

No. 733,267.

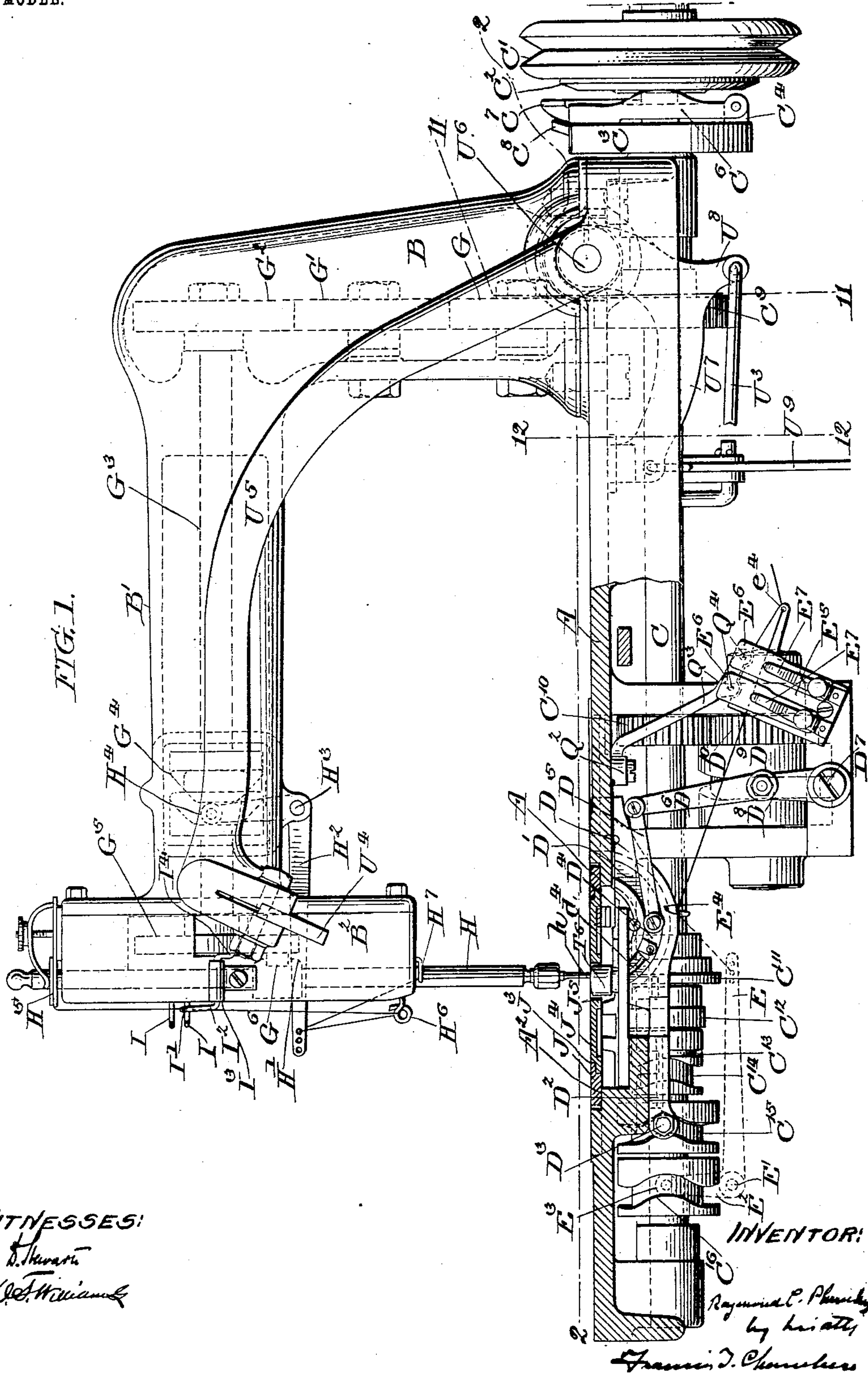
PATENTED JULY 7, 1903.

R. L. PLUMLEY.
BUTTONHOLE SEWING MACHINE.

APPLICATION FILED FEB. 24, 1902.

NO MODEL.

8 SHEETS—SHEET 1.



WITNESSES:

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H. F. Williams

INVENTOR:

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in D. Chambers

No. 733,267.

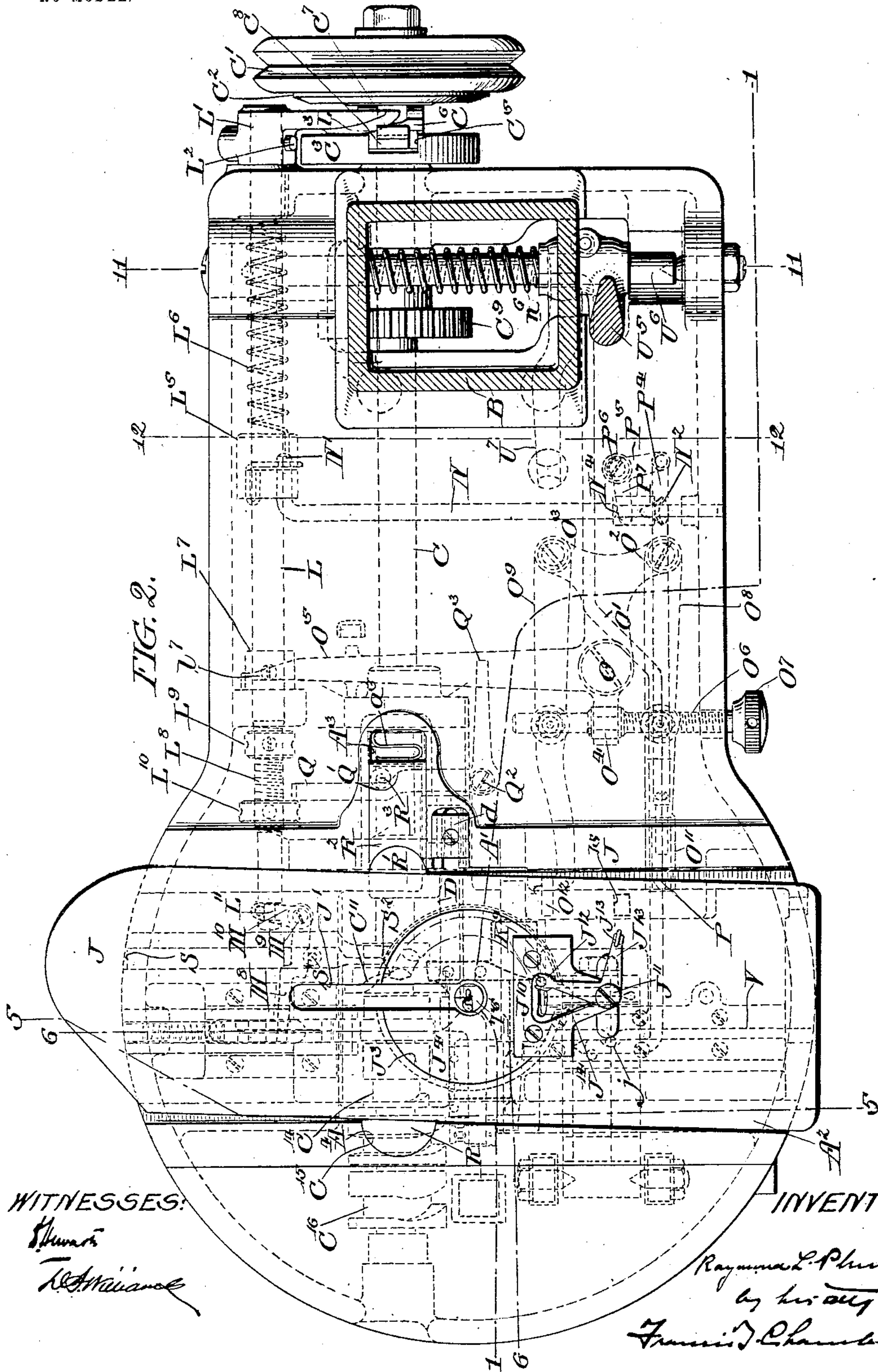
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8 SHEETS—SHEET 2.



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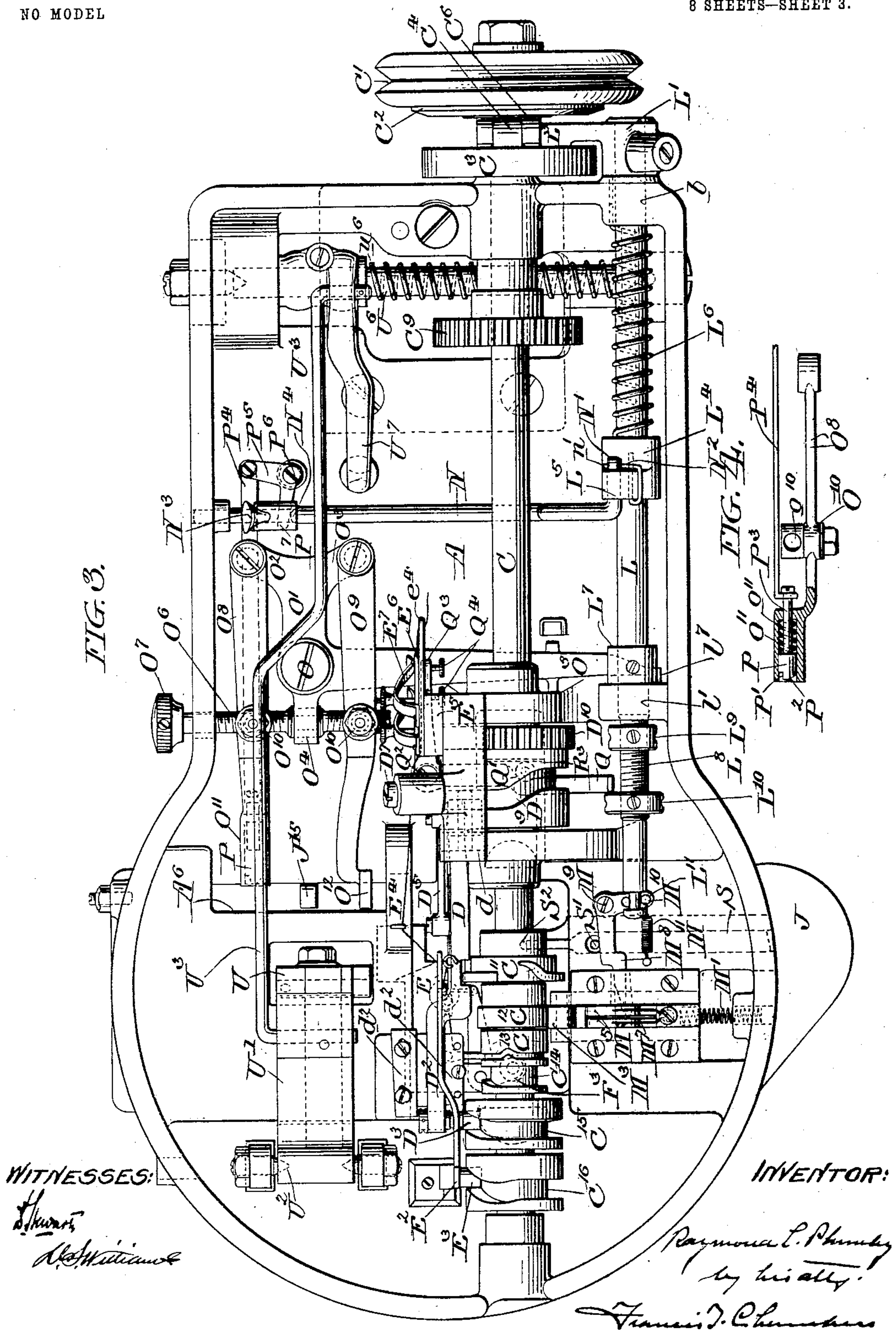
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8 SHEETS—SHEET 4.

FIG. 5.

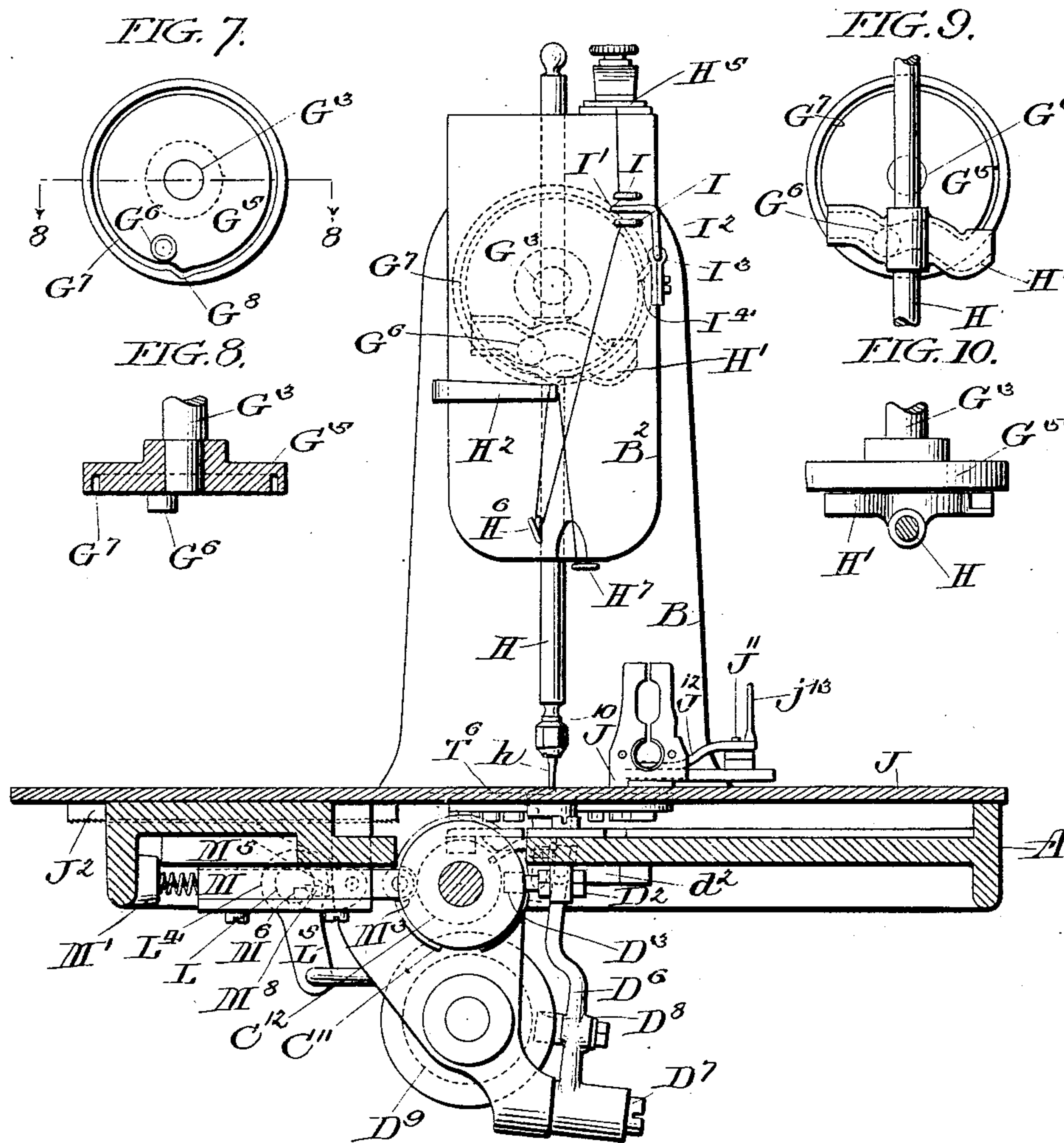


FIG. 7.

