

No. 713,764.

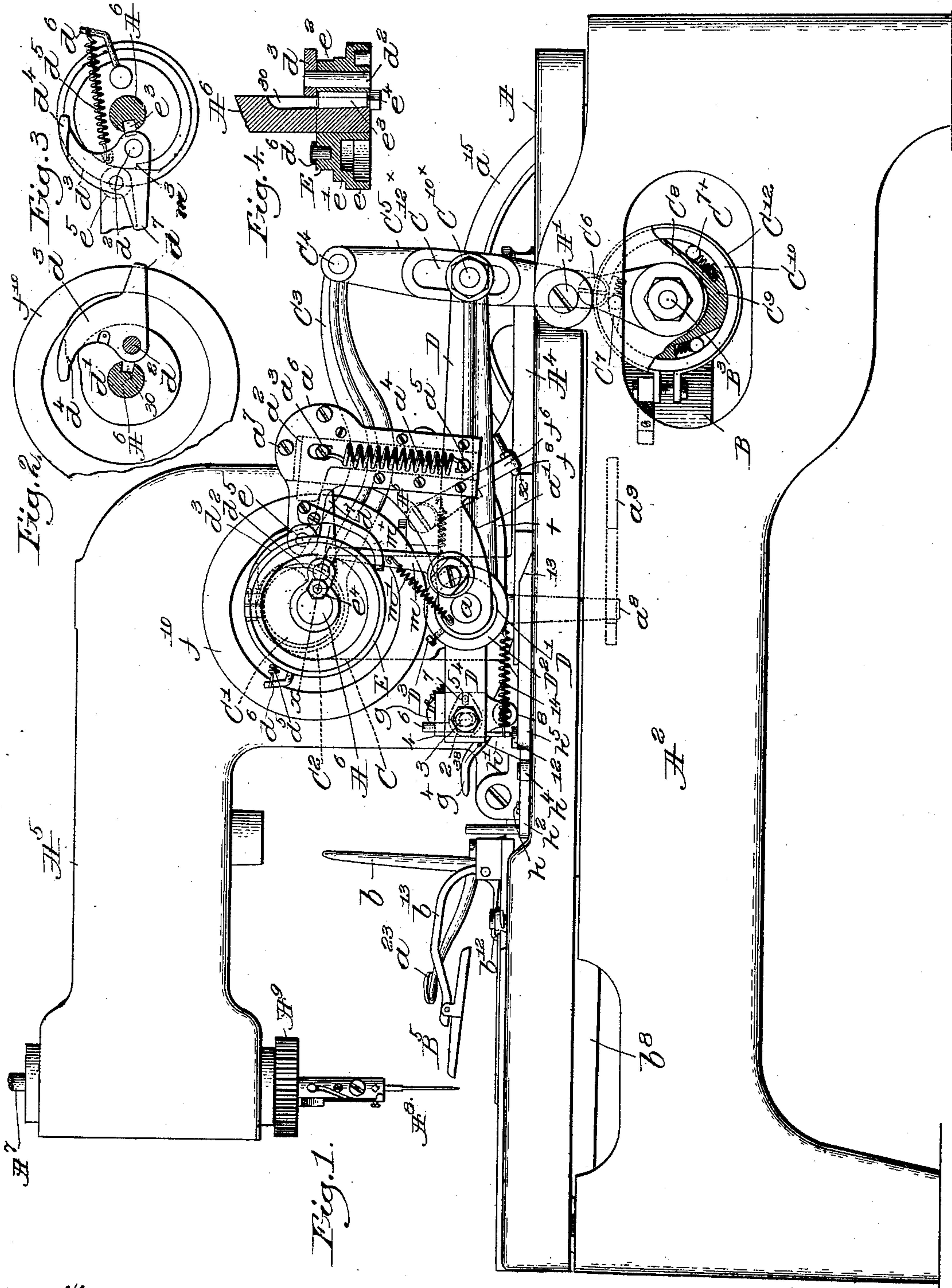
Patented Nov. 18, 1902.

G. S. HILL.
BUTTONHOLE SEWING MACHINE.

