongue of the hook directed forward, said rotating part and deflecting means having parts located in sufficient proximity to prevent the passage of the hook when it is turned sidewise to the direction of movement.

10. In a machine for fastening hooks and eyes on cards, the combination with the hook-receptacle, and the hook-chute, of a rotating part adapted to receive the hooks from the hook-receptacle, and deliver them to the hook-chute, a guide device adapted to guide the hooks toward the chute, and a plurality of deflecting-fingers in sufficient proximity to said rotating part and to said guide, to engage with the hook, and adapted to deflect it to a definite direction relatively to said chute, with its tongue directed forwardly.

11. In a machine for fastening hooks and eyes on cards, the combination with the rotating hook-receptacle, and means for rotating the said receptacle, of a conical feed or transfer wheel located below said receptacle, and having a flange with a space between the flange and the wheel sufficient to be entered by the sewing-eyes of the hook, a hook-chute leading tangentially from said feed or transfer wheel, and means located adjacent to the feed or transfer wheel adapted to guide the hooks into the chute and comprising a finger located sufficiently close to the aforesaid flange and wheel to engage with the tongue of the hook when the hook lies crosswise to the flange, substantially as and for the purpose set forth.

12. In a machine for fastening hooks and eyes on cards, the combination with the hook-receptacle, having charging and delivery apertures, and means for rotating said receptacle, of a feed-wheel located below said receptacle, and having a conical surface adapted to cause the hooks to be delivered at the smaller-diameter part of the conical surface, a chute leading from such part of the conical surface, and means for guiding the hooks from said feed-wheel into said chute.

13. In a machine for fastening hooks and eyes on cards, the combination with the hook-receptacle, of a feed-wheel adapted to receive the hooks therefrom, a chute adapted to receive the hooks from the feed-wheel, and a blade located in proximity to the surface of the feed-wheel and adapted to sweep the hooks to proper position on said wheel to enter the chute.

14. In a machine for fastening hooks and eyes on cards, the combination with the hook-feeding means, of gripper mechanism comprising grippers adapted to engage the hook, mechanism adapted to open and close said grippers relatively to the hook, and mechanism adapted to move the gripper mechanism to carry the hook from the hook-feeding means.

15. In a machine for fastening hooks and eyes on cards, the combination with the hook-chute, a hook-support at the lower end of said chute, a spring located at the lower end of said chute and adapted to retain the hook when delivered to said support from said chute, grippers adapted to engage the hook when so held by the spring, and means for operating the grippers to deliver the hook from the retaining-spring.

16. In a machine for fastening hooks and eyes on cards, the combination with the hook-feeding means, of gripper mechanism comprising grippers adapted to engage the hook, cam mechanism adapted to open and close said grippers relatively to the hook, and cam mechanism adapted to move the gripper mechanism to carry the hook from the hook-feeding means.

17. In a machine for fastening hooks and eyes on cards, the combination with means for engaging said hooks and eyes and delivering them successively in pairs to the cards, means for fastening said hooks and eyes successively to the cards, and means for periodically interrupting the effective operation of said delivery means for the purpose of progressing the cards while the fastening means remain inoperative.

18. In a machine for fastening hooks and eyes on cards, the combination with the card-feeding means, of a hook-feeding chute, means for delivering hooks successively from said chute to the card, means for fastening the hooks to the card, dogging means for detaining the hooks in the chute, and controlling means mechanically connected with the hook-delivery means and adapted to control said dogging means, substantially as and for the purpose set forth.

19. In a machine for fastening hooks and eyes on cards, the combination with the card-feeding means, of a hook-feeding chute, means for delivering hooks successively from said chute to the card, means for fastening the hooks to the cards, dogging means for detaining the hooks in the chute, operating means for the card-feeding means, and controlling means for said dogging means, operatively connected with the said operating

means for the card-feeding means, substantially as and for the purpose set forth.

20. In a machine for fastening hooks and eyes on cards, the combination with an intermittently-operated card-feeding means, operating means for said card-feeding means, a hook-chute and hook-delivering means, dogging means for retaining the hooks in the hook-chute, a ratchet device operatively connected to the operating means for the card-feeding means and adapted to operate the dogging means after a predetermined number of operations of the card-feeding means, and said ratchet mechanism operatively connected with the card-feeding means.