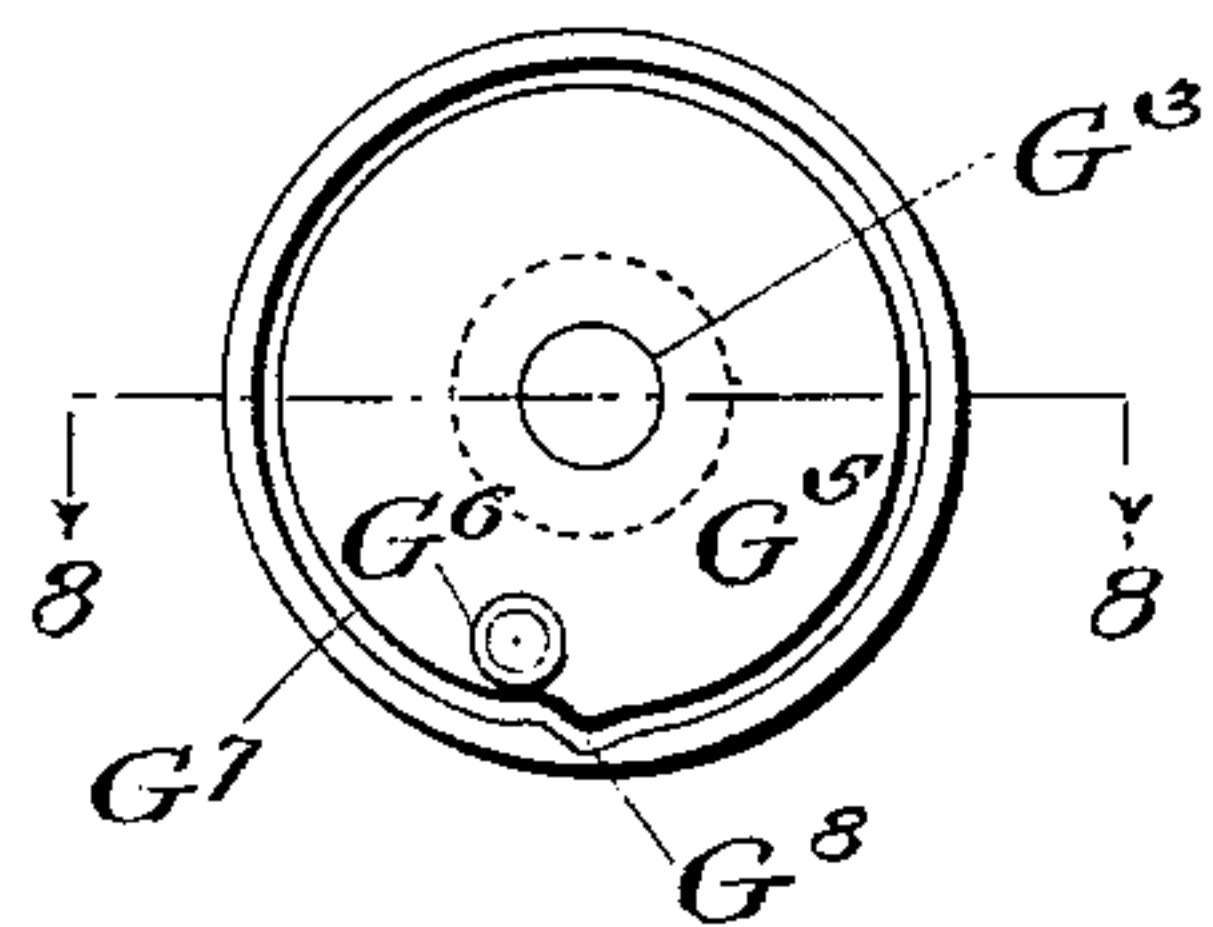


FIG. 8.

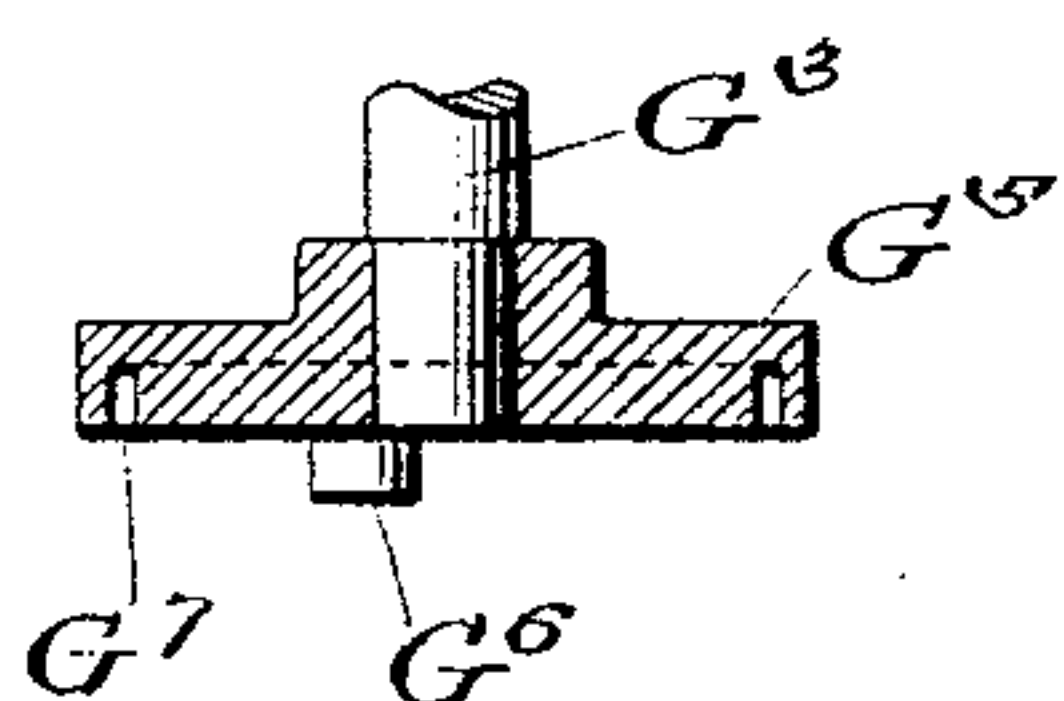


FIG. 9.

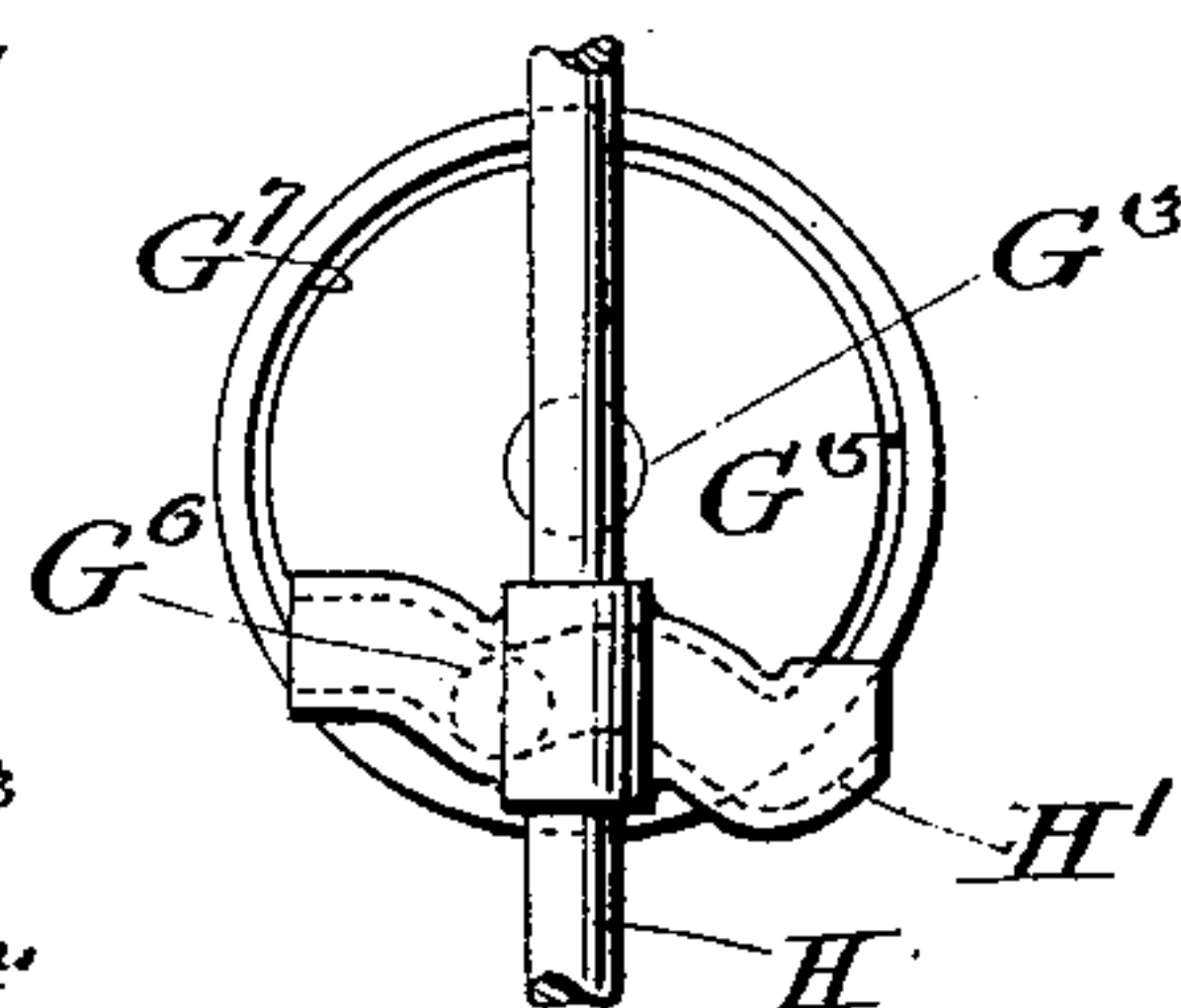


FIG. 10.

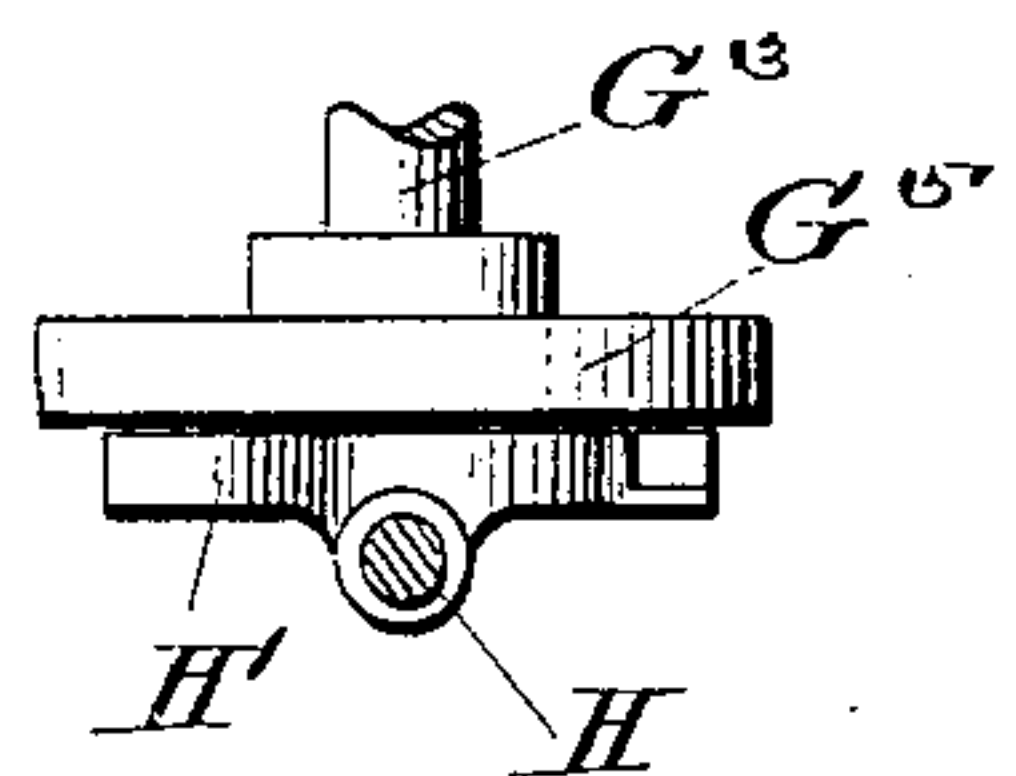
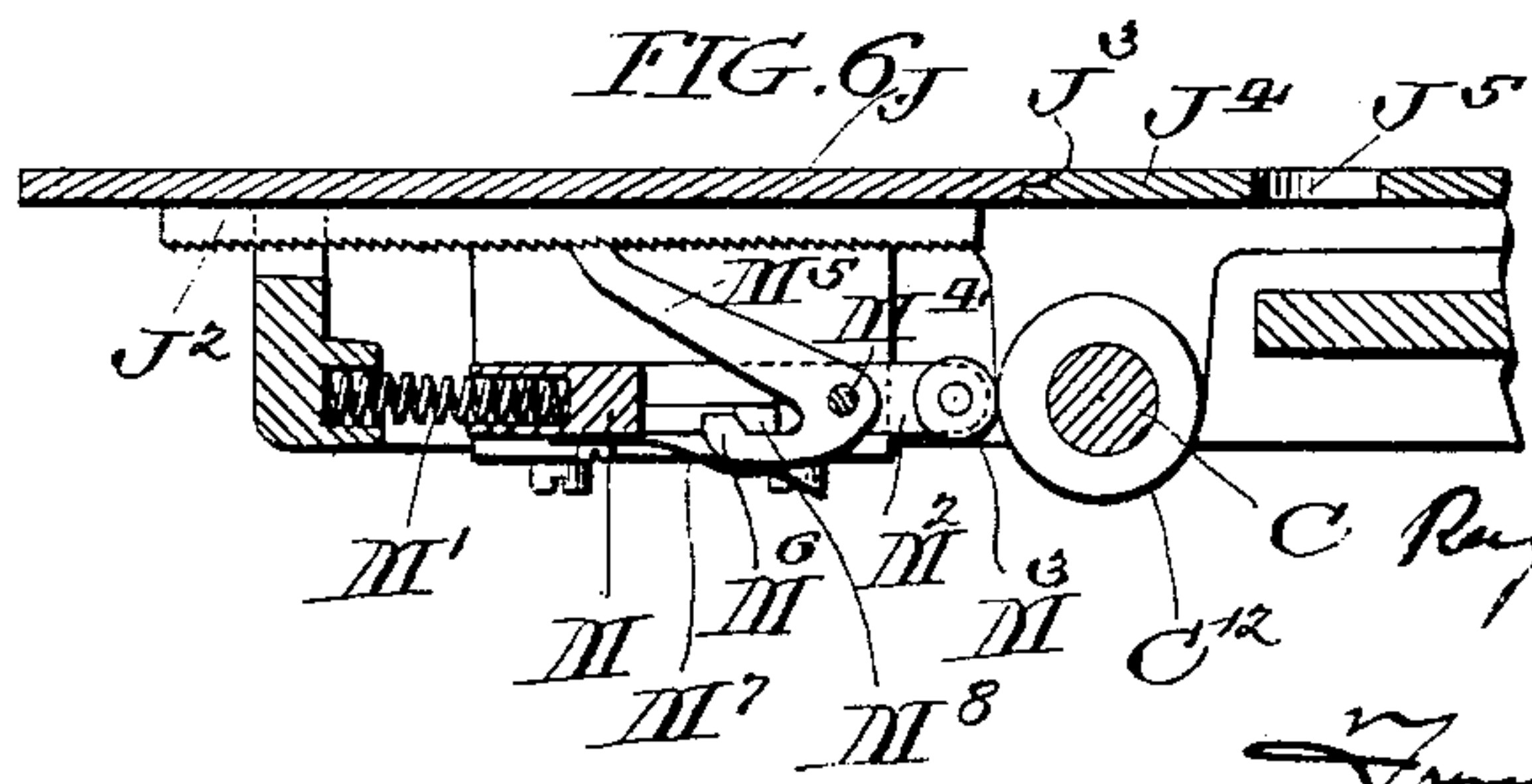


FIG. 6.