(Application filed Feb. 20, 1902.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses:
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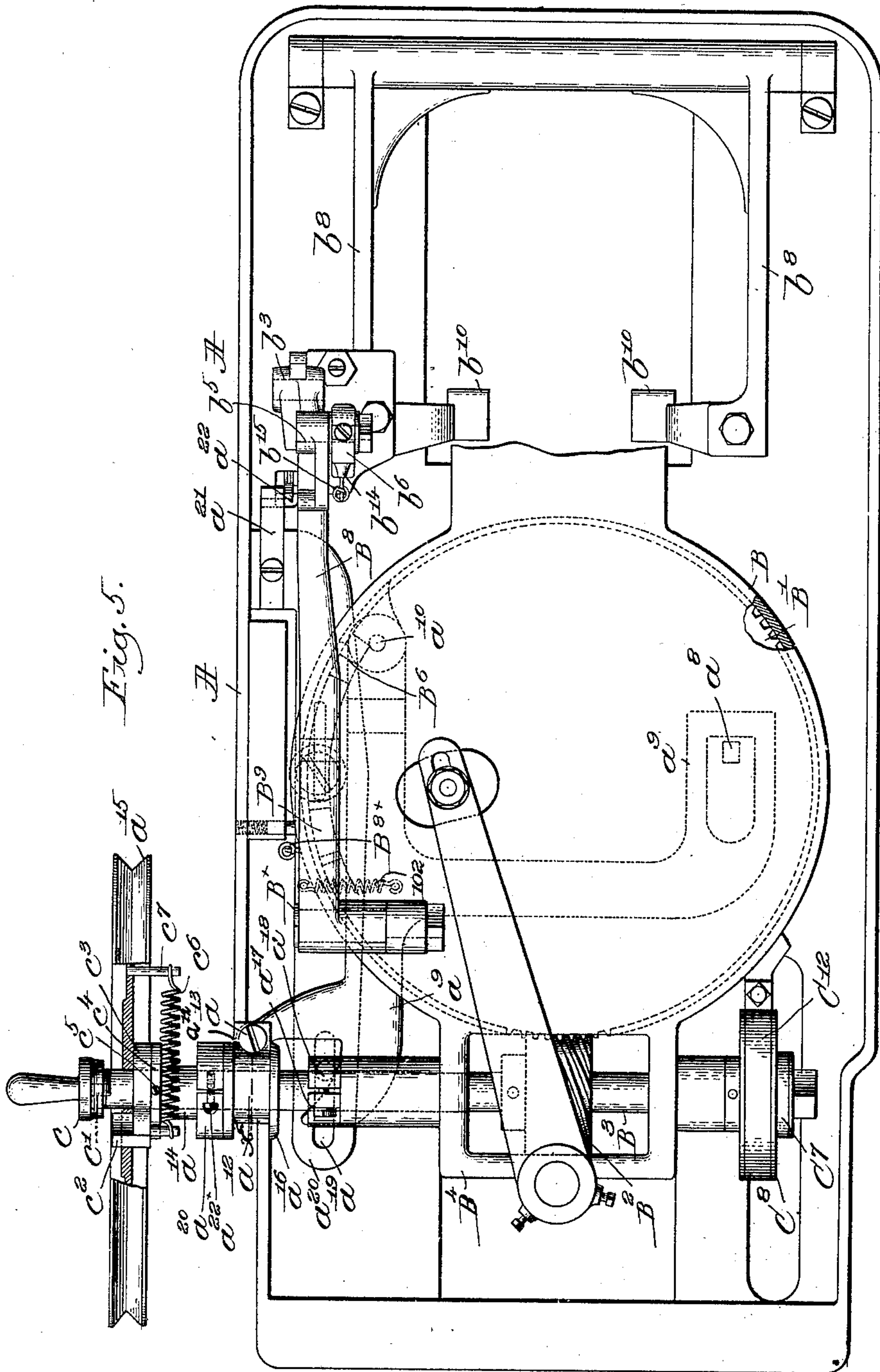
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4 Sheets—Sheet 2.