21. In a machine for fastening hooks and eyes on cards, the combination with an intermittently-operated card-feeding means, and means for successively fastening the hooks and eyes on the card, of a hook-chute and hook-delivering means, dogging means for retaining the hooks in the hook-chute, and ratchet mechanism in mechanical connection with the hook-delivering means and adapted to operate the dogging means after a predetermined number of operations of the hook-delivering means.

22. In a machine for fastening hooks and eyes on cards, the combination with an intermittently-operating card-feeding means, operating means for said card-feeding means, a hook-chute, dogging means for retaining the hooks in the hook-chute, ratchet mechanism operatively connected with the operating means for the card-feeding means, said ratchet mechanism being adapted to operate the dogging means after a predetermined number of operations of the feeding means, and a yielding hook-retaining device at the lower end of said chute for detaining the hooks as they reach the lower end of the chute.

23. In a machine for fastening hooks and eyes on cards, the combination with the eye-receptacle and the fastening mechanism, of a chute adapted to receive the eyes from the eye-receptacle and a rail leading from said chute and adapted to be straddled by the eyes, and to deliver the eyes to the fastening mechanism.

24. In a machine for fastening hooks and eyes on cards, the combination with the eye-receptacle and the fastening mechanism, of a chute adapted to receive the eyes from the eye-receptacle, and a rail leading from said chute and adapted to be straddled by the eyes, and to deliver the eyes to the fastening mechanism, said rail having a bead on its eye-receiving edge adapted to hold the eye on the rail.

25. In a machine for fastening hooks and eyes on cards, the combination of an eye-receptacle, an eye-feed rail, an eye-retaining spring at the lower end of said rail and means for successively taking the eyes therefrom.

26. In a machine for fastening hooks and eyes on cards, the combination of an eye-feed rail and wiping devices adapted to engage with the eyes on the feed-rail for freeing the feeding motion of the eyes on the rail and means for operating said wiping devices.

27. In a machine for fastening hooks and eyes on cards, the combination with sewing mechanism comprising a needle-bar, of an eye-feed rail, and wiping devices operatively connected to and actuated by said needle-bar and adapted to engage the eyes on the feed-rail and free the feeding motion of the eyes on the rail.

28. In a machine for fastening hooks and eyes on cards, the combination with means for successively engaging and delivering the hooks and eyes in pairs to the presser-foot, and then releasing them, the presser-foot adapted to engage the engaged hook and eye before their release from the delivering means, and to retain the engaged hook and eye in delivered position after such release and means for operating the presser-foot alternately with the engaging and delivery means, and means for fastening the hooks and eyes while so held.

29. In a machine for fastening hooks and eyes on cards, the combination with means for engaging and delivering the hooks and eyes to the presser-foot, card-feeding means, a presser-foot adapted to retain the engaged hook and eye in delivered position, and said presser-foot operatively connected with means operating in conjunction with the card-feeding means to simultaneously progress said hook and eye and card and alternate in operation with said delivery means.

30. In a machine for fastening hooks and eyes on cards, the combination of hook and eye engaging and feeding means, card-feeding means, of a presser-foot having vertical and horizontal movements so as to follow the movement of the card while fastening the hook and eye, and means for operating the presser-foot comprising two cams, and a lever capable of movement in two transverse directions.

31. In a machine for fastening hooks and eyes on cards, the combination with the card-feeding means, of hook and eye delivery means, a presser-foot adapted to engage the delivered hook and eye and hold same on the card, sewing mechanism for stitching the sewing-eyes of the hooks and eyes to the card when so held, and operating mechanism for the presser-foot, adapted to press same toward the card, to move same with the card during the feeding movement from eye to eye of the same hook and eye, and to lift the presser-foot from the hook and eye and move the said foot backwardly during the feeding movement of the card from one hook and eye to the next hook and eye.

32. In a machine for fastening hooks and eyes on cards, the combination with the intermittently-operating card-feeding means, of

a presser-foot, supported so as to be capable of moving vertically and horizontally, and operating mechanism therefor, comprising a lever supported so as to be capable of movement in two transverse directions, and connected with the presser-foot and two cams operating on said lever in two different directions and adapted to produce vertical and horizontal movement of the presser-foot.

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