WITNESSES:

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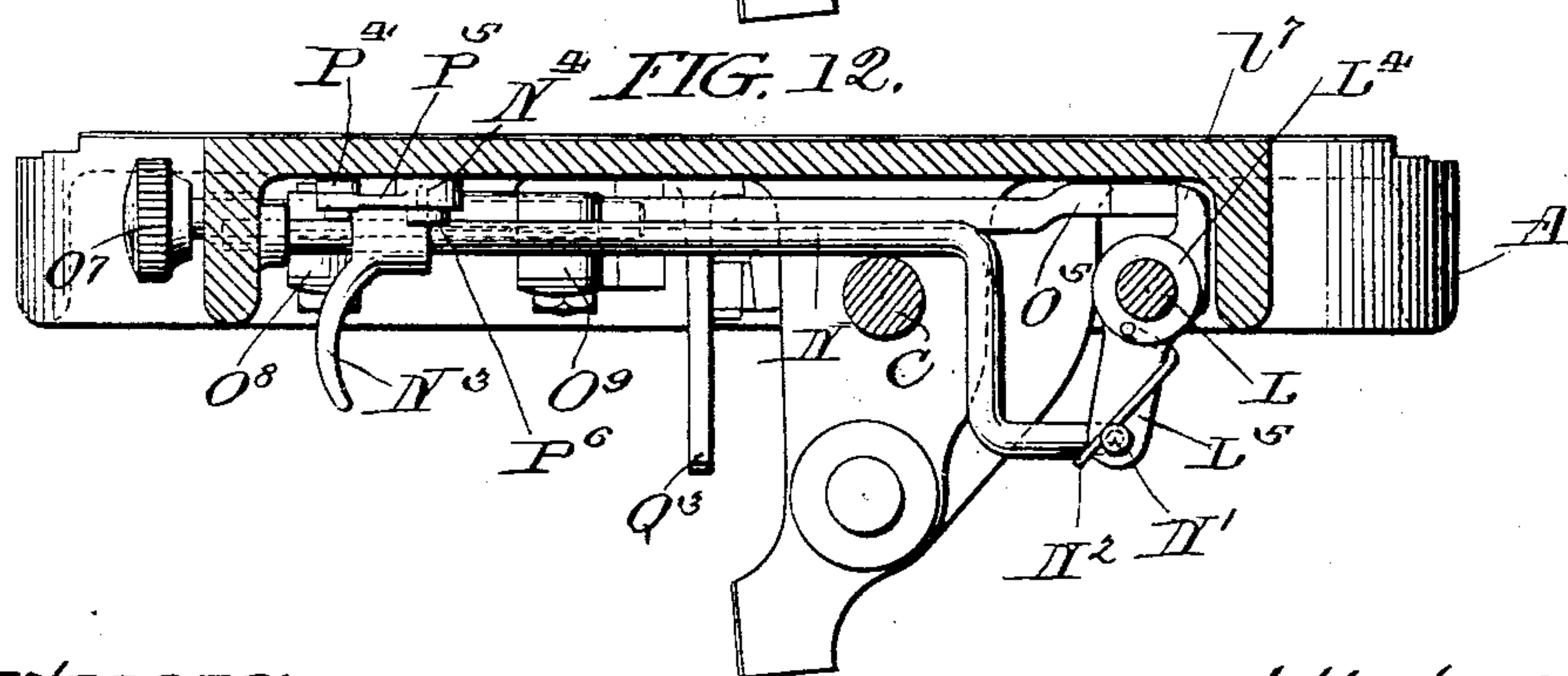
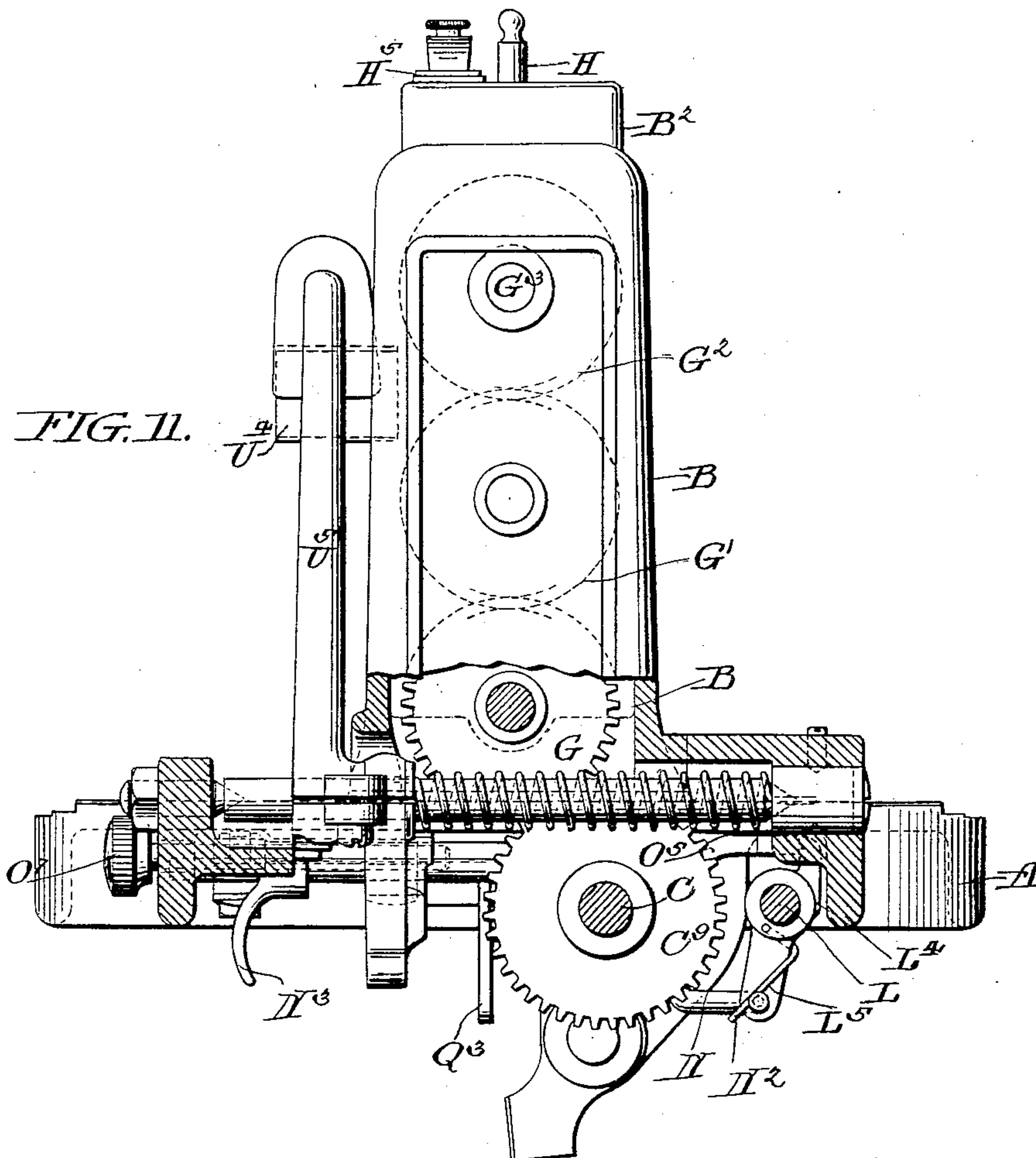
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BUTTONHOLE SEWING MACHINE.

APPLICATION FILED FEB. 24, 1902.

NO MODEL.

8 SHEETS—SHEET 5.



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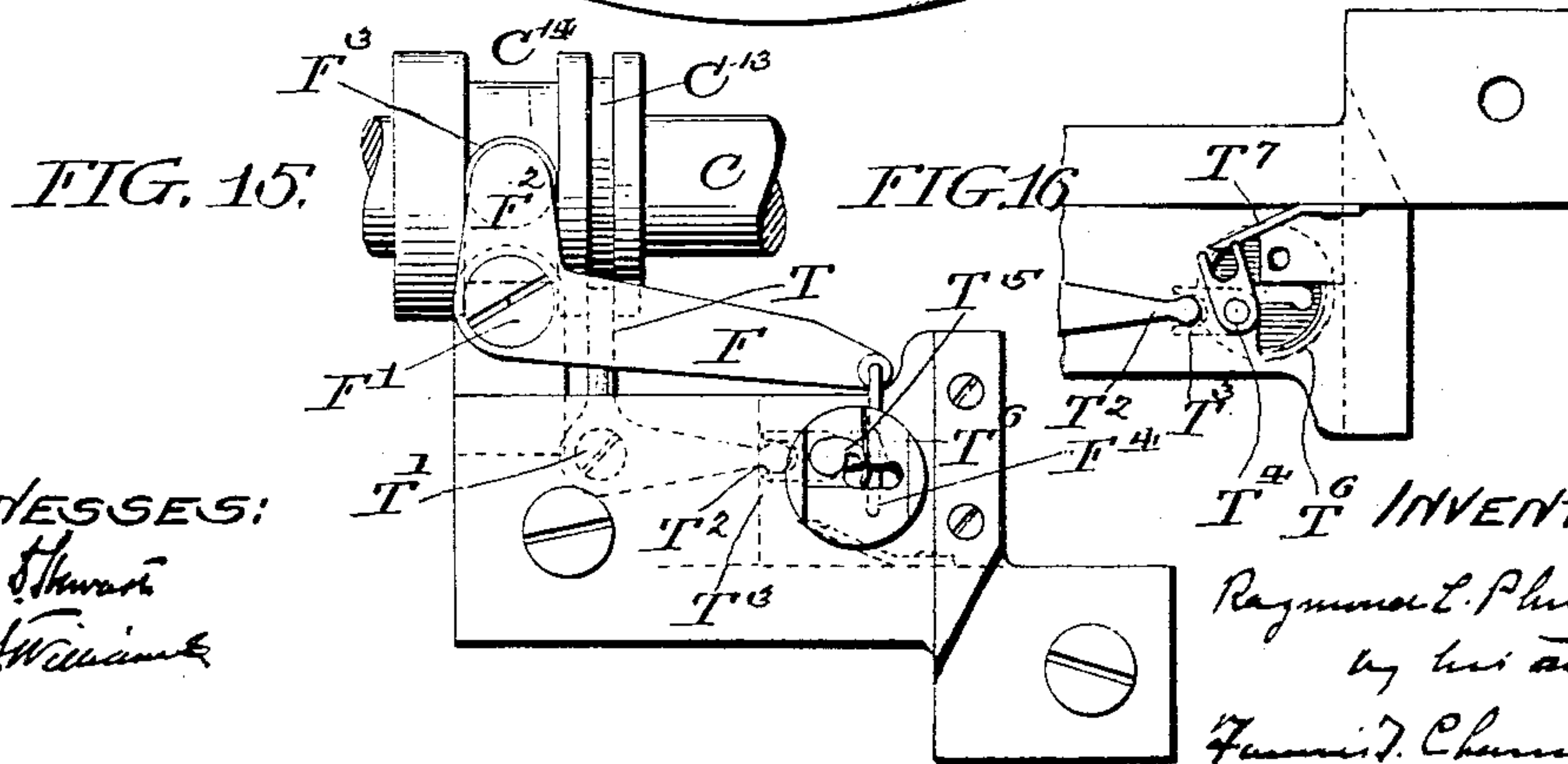
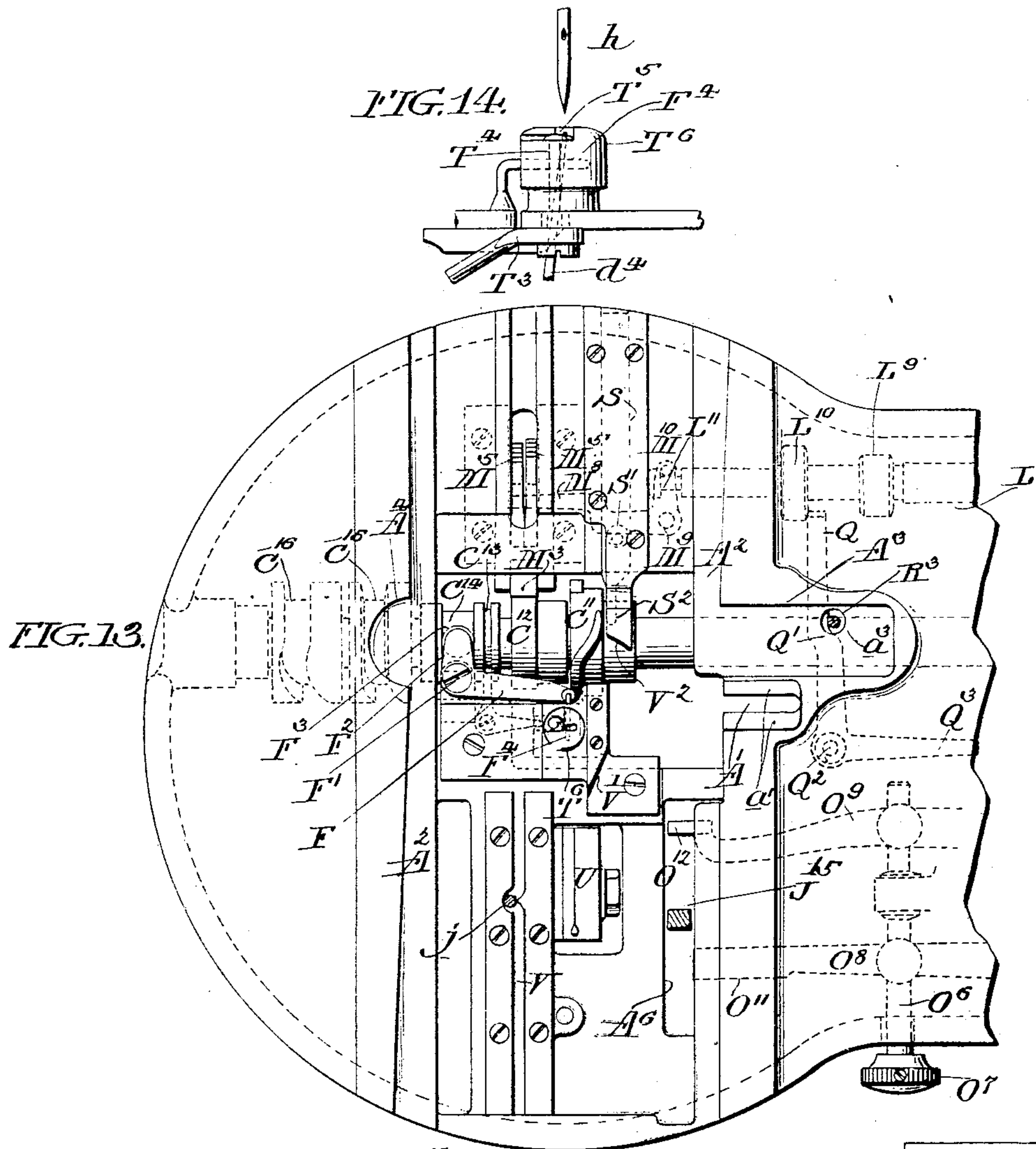
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R. L. PLUMLEY.
BUTTONHOLE SEWING MACHINE.