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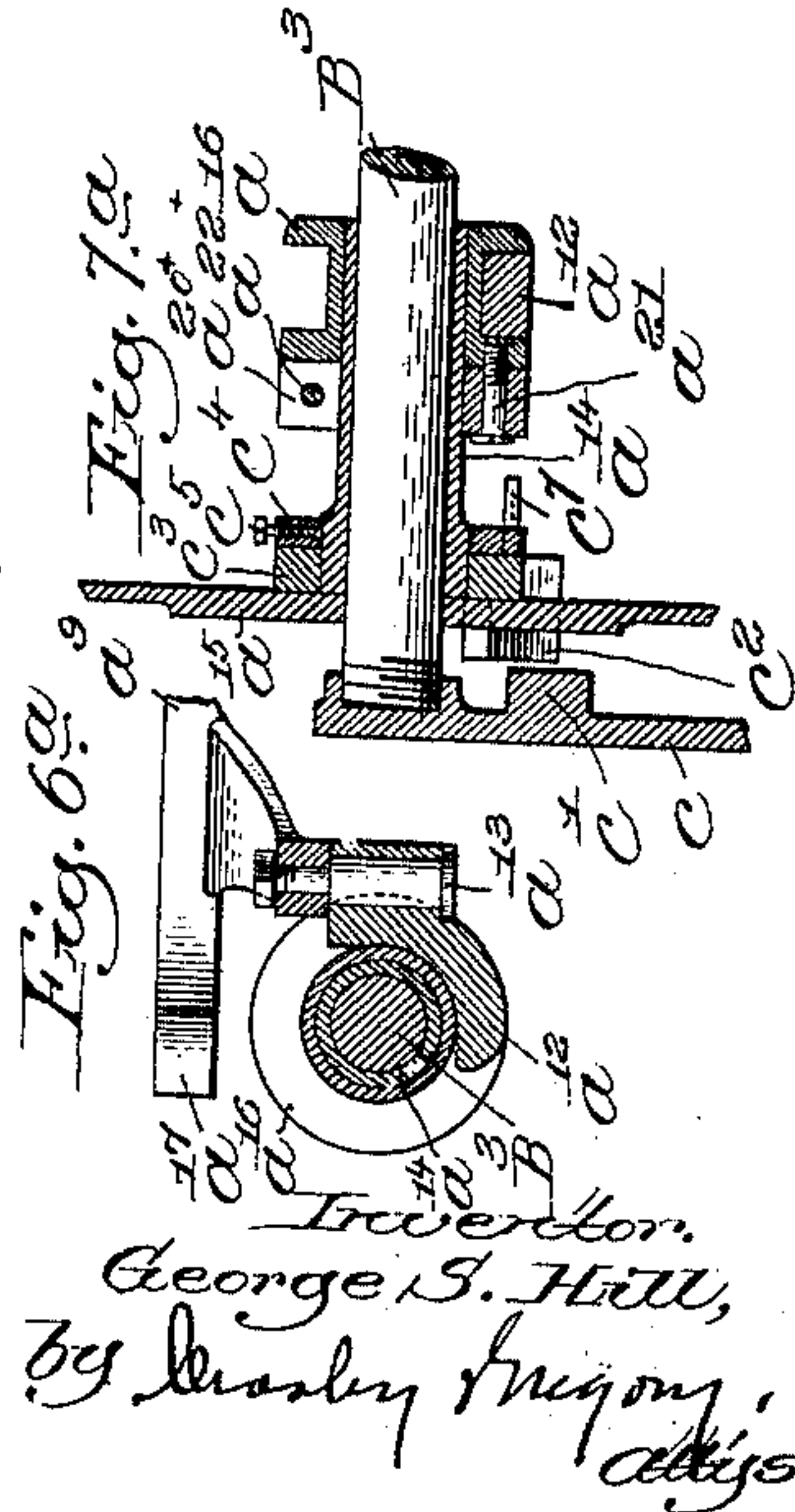
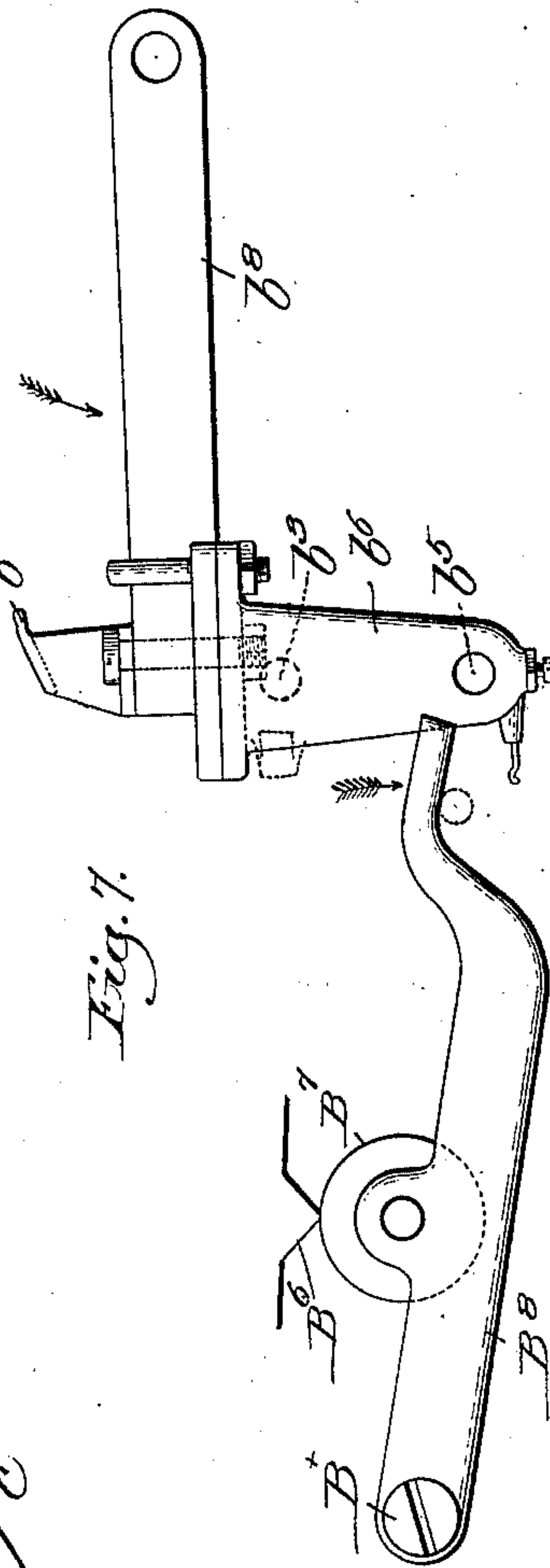