APPLICATION FILED FEB. 24, 1902.

NO MODEL.

8 SHEETS—SHEET 6.



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R. L. PLUMLEY.
BUTTONHOLE SEWING MACHINE.

APPLICATION FILED FEB. 24, 1902.

NO MODEL.

8 SHEETS—SHEET 7.

FIG. 17.

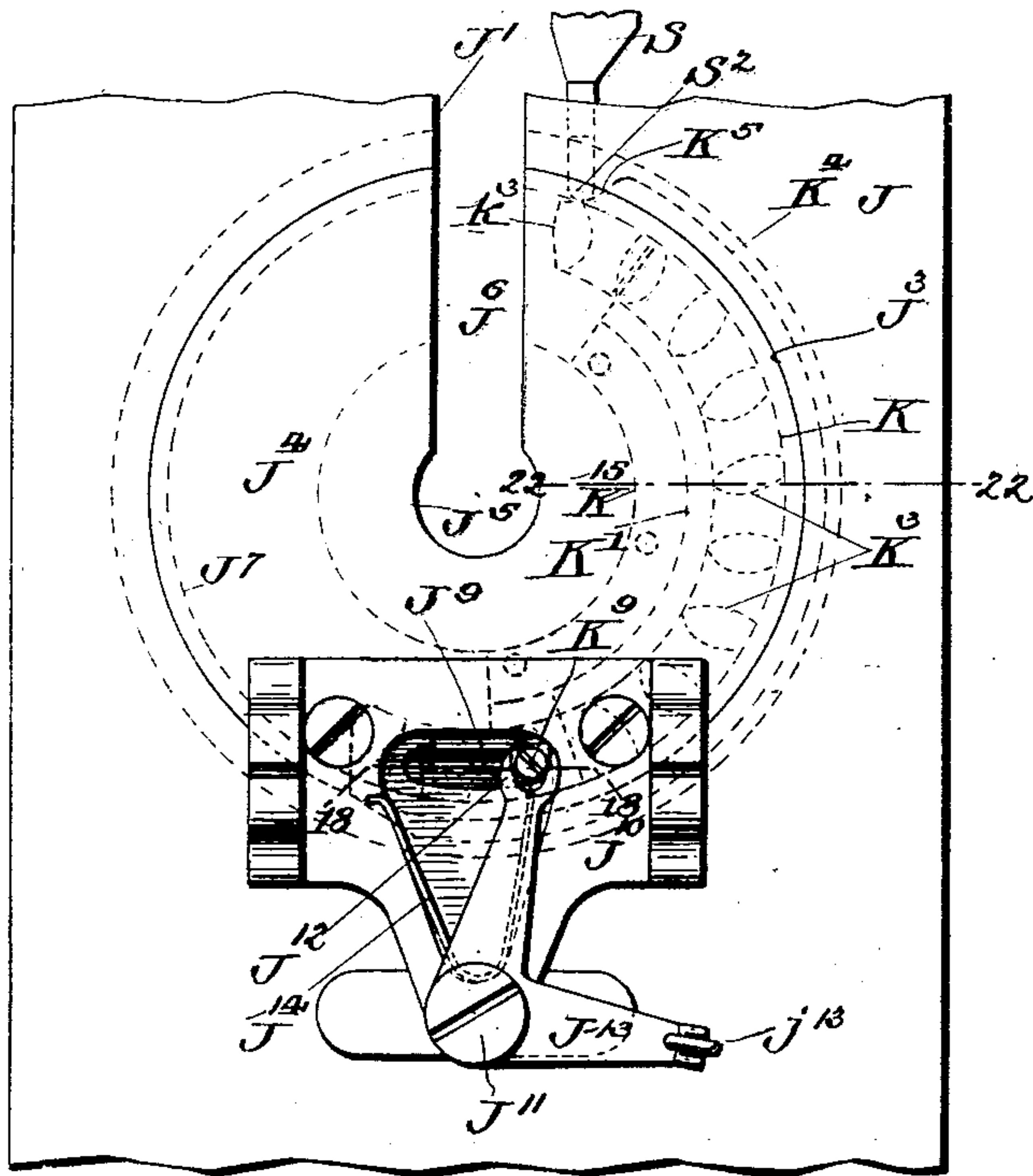


FIG. 18.

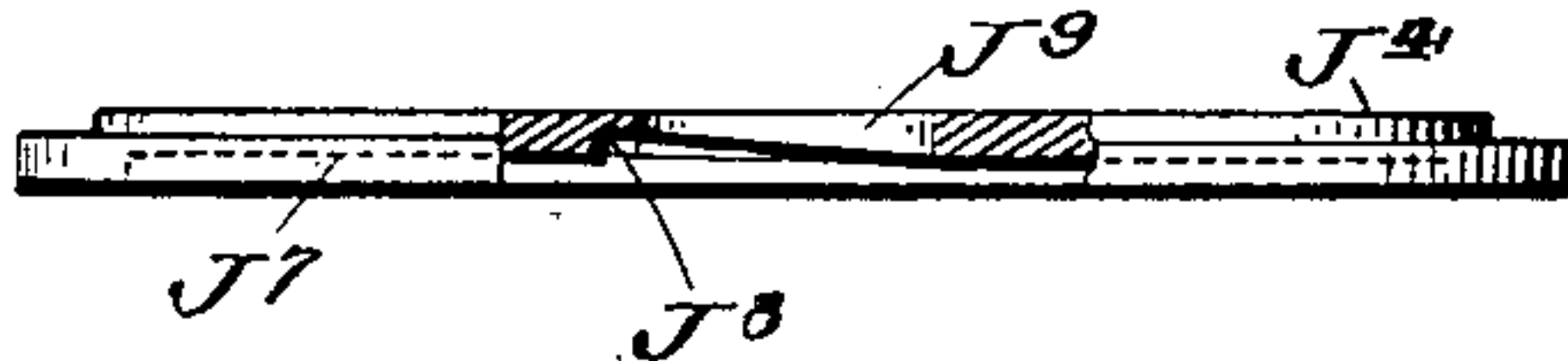


FIG. 19.

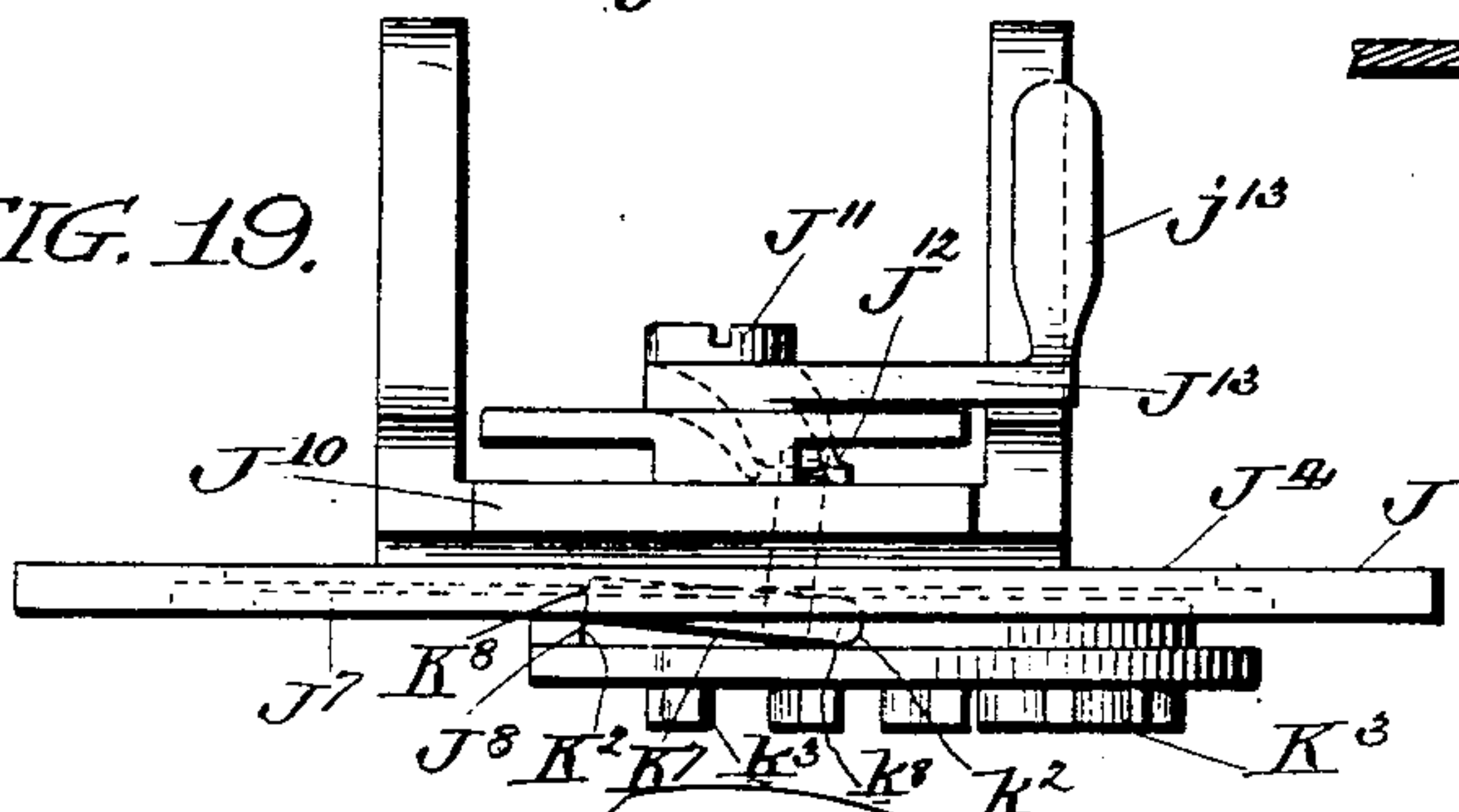


FIG. 22.

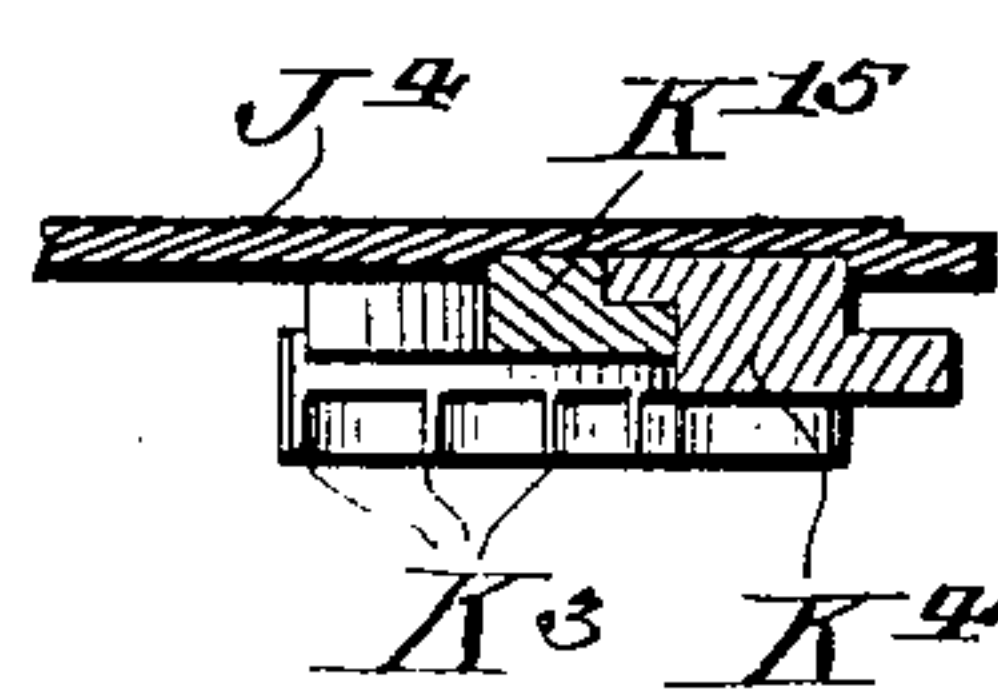


FIG. 20.

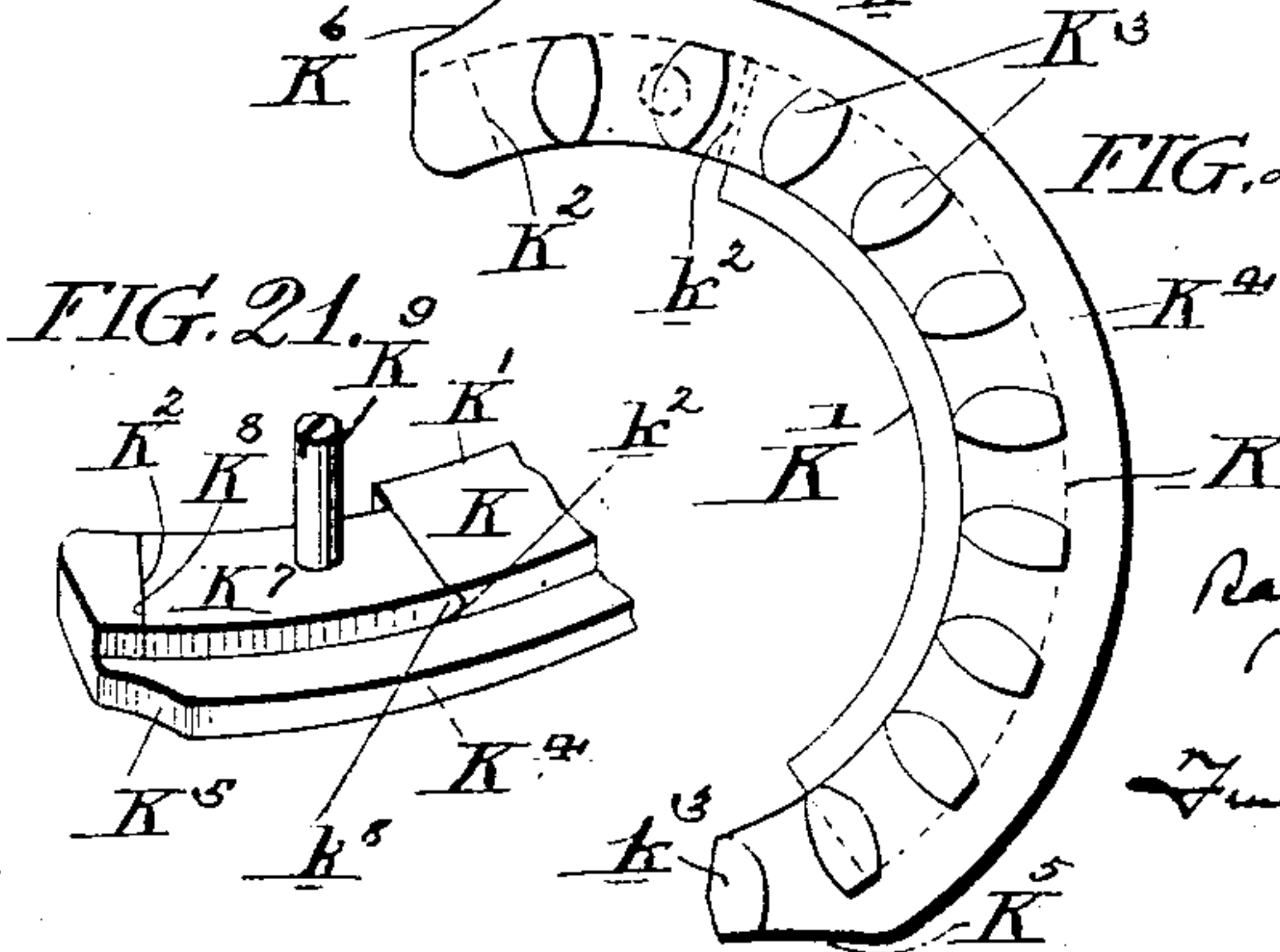


FIG. 21.

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R. L. PLUMLEY.
BUTTONHOLE SEWING MACHINE.
APPLICATION FILED FEB. 24, 1902.

NO MODEL.

8 SHEETS—SHEET 8.

FIG. 23.

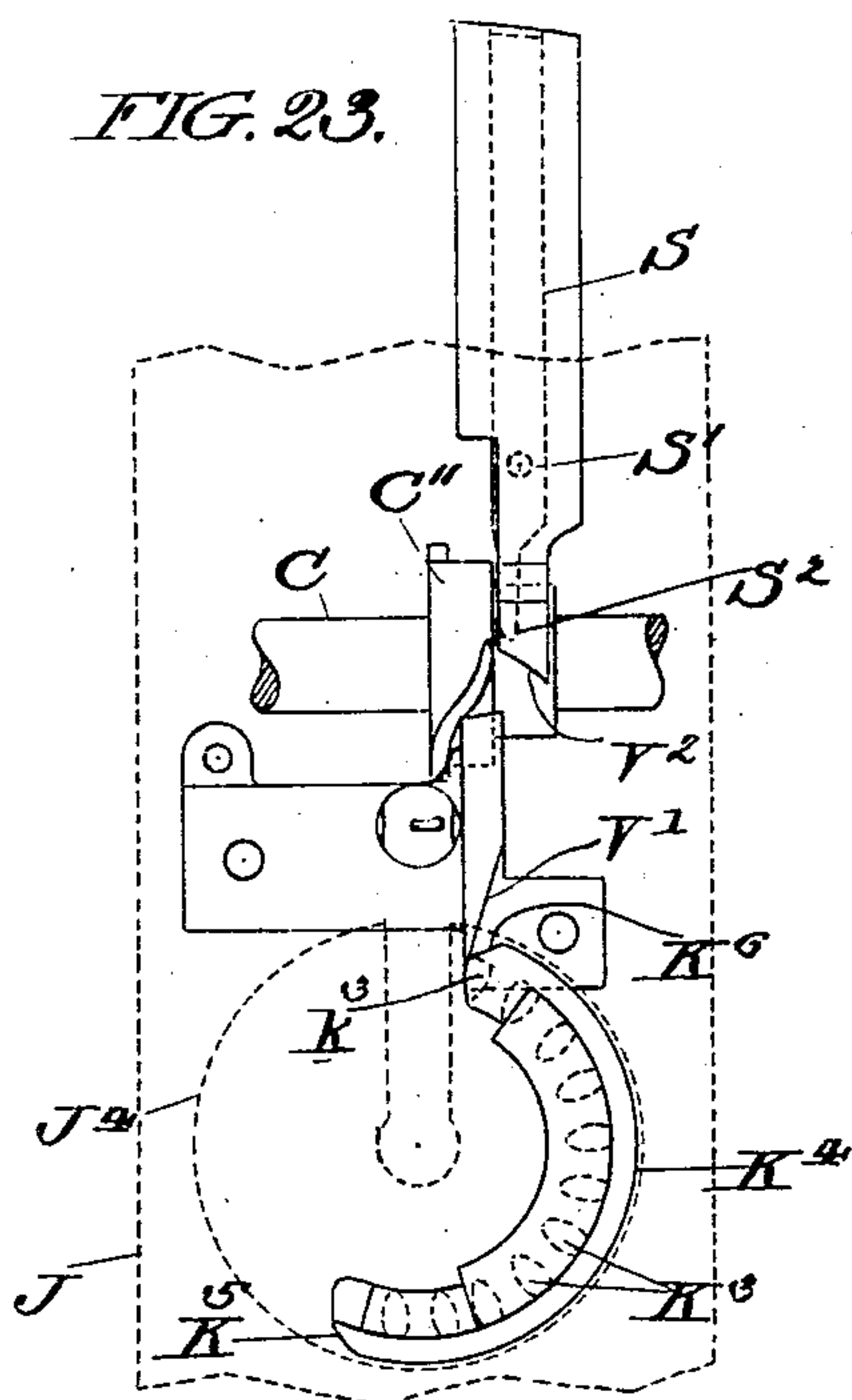


FIG. 24.

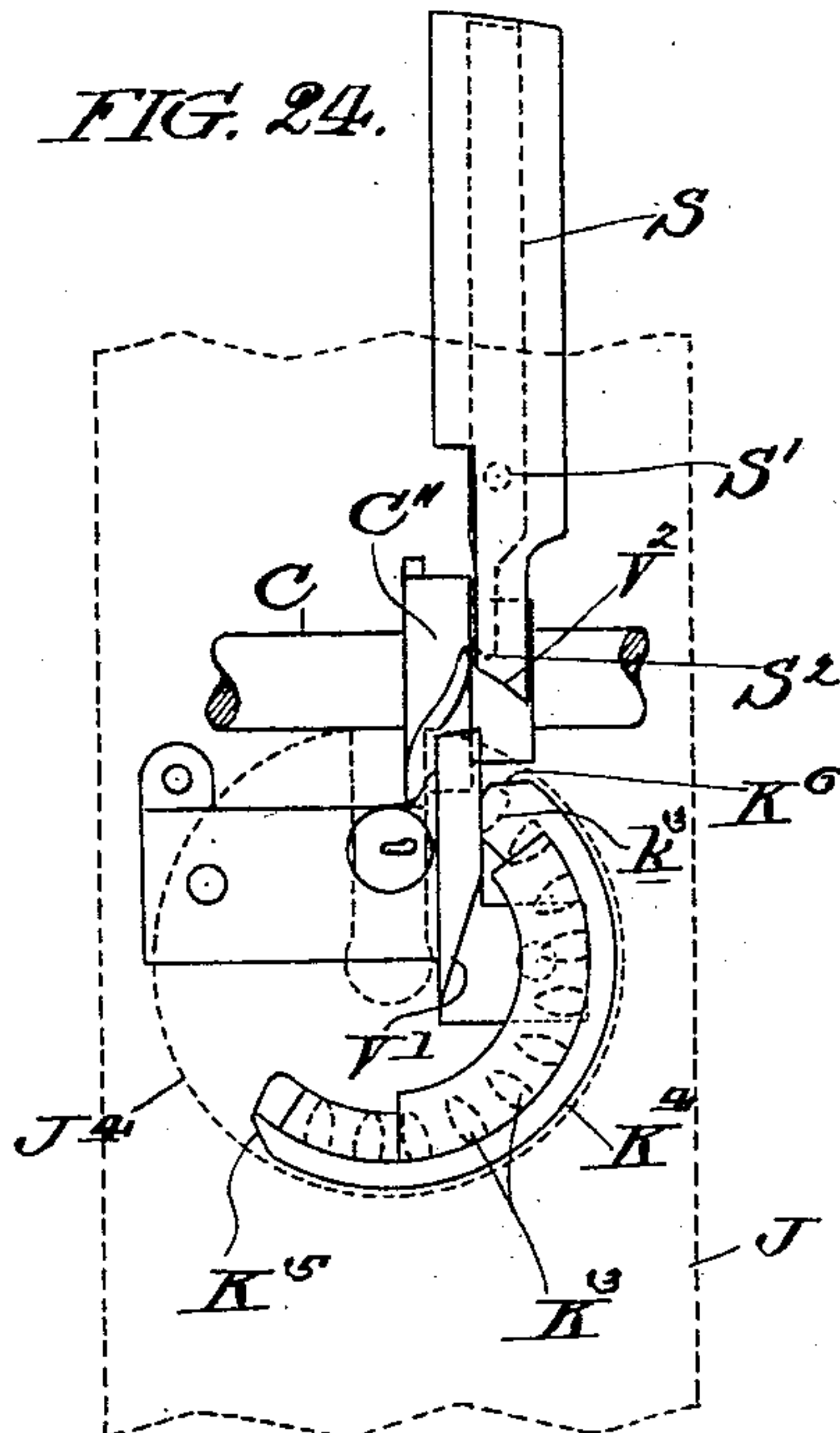


FIG. 25.

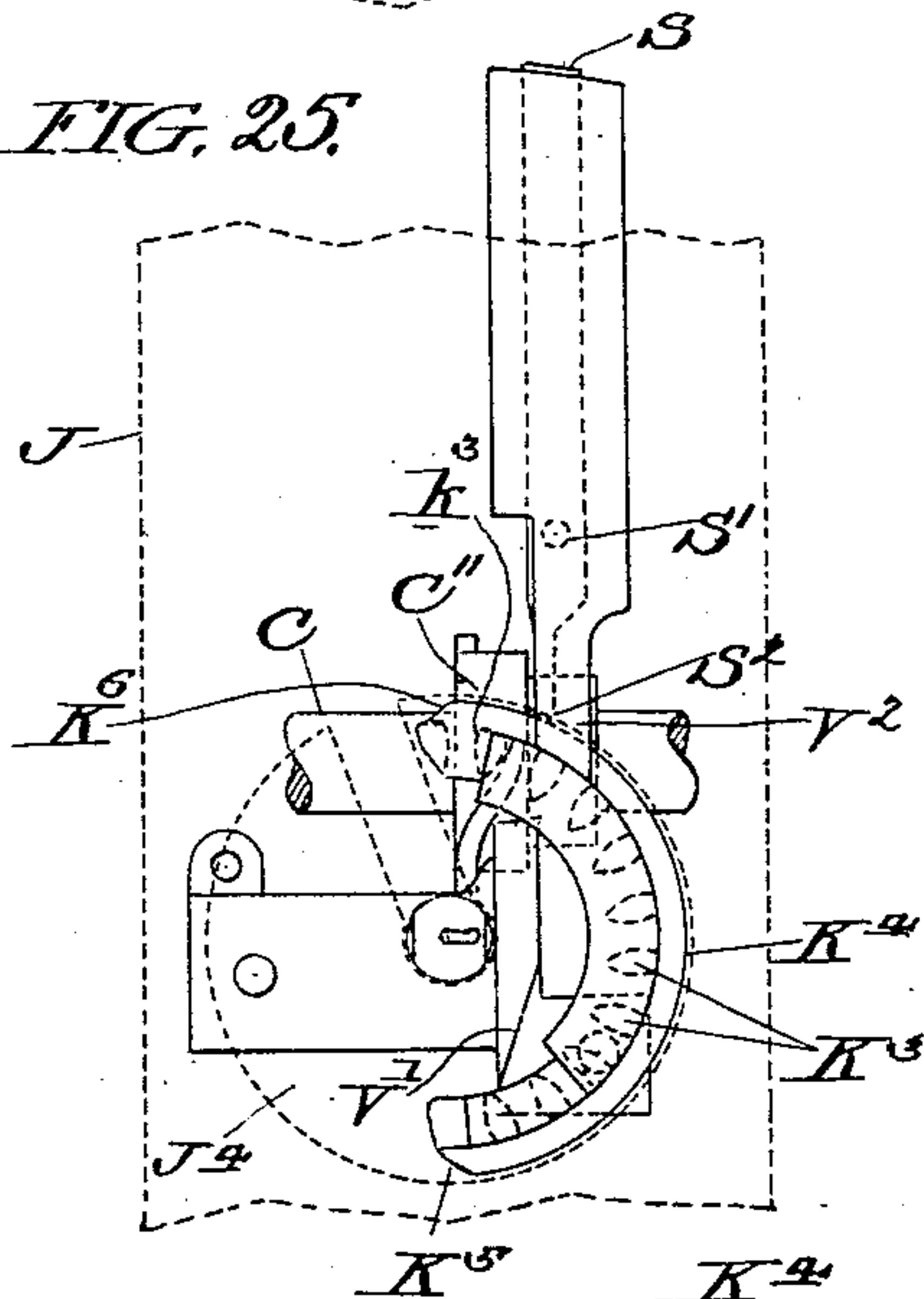
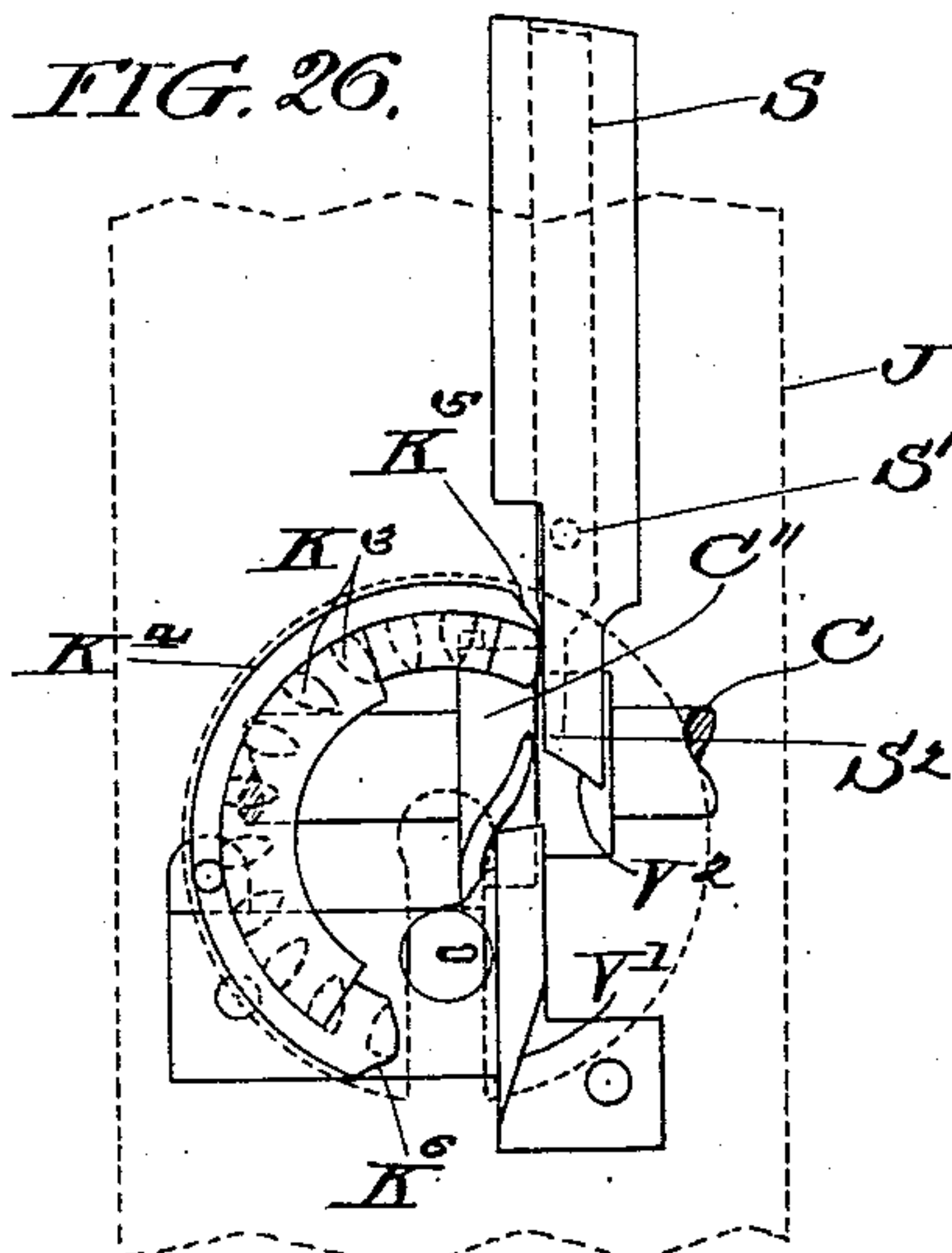