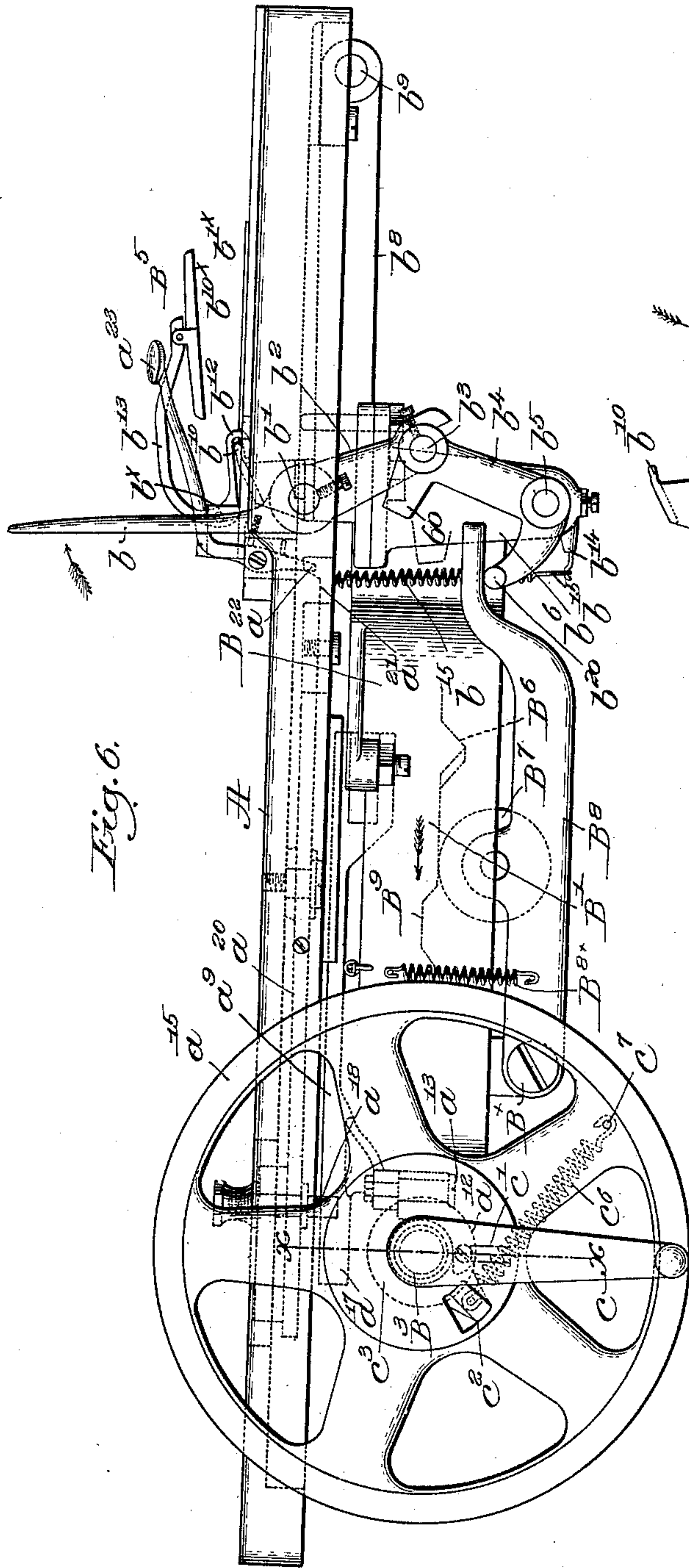
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4 Sheets—Sheet 3.