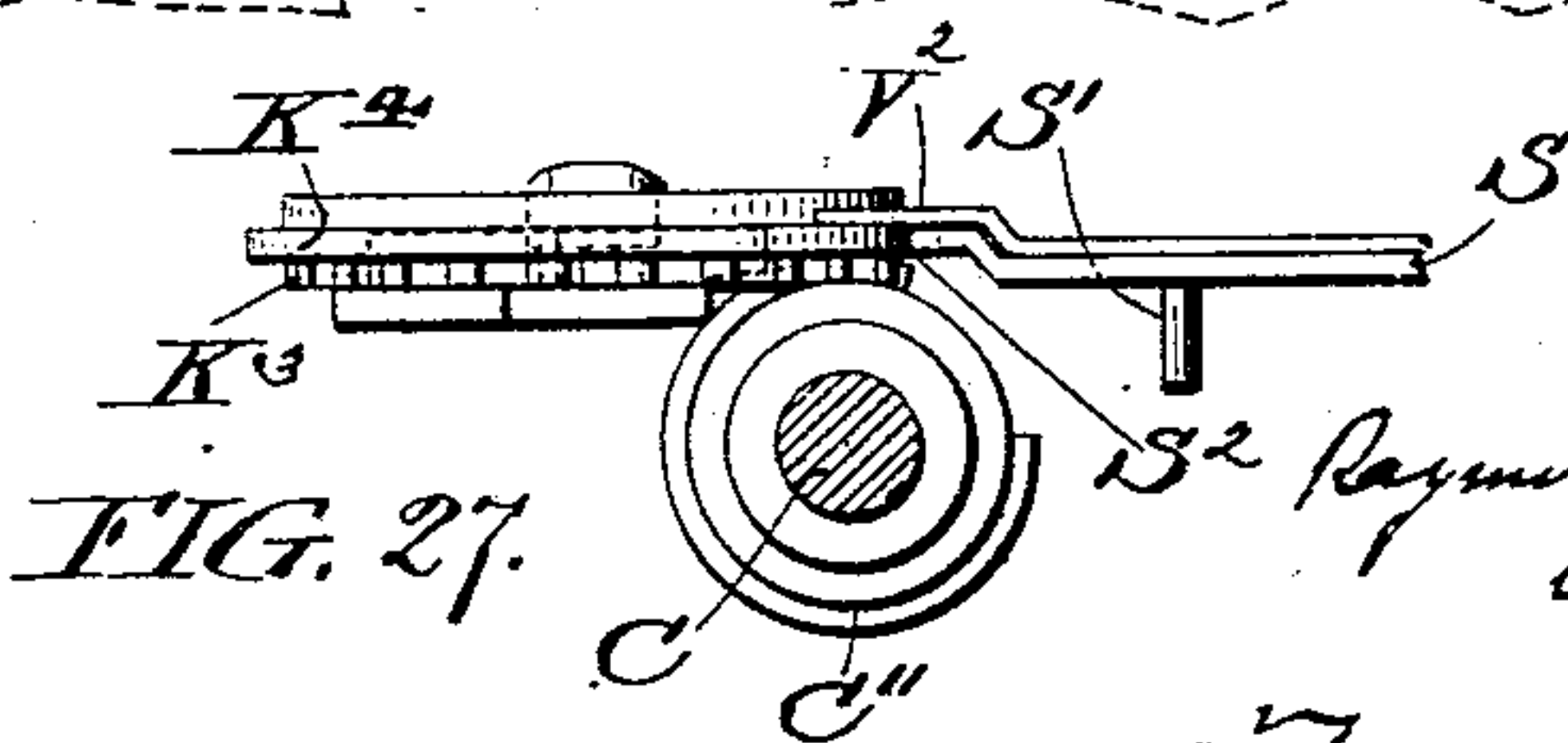
FIG. 26.



WITNESSES:

Wm. H. Williams
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FIG. 27.



INVENTOR:

Raymond L. Plumley
by his atty.
James D. Chamber.

UNITED STATES PATENT OFFICE.

RAYMOND L. PLUMLEY, OF WILMINGTON, DELAWARE, ASSIGNOR TO TRUMP BROTHERS MACHINE COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE.

BUTTONHOLE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 733,267, dated July 7, 1903.

Application filed February 24, 1902. Serial No. 95,143. (No model.)

To all whom it may concern:

Be it known that I, RAYMOND L. PLUMLEY, a citizen of the United States of America, residing in Wilmington, in the county of New-castle, in the State of Delaware, have invent-
 5 ed certain new and useful Improvements in Buttonhole-Sewing Machines, of which the following is a true and exact description, reference being had to the accompanying draw-
 10 ings, which form a part thereof.

My invention relates to buttonhole-sewing machines of the same general character as are described in the patents to Mills and Moore, No. 439,599, of October 28, 1890, and to Fred-
 15 erick and Plumley, No. 573,969, of December 29, 1896.

The object of my invention is to improve the machine of the former patents in fea-
 20 tures where such machines have shown themselves to be capable of improvement, particularly in the mechanism for adjusting the machine for different sizes of buttonholes and in the devices for arresting the motion of the machine and simultaneously disconnecting
 25 parts which would in normal condition oppose the return of the sliding table to the place of beginning; also, in simplifying and improving the mechanism which operates the sliding feed-table and the mechanism which
 30 operates the rotating table in connection with the sliding table.

The nature of my improvements will be best understood as described in connection with the drawings in which they are illus-
 35 trated, and in which—

Figure 1 is a side elevation of my improved machine, shown partly on the section-line 1 1 of Fig. 2. Fig. 2 is a plan view of the machine, taken on the section-line 2 2 of Fig. 1.
 40 Fig. 3 is a plan view of the under side of the machine; Fig. 4, a side elevation of one of the stop-levers with an adjustable stop-socket shown in section. Fig. 5 is an elevation of the machine, taken on the section-line
 45 5 5 of Fig. 2; Fig. 6, a sectional elevation on the line 6 6 of Fig. 2. Fig. 7 is a front view of the crank and cam disk which operates the upper needle and a take-up device to be described. Fig. 8 is a section on the line 8 8 of
 50 Fig. 7. Fig. 9 is a view similar to Fig. 7,

showing the needle-bar and its attached scroll-cam in connection with the crank-disk. Fig. 10 is a plan view of the parts shown in Fig. 9. Fig. 11 is a sectional elevation taken on the line 11 11 of Fig. 1; Fig. 12, a sectional
 55 elevation taken on the line 12 12 of Fig. 1. Fig. 13 is a plan view of the front end of the machine with the sliding table removed. Fig. 14 is an elevation of the head, showing the needles and fingers working in connection
 60 with the head in the formation of the buttonhole-stitch. Fig. 15 is a plan view, on an enlarged scale, showing the tension-regulating and purl-controlling fingers operating in connection with the head with their appro-
 65 priate cams and mechanism for actuating them. Fig. 16 is a plan taken from the under side of the head, showing a way of disconnecting the purl-controlling finger. Fig. 17 is a plan view, on an enlarged scale, of the
 70 central portion of the feed-table, showing the rotating table and appliances used in connection therewith. Fig. 18 is an edge view of the rotating table, partly in section, to show the latch-recess used for securing the rack in
 75 position. Fig. 19 is an elevation of the table and the mechanism shown in Fig. 17. Fig. 20 is a plan view of the rack and portions connected therewith; Fig. 21, a per-
 80 spective view showing the locking device used in connection with the rack; Fig. 22, a section on the line 22 22 of Fig. 17. Figs. 23 to 26, inclusive, show progressively the shifting relative positions of the sliding table,
 85 the rotating table, and the devices regulating such relative movements of each said tables; and Fig. 27 is an elevation showing the rotating table, the worm used for rotating it, the stop which arrests positively the motion
 90 of the sliding table, and the finger which connects the driving devices which actuate the sliding table.

A indicates what is at once the bed and the main or stationary table of the sewing-machine. The table is formed with guideways
 95 A^2 , (see Figs. 1 and 13,) which, as in the previous constructions of the older patents, are made to permit the desirable angular shifting of the sliding table in the act of forming the eye on the buttonhole and which in my
 100

present construction have on the one side (see the left of Fig. 13) a segmental bearing (indicated at A^4) and on the other side and directly opposite to said segmental bearing
 5 A^4 a guideway, (indicated at A^3), and having an opening a^3 , formed through its bottom, for purposes to be hereinafter described. The table A is also formed with a slot A' , (best shown in Fig. 13,) on each side of which are
 10 formed guideways a' , which support one end of the lower needle race-frame.

B indicates the standard rising from the rear end of the bed-plate A, which is made hollow and continued horizontally, as indicated at B' , to support the head B^2 , which in
 15 turn supports the upper needle-bar and the mechanism for actuating it.

C is the main driving-shaft of the machine, which is actuated by mechanism similar to that described in the patent to Frederick and Plumley, No. 573,969, of December 29, 1896, C' indicating the driving-pulley, running loosely on the end of the shaft C; C^2 , the friction-clutch secured to turn with the shaft C
 20 and to couple the shaft and pulley C' , under normal conditions the said clutch being connected through the pivoted lever C^6 to the head C^3 , the pivotal connection being indicated at C^4 , C^7 indicating the upwardly-projecting finger of the lever C^6 , and C^8 the stop-
 25 lug, which by coming in contact with the spring-finger to be described arrests the machine always in the same position.

C^9 is a gear-wheel secured on the shaft C
 35 and driving, through the gears G, G' , and G^2 , the horizontal shaft G^3 , (see Fig. 1,) to which shaft is connected the cam G^4 , which operates the main take-up lever for the upper thread and the terminal disk G^5 , which, as
 40 best shown in Figs. 7 to 10, is provided with a crank-pin G^6 and also, preferably, with a cam-groove, (indicated at G^7 G^3 , the part G^7 being circular.)

H indicates the reciprocating bar, to which
 45 the upper needle is secured, said bar moving in guideways in the head B^2 and having secured to it the scroll-cam H' , which is engaged by the crank-pin G^6 , the motion given to the needle being the compound motion resulting
 50 from the rotation of the crank-pin and the irregular form given to the scroll-cam H' .

H^2 (see Figs. 1 and 5) is the take-up lever for the upper thread, pivoted at H^3 and having an extension H^4 , which is actuated by the
 55 cam G^4 .

H^5 indicates the tension for the upper thread; H^6 and H^7 , guides for the thread.

I I (see Figs. 1 and 5) are guides for the upper thread, in connection with which operates a take-up lever (indicated at I^2) having a perforated end I' , which extends between the guides I I and through which the thread passes, as shown in Fig. 5. The lever I^2 is pivoted at I^3 and formed with a lever extension I^4 , which engages in and is actuated by
 60 the cam-groove G^7 G^8 . This lever I^2 acts as a supplemental take-up device for the upper

thread and is especially designed for operation in connection with the loop-controlling finger to be hereinafter described, which, how-
 70 ever, forms no part of the invention which my present application is intended to cover, as both this supplemental take-up device and the purl-controlling finger and their operative combinations in the machine form the
 75 subject-matter of my pending application for Letters Patent, filed January 25, 1902, Serial No. 91,156.

J is the sliding feed-table, moving on the guideways A^2 A^2 , said table being formed, as
 80 is shown, with the centrally-located slot J' , leading into the circular opening J^3 , in which the rotating table is located.

J^2 (see Fig. 6) is the rack secured on the under side of table J and by which it is ac-
 85 tuated, as hereinafter described.

J^4 is the rotating table, rotatably secured in the circular opening J^3 and formed with a central opening J^5 , from which leads the slot J^6 , which normally registers with the slot J'
 90 of the table J. The table J^4 (see Fig. 18) is formed with a circular recess J^7 in its lower face and provided with a segmental guide-plate K^{15} , which, together with the wall of the recess J^7 , holds in place and guides the mov-
 95 able segmental rack, to be hereinafter described. The under side of the rotatable table is also formed with a shouldered recess, as indicated at J^8 , (see Figs. 18 and 19,) into which leads the slot indicated at J^9 . (See
 100 also Fig. 17.)

J^{10} indicates the casting to which the clamping mechanism (not shown) is connected. This casting is secured on the upper face of the table J^4 and is formed with a groove, as
 105 shown in Fig. 17, which registers with the slot or groove J^9 . The casting also supports a pivot J^{11} , upon which is pivoted the lever J^{12} J^{13} , the arm J^{12} of which is formed to engage the pin K^9 , hereinafter described, while the
 110 other arm, J^{13} , is provided with a finger-rest j^{13} , by which it is conveniently operated.

J^{14} indicates a spring which normally holds the lever in the position shown in Fig. 17.

K (see Figs. 17, 19, 20, and 21) is a seg-
 115 mental plate, the outer portion of which rests against the wall of the recess J^7 in the revolving table, while the center projecting edge K' extends under the segmental guideway K^{15} , as best shown in Fig. 22. On the lower
 120 face of the plate K is formed or secured the segmental rack indicated at K^3 , k^3 indicating the tooth which is first engaged by the actuating-worm. The segmental rack-plate is also provided with an outwardly-extending
 125 cam-flange, (indicated at K^4), the central portion being segmental, while the ends K^5 and K^8 constitute the cams or irregular portions. Near the front end of the rack-plate a recess is formed, as indicated at K^2 , (best shown in
 130 Fig. 21,) the rear edge of the recess being preferably curved, as indicated at k^2 , and in this recess I place the lock or latch block K^7 , with a preferably rounded end k^8 , and its

front end K^8 forming an abrupt shoulder. From the block K^7 extends the pin K^9 , which leads through the slot J^9 and is engaged at the upper end by the forked lever-arm J^{12} , as shown in Figs. 17 and 19. It will be obvious that the action of the spring J^{14} is to hold the lever-arm normally in the position shown in Figs. 17 and 19, and that therefore the latch-block K^7 is normally tilted upward, so that its shouldered edge K^8 extends into and is engaged by the notch J^8 in the table J^4 , therefore securely locking the segmental rack in position.

C^{11} is the worm secured to the shaft C, which at proper times engages the segmental rack of the revolving table and gives said table the necessary movement of rotation to form the eye of the buttonhole.

S is a finger which, through a pin S' and mechanism to be hereinafter described, disconnects the mechanism operating to feed the sliding feed-table J. The said finger or sliding plate S has an end S^2 , (see Fig. 17 and Figs. 23 to 27,) which projects into path of the cam K^4 , as shown in the above-mentioned figures.

V' (see Fig. 13 and Figs. 23 to 26) is a stationary cam having a wedge-like end which is impinged upon by the front tooth k^3 of the rack and by means of which and a manipulation to be described the rack is forced backward during the sewing of the first side of the buttonhole.

V^2 is a stationary stop arranged to engage the outer edge of the plate K, as shown in Fig. 25, when the first side of the buttonhole is stitched, holding the parts in position while the rotatable table operates in forming the eye of the buttonhole.

Before describing the other parts of the machine I will here state that the buttonhole being cut and the goods and machine in position for the sewing of the buttonhole the operator in starting the machine presses on the end J^{13} of the lever J^{13} and, acting through the pin K^9 , depresses the latch-block K^7 until it is free from the notch J^8 and presses against the shoulder K^8 of the rack-plate K, which, with the attached rack, is pushed slightly to the rear, so that the front tooth k^3 will ride along the edge of the cam V' , as indicated in Figs. 23 and 24, the sliding plate J advances, stitching the first side of the buttonhole, until the tooth k^3 reaches the end of the cam-plate V' , which end is placed in proper relation with the worm C^{11} , and as soon as the tooth k^3 is out of contact with the cam-plate the rack snaps forward under the influence of the spring J^{14} to normal position. This forward motion of the rack brings the cam end K^5 of the segment K^4 in contact, or nearly so, with the end S^2 of the finger S, so that at the first circular stitch it forces said finger backward, and thereby disconnects the devices which actuate the sliding table, and not only is this feed mechanism thus disconnected, but the stop V^2 practically at the

same time comes in contact with the edge of the plate K, positively arresting the forward motion of the feed-plate in the correct position for the sewing of the eye. The worm C^{11} then immediately begins to act upon the rack, turning it and the table J^4 for the stitching of the eye, and at the same time that the forward motion of the rack disconnects it from the worm-wheel the rear edge of the plate K clears the stop V^2 , and immediately afterward the portion K^6 of the segment K^4 permits the finger S to return to normal position, so that the straight-feed mechanism is restored to operation, and the machine at once continues the stitching of the second side of the buttonhole. In restoring the feed-table to position to begin another buttonhole the operator again actuates the lever J^{13} , so as to avoid contact between the segmental rack and the stop V^2 .

The movable rack, and its combination with the actuating devices and the devices which it actuates, forms one and an important feature of my invention.

The sliding table J rests at its left-hand side (see Fig. 2) against a segmental block R, fitting and turning in the segmental bearing A^4 , and on the opposite or right-hand side it rests against another segmental block R' , having its bearing in a segmental recess formed at the end of a slide R^2 , which slide moves in the guideway A^3 and is thrust forward by a spring a^3 , as shown in Fig. 2. From the bottom of the slide R^2 extends a pin R^3 , (see Figs. 2, 3, and 13,) which pin extends through the opening r^3 , Fig. 13, and normally rests in contact, or nearly so, with a lever-arm Q of a lever Q Q^3 , pivoted at Q^2 , and preferably having its end Q^3 arranged to operate upon the tension device, as hereinafter described. The end of the lever-arm Q is arranged, in connection with the stop action of the machine, so that in the act of stopping the machine the lever is shifted toward the right from the position shown in Figs. 2 and 13, with of course the effect of moving the slide R^2 away from the table J, so as to release the frictional contact of the segmental blocks R and R' with the table and enable the table to be moved back to place of beginning.

The device of applying the frictional resistance to the edge of the table as described, and also the construction by which the stop-page of the machine relaxes this frictional resistance, forms another feature of my invention.

The feed of the sliding table J is effected by the mechanism best shown in Fig. 6—that is to say, a rack J^2 is secured on the under side of the table and below it. Supported on the frame of the machine is the slide M, moving in suitable horizontal bearings and having a friction-roller M^3 , which rests in contact with the cam C^{12} on the main shaft C, the friction-roller being held in contact with the cam through the action of a spring M' . As shown, the slide M is bifurcated, as indi-

cated at M^2 , and supports a pivot-pin M^4 , on which are pivoted a pawl or pawls M^5 , held in operative contact with the rack J^2 by the action of springs M^7 . It will be seen that this feeding device is one of great simplicity and accuracy of operation, and this, again, is one of the novel features of my invention. As a means for retracting the pawls M^5 from operative contact with the rack J^2 I show the lever M^8 . (See Figs. 2, 3, and 13 in addition to Fig. 6.) This lever rests normally just above the curved heel extension M^6 of the pawls; but when moved toward the left, as shown in Fig. 6, it depresses the heel extensions, and consequently depresses the pawls out of contact with the rack. The lever M^8 is connected so as to be actuated to depress the pawls when the machine is stopped and also when the finger S is actuated. Thus, as shown, the lever M^8 is pivoted at M^9 and has a lever extension M^{10} , which is connected to the rock-shaft L , as hereinafter described, a spring M^{11} (see Fig. 3) normally holding the lever M^8 out of operative position and in contact with the pin S' , extending from the finger S . I have already described how the said finger S is operated by the contact of the cam portion of the segmental rack on the rotating table, and it will therefore be understood that the lever M^8 is operated to remove the pawls from contact with the rack-path during the stitching of the eye of the buttonhole and also at the stoppage of the machine, this last removal of the pawls being of course necessary in order to enable the sliding table to be restored to position to begin the operation on another buttonhole.

Before leaving for a time the description of features immediately connected with the operation of the feed-table I will note that the table J has depending from it a pin j , which moves in a cam-groove V , which cam-groove gives the necessary shift to the table in the operation of stitching the eye of the buttonhole. This of course is an old and familiar device.

L is a rock-shaft supported in suitable bearings, (indicated at l and l'), so as to be capable not only of rocking in said bearings, but also of a slight longitudinal motion, the extent of this motion being regulated by a collar L^9 , adjustable on a threaded portion L^8 of the shaft L . The end of the shaft L has attached to it a head L' , from which extends the stop pawl or finger L^3 and which head also supports the spring-supported stop, (indicated at L^2), all substantially as described in the patent to Frederick and Plumley, No. 573,969, of December 29, 1896, and the operation of the finger and stop in connection with the clutch is substantially identical with the similar devices described in said patent—that is to say, when the shaft L is rotated to move the finger L^3 outwardly the clutch is in contact with the driving-pulley and the pulley coupled to the shaft C . When, however, the shaft L is rocked inward, the finger L^3

comes in contact with the pivoted lever C^6 and forces it inward against the pressure of the spring held in the head C^3 , releasing the frictional contact of the clutch, the machine being arrested in definite position by the contact of the finger C^8 with the stop L^2 . It will be obvious that this action of the finger upon the clutch mechanism is accompanied by a considerable pull on the shaft L , and in my present construction I permit the shaft freedom of longitudinal movement to enable it to shift its position under this pull, the spring L^6 being connected with the shaft, so as both to tend to rock it downward into position to disengage the clutch and also to thrust it inward to the position shown in Fig. 3, the shifting of the shaft being regulated by the adjustment of the collar L^9 , between which and the fixed collar L^7 the bearing L' is situated. Secured on the shaft L is the collar L^4 , having extending downward from it the lever-arm L^5 . Also secured on the said rock-shaft is the collar L^7 , having extending upward from it the stop-finger, (indicated at l' .)

L^{10} is a collar adjustably secured on the threaded portion L^8 of the rock-shaft and resting in contact with the lever-arm Q , already described, and which lever-arm operates the slide R^2 through its contact with the pin R^3 and also, as previously stated, operates upon the tension device. In the extreme inner end of the rock-shaft I form a collar L^{11} , which is engaged by pins on the lever-arm M^{10} , as shown in Fig. 3, said lever-arm operating the pawl-depressing finger or lever M^8 , as previously described.

O (best shown in Fig. 3) is a pivot, to which is pivotally secured the lever-arm O^5 , which arm in one position is made to engage the finger l' , as shown in Figs. 11 and 12, holding the rock-shaft back out of operative position and longitudinally in the position shown in Fig. 3. When the lever O^5 is moved toward the right, it releases the finger l' , permitting the spring L^6 to rotate the stop-finger downward into engagement with the clutch, which engagement shifts the rock-shaft toward the right. The lever O^5 has attached to it the lever-arm O' , forked at the end, as indicated at O^2 O^3 , and the said lever O^5 has also attached to it the other projecting arm, (indicated at O^4 .) Pivoted to the forks O^2 and O^3 of the lever O' are the stop-levers O^8 and O^9 , each of said levers having formed in them a pin-hole, (indicated at O^{10} , see Fig. 4,) through which passes a pin projecting from the bottom of a threaded block o^{10} .

O^6 indicates a right and left threaded screw supported in the lever-arm O^4 , as shown in Fig. 3, the threads of said screw being indicated in the threaded block o^{10} , supported on the levers O^8 and O^9 . The said adjusting-screw is also provided with a turning head O^7 , conveniently situated at the side of the machine upon which the operator sits. The lever-arm O^9 has a stop-finger, (indicated at O^{12}), which projects into an opening A^6 ,

formed through the stationary table of the machine beneath the feed-table J, and into which opening projects the stop-lug J¹⁵, extending downward from the bottom of table J. The other lever O⁸ supports at its end a socket O¹¹, in which moves the retractable stop P, having a shoulder P' on one side and a bevel portion P² on the other, the said stop-plunger P being thrust out of the socket by the action of a spring o¹¹ and operated through a pin P⁸ by a rod P⁴, which (see Fig. 3) is connected with the arm P⁵ of a bell-crank lever P⁵ P⁷, pivoted at P⁶ and having its arm P⁷ in contact with the shoulder N⁴, formed on a rod N, the bent end N' of which passes through a perforation in the lever-arm L⁵ and is formed, as shown, with a collar n', which in normal position is engaged by the spring N², secured on the lever L⁵, as shown in Figs. 3, 11, and 12. This device, of the use of the spring N² in place of an ordinary cotter-pin, is to facilitate the disengagement of the rod N with the lever L⁵ when such disengagement is desired. The rod N is also provided with a finger-pull, as indicated at N³.

It will be seen from the above description that the stop-levers O⁸ and O⁹ are, in effect, rigidly secured to the lever O⁵, so that all parts will turn together about the pivot O, the adjusting-screw O⁶ being used to move the stop ends of the levers together or apart or in accordance with the size of buttonhole to be sewed.

In operation, the machine being at a standstill, the feed-table is moved to the normal place of beginning and in contact with the shoulder P' of the stop-plunger P. The operator then draws down the rod N, with the double effect of first rocking the shaft L outward, freeing the clutch and enabling it to couple the driving-pulley with the shaft and retracting the finger l⁷, and, second, of simultaneously retracting the stop-plunger P and by the pull of the shoulder N⁴, transmitted through the bell-crank lever P⁷ P⁵, the rod P⁴, and the spring o¹¹, drawing on the lever-arm O⁸ and revolving the whole system of levers pivoted at O, so that the arm O⁵ will be moved to engage the finger l⁷ and the finger O¹² moved to the position it should occupy. The release of the stop pawl or finger L³ also permits the shaft L to move inward under the pressure of the spring L⁶, the shifting of the collar L¹⁰ permitting the lever Q to move toward the left, and hence permitting the slide R² to move toward the sliding table, which is therefore clamped between the segment-blocks R and R'. At the same time the shifting of the collar L¹¹ permits the spring M¹¹, acting on the lever-arm M¹⁰, to shift the lever or finger M⁸ into position where it no longer prevents the pawls from engaging the rack on the table. The machine therefore at once begins and continues in operation until the buttonhole is finished, at which time the stop-lug J¹⁵ comes in contact with the stop O¹² on

the stop O⁹, shifting it and the connected lever O⁵, so that said lever O⁵ releases the finger L⁷, which in turn permits the spring L⁶ to rock the lever L⁵ downward and engage the stop-finger L³ with the clutch, as previously described, this engagement shifting the shaft L longitudinally and retracting the pawls from operative connection with the rack and also retracting the slide R², as already described.

I have already stated that the arm Q³ of the lever Q has an operation upon the tension device of the machine. This is sufficiently illustrated in Figs. 1 and 3. The lever-arm Q³ has extending from its end adjusting-screws Q⁴ Q⁴, which lie immediately below tension-plates, (indicated at E⁶ E⁶), said tension-plates normally resting on a base-plate E⁵, having a perforated arm e⁴, as shown, and the plates E⁶ being held down by the action of springs (indicated at E⁷ E⁷) the thread passes between the base E⁵ and the plates E⁶ to receive the proper tension; but on the stoppage of the machine the lever-arm Q³ is moved upward, so that the set-screws Q⁴ push the plates E⁶ slightly upward and relax the tension upon the thread, enabling the feed-plate to be moved back to the place of beginning without danger of breaking the thread or undue resistance.

I have now described the essentially novel features of my invention and will pass to a general description of the coöperative parts, which, I may state, except in some features of combination with novel parts already specified, are not the subject-matter of my present application for a patent.

D is the race-block for the lower needle-slide. It is formed with a segmental race (indicated at D') and has an extension which passes on through the slot A' (see Fig. 2) and has attached to it a slide d, which moves in the guideways a'. The race-block has its other end (indicated at D²) suitably supported in guides d² (see Fig. 3) and provided with a cam-roller D³, which is engaged and operated by a cam, (indicated at C¹⁵.) The lower needle (indicated at d⁴) is secured to the race-block D⁴, working in the raceway D' and operated, through a connecting-rod D⁵ and a lever D⁶, pivoted at D⁷ and having a cam-roller D⁸, by a cam D⁹, (see Figs. 1 and 3,) which cam has attached to its shaft a gear-wheel D¹⁰, driven by a gear C¹⁰ on the shaft C, the motion of the race-block and needle being a combined one, derived from the two cams D⁹ and C¹⁵ and also through the shape of the raceway D'.

At E, I have indicated the lower take-up lever, through which the thread passes from the tension device already described through the guideways, (indicated at E⁴.) The take-up lever E is pivoted at E' and has connected to it an arm E², provided with a cam-roller E³, which is acted upon by a cam, (indicated at C¹⁶.)

F⁴ (best shown in Fig. 15) is a finger which projects through a suitable guideway in the

head T^6 and is actuated through a lever $F F^2$, pivoted at F' and provided with a cam-roller F^3 by a cam C^{14} . This finger has been used in prior machines for the purpose, as described in the earlier patents, of destroying the loop and preventing the unraveling of the button-hole. In my present machine it also has a useful function in connection with the purl-controlling finger in regulating the tension and properly adjusting the purl; but this new combination forms in part the subject-matter of my said copending application, filed January 25, 1902, Serial No. 91,156.

T^5 is the purl-controlling finger to which I have above referred. It is situated in a space formed at the top of the head T^6 and secured on the end of forward spindle T^4 , to the lower end of which is fastened, as shown, the forked lever-arm T^3 , (see Figs. 15 and 16,) the fork being engaged by the end of a lever-arm T^2 of a lever pivoted at T' and having another arm T , which is engaged and actuated by the cam C^{13} . It is unnecessary to further describe the function of this finger, because, as already stated, it forms the subject-matter of another application for Letters Patent and is only here shown because it is a part of the actual operative machine illustrated in the drawings. When it is desired to operate the machine without the purl-controlling finger, it is disengaged from the lever-arm T^2 and moved out of operative position, where it is held by a spring T^7 , as shown in Fig. 16.

Another feature illustrated in the drawings of my machine is the device for cutting the buttonhole in the cloth preparatory to stitching it. This mechanism consists of an anvil U , supported on an arm U' , pivoted at U^2 . (See Fig. 3.) The anvil is normally depressed out of operative position, but is raised into operative position by the pull on the connecting-rod U^3 , which is coupled to an extension U^8 (see Fig. 1) of the bent lever U^7 , pivoted at U^6 and having extending from it the arm U^5 , which supports at its end the striker U^4 . The construction of the pivoted shaft U^6 is well shown in Figs. 2 and 3, the action of the spring n^6 being to hold the parts normally in the position shown in Fig. 1 while the anvil is depressed and the striker brought down upon it to cut a buttonhole by the action of the lever U^9 upon a bent lever U^7 .

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

1. In a buttonhole-sewing machine having a main driving-shaft and means for actuating said shaft coupled thereto by a clutch, the combination of a rock-shaft, a stop-pawl secured to said rock-shaft and adapted when in engagement with the clutch to disconnect the main shaft from the driving means, means tending to rock the shaft in the direction to engage the pawl and clutch, a latch also secured to the rock-shaft, a pivoted latch-lever O^5 adapted to engage the latch on the rock-shaft and hold the stop-pawl out of contact

with the clutch, stop-levers $O^8 O^9$ adjustably connected with the lever O^5 so that their stop-supporting ends can be made to approach or recede from each other, means for securing the stop-levers in fixed relation to the latch-lever O^5 so that said levers will move together around the pivot of lever O^5 , whereby the movement of the stop-levers will shift the latch-lever out of engagement with the latch on the rock-shaft, a manually-operated device for rocking the rock-shaft to disengage the stop-pawl from the clutch, means connecting said device with the levers aforesaid whereby the same movement which disengages the pawl turns the stop-levers to starting position and the lever O^5 to position to engage the latch on the rock-shaft, a rack secured to the feed-table of the machine, a reciprocating pawl or pawls for actuating said rack and table, a pawl-engaging finger whereby said pawl or pawls are held out of operative position, means actuated by the movements of the rock-shaft whereby said finger is actuated to disengage the pawls substantially simultaneously with the stoppage of the machine, a friction-clamp acting to steady the movements of the feed-table, a tension-clamp for the lower thread and means actuated by the movement of the rock-shaft to stop the machine for relieving the pressure of said clamps.

2. In a buttonhole-sewing machine having a main driving-shaft, and means for actuating said shaft coupled thereto by a clutch, the combination, of a rock-shaft, a stop-pawl secured to said rock-shaft and adapted when in engagement with the clutch to disconnect the main shaft from the driving means, means tending to rock the shaft in the direction to engage the pawl and clutch, a latch also secured to the rock-shaft, a pivoted latch-lever O^5 adapted to engage the latch on the rock-shaft and hold the stop-pawl out of contact with the clutch, stop-levers O^8, O^9 , adjustably connected with the lever O^5 so that their stop-supporting ends can be made to approach or recede from each other, means for securing the stop-levers in fixed relation to the latch-lever O^5 so that said levers will move together around the pivot of lever O^5 , whereby the movement of the stop-levers will shift the latch-lever out of engagement with the latch on the rock-shaft, a manually-operated device for rocking the rock-shaft to disengage the stop-pawl from the clutch, means connecting said device with the levers aforesaid whereby the same movement which disengages the pawl turns the stop-levers to starting position and the lever O^5 to position to engage the latch on the rock-shaft, a rack secured to the feed-table of the machine, a reciprocating pawl or pawls for actuating said rack and table, a pawl-disengaging finger whereby said pawl or pawls are held out of operative position, means actuated by the movement of the rock-shaft whereby said finger is actuated to disengage the pawls substantially simultane-

ously with the stoppage of the machine, a friction-clamp acting to steady the movements of the feed-table, a tension-clamp for the lower thread and means actuated by the movement of the rock-lever to stop the machine for relieving the pressure of said clamps.

3. In a buttonhole-sewing machine having means for driving it coupled to its main shaft by a clutch, a longitudinally-movable rock-shaft having a stop-pawl secured to it and means tending to move the shaft and pawl to position to disengage the clutch, the engagement of the clutch and stop-pawl acting to shift the rock-shaft longitudinally in one direction and a spring tending to move it in the opposite direction, the combination with stop mechanism actuated by the feed-table and coupled to the rock-shaft as described so that the setting of the stops in position to begin a buttonhole disengages and holds disengaged the stop-pawl and the movement of the stop at the end of the buttonhole releases the rock-shaft and pawl, one or more feed-pawls acting to move the feed-table and means actuated by the longitudinal movement of the rock-shaft for engaging and disengaging said pawls.

4. In a buttonhole-sewing machine having means for driving it coupled to its main shaft by a clutch, a longitudinally-movable rock-shaft having a stop-pawl secured to it and means tending to move the shaft and pawl to position to disengage the clutch, the engagement of the clutch and stop-pawl acting to shift the rock-shaft longitudinally in one direction and a spring tending to move it in the opposite direction, the combination with stop mechanism actuated by the feed-table and coupled to the rock-shaft as described so that the setting of the stops in position to begin a buttonhole disengages and holds disengaged the stop-pawl and the movement of the stop at the end of the buttonhole releases the rock-shaft and pawl, a friction-clamp for steadying the movement of the feed-table and means actuated by the longitudinal movements of the rock-shaft for shifting said clamp from and to operative position.

5. In a buttonhole-sewing machine having means for driving it coupled to its main shaft by a clutch, a longitudinally-movable rock-shaft having a stop-pawl secured to it and means tending to move the shaft and pawl to position to disengage the clutch, the engagement of the clutch and stop-pawl acting to shift the rock-shaft longitudinally in one direction and a spring tending to move it in the opposite direction the combination with stop mechanism actuated by the feed-table and coupled to the rock-shaft as described so that the setting of the stops in position to begin a buttonhole disengages and holds disengaged the stop-pawl and the movement of the stop at the end of the buttonhole releases the rock-shaft and pawl, a tension-clamp for the

lower thread and means actuated by the longitudinal movements of the rock-shaft for releasing and applying said clamp.

6. In a buttonhole-sewing machine having means for driving it coupled to its main shaft by a clutch, a longitudinally-movable rock-shaft having a stop-pawl secured to it and means tending to move the shaft and pawl to position to disengage the clutch, the engagement of the clutch and stop-pawl acting to shift the rock-shaft longitudinally in one direction and a spring tending to move it in the opposite direction, in combination with stop mechanism actuated by the feed-table and coupled to the rock-shaft as described so that the setting of the stops in position to begin a buttonhole disengages and holds disengaged the stop-pawl and the movement of the stop at the end of the buttonhole releases the rock-shaft and pawl, one or more feed-pawls acting to move the feed-table, a friction-clamp for steadying the movement of the feed-table, a tension-clamp for the lower thread and means actuated by the longitudinal movement of the rock-shaft for engaging and disengaging said pawls and clamps.

7. In a buttonhole-sewing machine the combination with the stationary table of the machine having guideways $A^2 A^2$ for the movable table which permit said movable table some freedom of angular adjustment, of a spring-actuated movable friction-clamp acting against the lateral edge of the movable table, stop mechanism for arresting the movements of the machine and means for retracting the friction-clamp actuated by said stop mechanism.

8. In a buttonhole-sewing machine the combination with the stationary table of the machine having guideways $A^2 A^2$ for the movable table which permit said movable table some freedom of angular adjustment, of a fixed pivoted friction-clamp acting against one lateral edge of the movable table, a spring-actuated movable clamp-holder supported on the fixed table on the opposite side of the movable table and supporting a pivoted clamp which in operation presses against the edge of said table, stop mechanism for arresting the movement of the machine and means actuated by said stop mechanism for retracting the clamp-holder when the motion of the machine is arrested.

9. In a buttonhole-sewing machine, the combination with the stationary table of the machine having guideways $A^2 A^2$ for the movable table which permit said movable table some freedom of angular adjustment, said guideways having on one side a segmental recess A^4 and on the other a guideway A^3 , a work-holding table J moving in the guideways A^2 , a clamp R resting against one edge of said table and fitting in recess A^4 , a slide R^2 moving in guideway A^3 and having a segmental recess at its end, a clamp R' supported in said recess and resting against the edge

of the table and a spring acting to force the slide R^2 inward and press the clamp R' against the table edge.

10. In a buttonhole-sewing machine having
5 a stop mechanism for arresting the motion of the machine the combination of a spring friction-clamp for steadying the motion of the movable table, with a spring-actuated tension-clamp for the lower thread, a lever
10 Q Q^3 arranged to simultaneously release the spring-pressure on said clamps and means for actuating said lever operated by the movements of the stop mechanism of the machine.

11. In a buttonhole-sewing machine the
15 combination with the rotatable table having a detent-recess J^3 and a slot J^9 , of a relatively movable segmental rack secured to said table by guideways, a latch-lock K^7 for securing the rack to the table in normal position, a pin
20 K^9 secured to the lock K^7 and extending through slot J^9 , a lever pivoted on the top of the table for releasing the lock and shifting the rack through engagement with pin K^9 and a spring tending to return the lever lock
25 and rack to normal locked position.

12. In a buttonhole-sewing machine having a sliding feed-table J and a rotatable table J^4 supported on said table J the combination of means for intermittently feeding table J with
30 a finger S^2 adapted when moved to disconnect said feed mechanism, a movable segmental rack secured in segmental guideways on the rotatable table, a spring acting to return and hold the movable rack to normal position, a
35 feed-worm C^{11} arranged to engage the rack and operate it and the rotatable table to form the eye of the buttonhole and a cam V' acting as the sliding table advances to push back the rack against the spring and to release the rack
40 and allow it to move into its normal locked position when the eye of the buttonhole is reached, the finger S^2 being so placed as to contact, or nearly so, with cam end K^5 of rack when in normal position, so as to be moved by
45 said cam end, immediately upon the movement of the rack incident to the making of the first circular stitch.

13. In a buttonhole-sewing machine having a sliding feed-table J and a rotatable table J^4
50 supported on said table J the combination of means for intermittently feeding table J , with a finger S^2 adapted when moved to disconnect said feed mechanism, a movable segmental rack secured in segmental guideways
55 on the rotatable table and having a cam K^5 K^4 , a spring acting to return and hold the movable rack to normal position, a feed-worm C^{11} arranged to engage the rack and operate it and the rotatable table to form the eye of
60 the buttonhole, and a cam V' acting as the sliding table advances to push back the rack against the spring and to release the rack when the eye of the buttonhole is reached,

the finger S^2 being so placed as to contact, or nearly so, with cam end K^5 of rack when in
65 normal position, so as to be moved by said cam end, immediately upon the movement of the rack incident to the making of the first circular stitch.

14. In a buttonhole-sewing machine having
70 a sliding feed-table J and a rotatable table J^4 supported on said table J , the combination of means for intermittently feeding table J , with a finger S^2 adapted when moved to disconnect said feed mechanism, a movable seg-
75 mental rack secured in segmental guideways on the rotatable table and having a cam K^5 K^4 , spring acting to return and hold the movable rack to normal position, a feed-worm C^{11}
80 arranged to engage the rack and operate it and the rotatable table to form the eye of the buttonhole, a cam V' acting as the sliding table advances to push back the rack against the spring and to release the rack when the
85 eye of the buttonhole is reached the finger S^2 being so placed as to contact, or nearly so, with cam K^5 at the end of the rack when released from cam V' , and a stop V^2 acting to engage the rack and hold the movable plate
90 J and all attached parts in position for stitching around the eye of the buttonhole.

15. In a buttonhole-sewing machine having a sliding feed-table J , means for actuating the feed-table as described, a rotatable table J^4 secured to table J and a worm C^{11} for actuating
95 the rotatable table, the combination of a segmental rack movable in segmental bearings on table J^4 with a spring acting to return the rack to normal operative position, and a cam
100 V' acting to hold the rack out of normal position while the first portion of the buttonhole is being stitched and to release it when the eye is reached, the worm C^{11} being placed to engage the rack as it moves to normal position on the table J^4 .
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16. In a buttonhole-sewing machine having a sliding feed-table J , means for actuating the feed-table as described, a rotatable table J^4 secured to table J and a worm C^{11} for actuating
110 the rotatable table, the combination of a segmental rack movable in segmental bearings on table J^4 with a spring acting to return the rack to normal operative position, a cam V' acting to hold the rack out of normal position while the first portion of the buttonhole
115 is being stitched and to release it when the eye is reached, the worm C^{11} being placed to engage the rack as it moves to normal position on the table J^4 , and a stop V^2 acting to hold the sliding table stationary while the
120 eye is stitched by abutting against the edge of the rack.

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Witnesses:

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