Witnesses:
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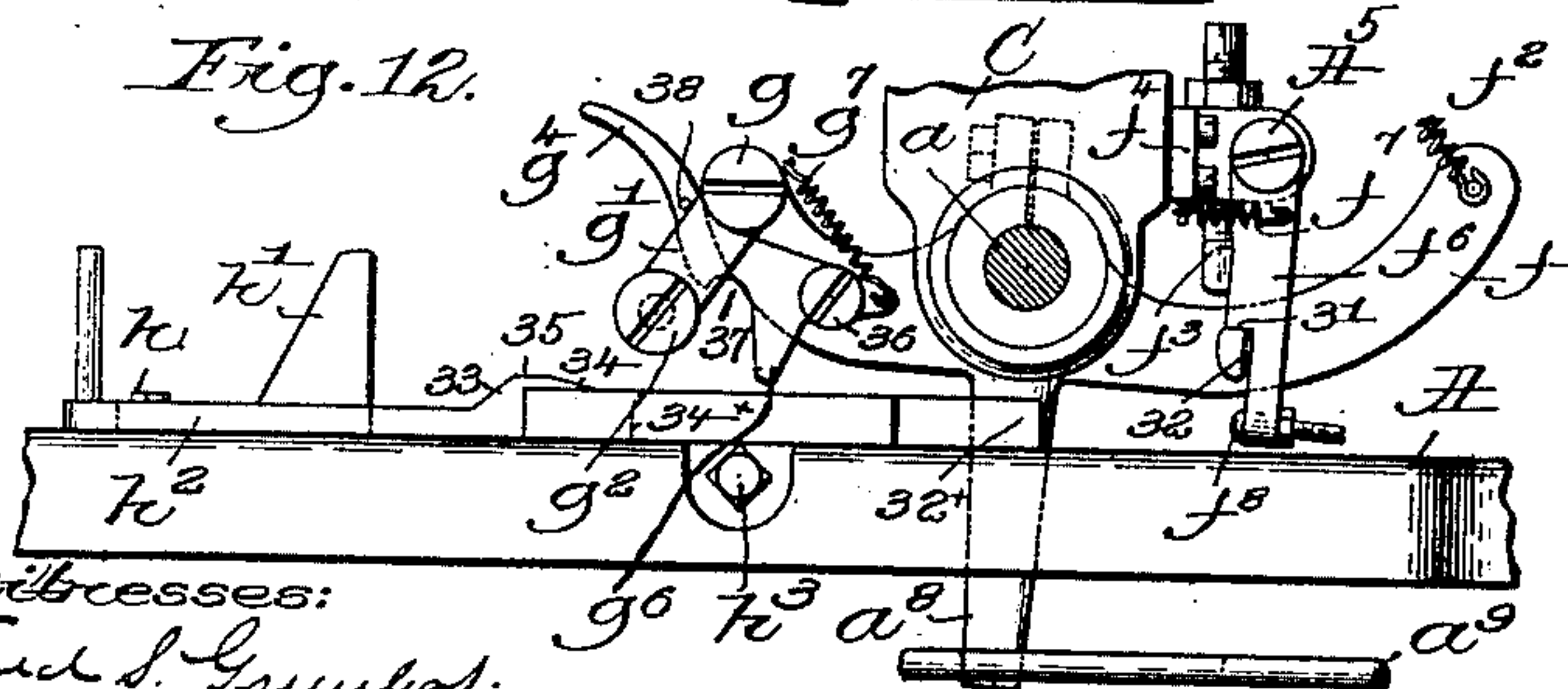
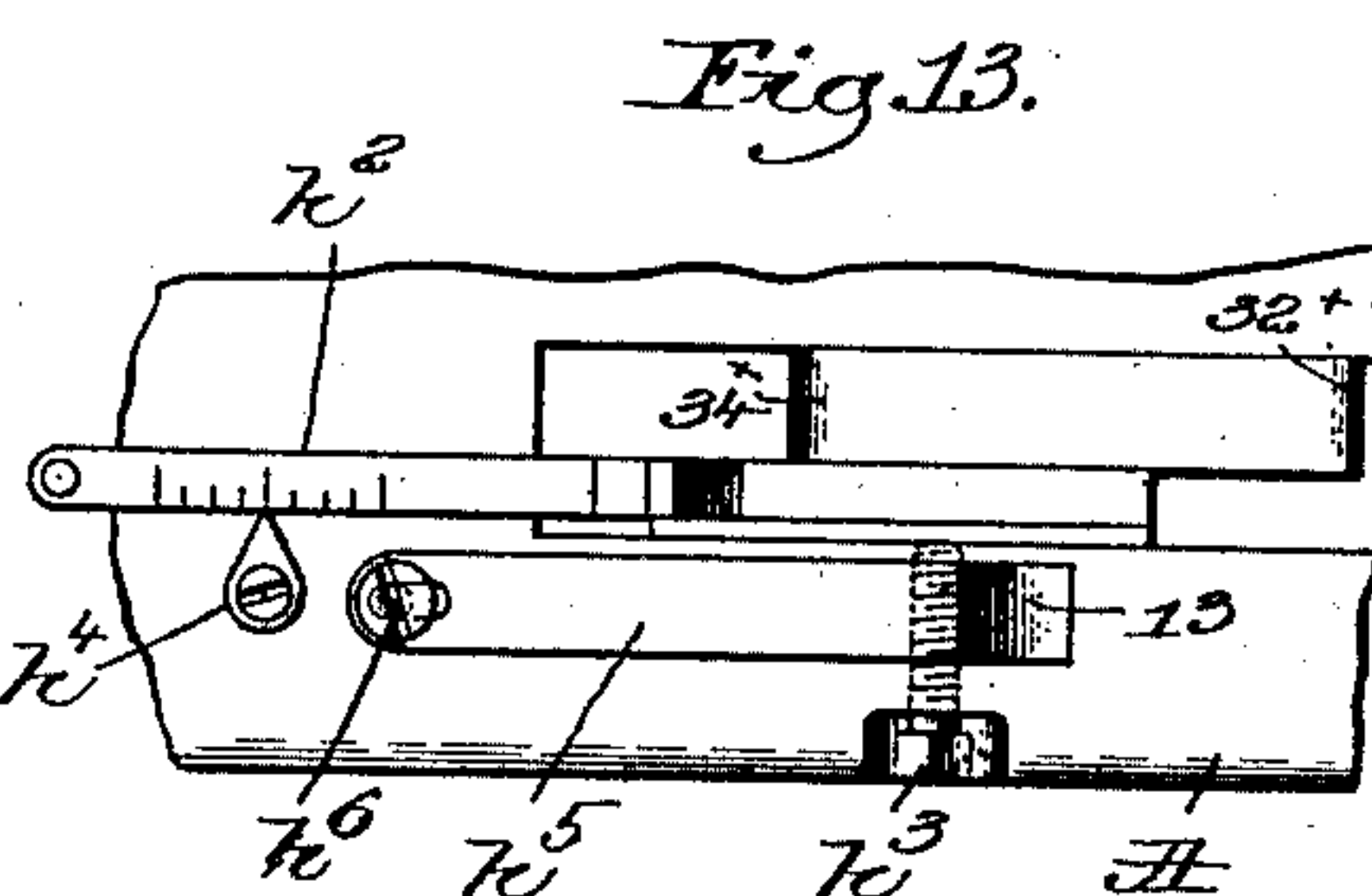
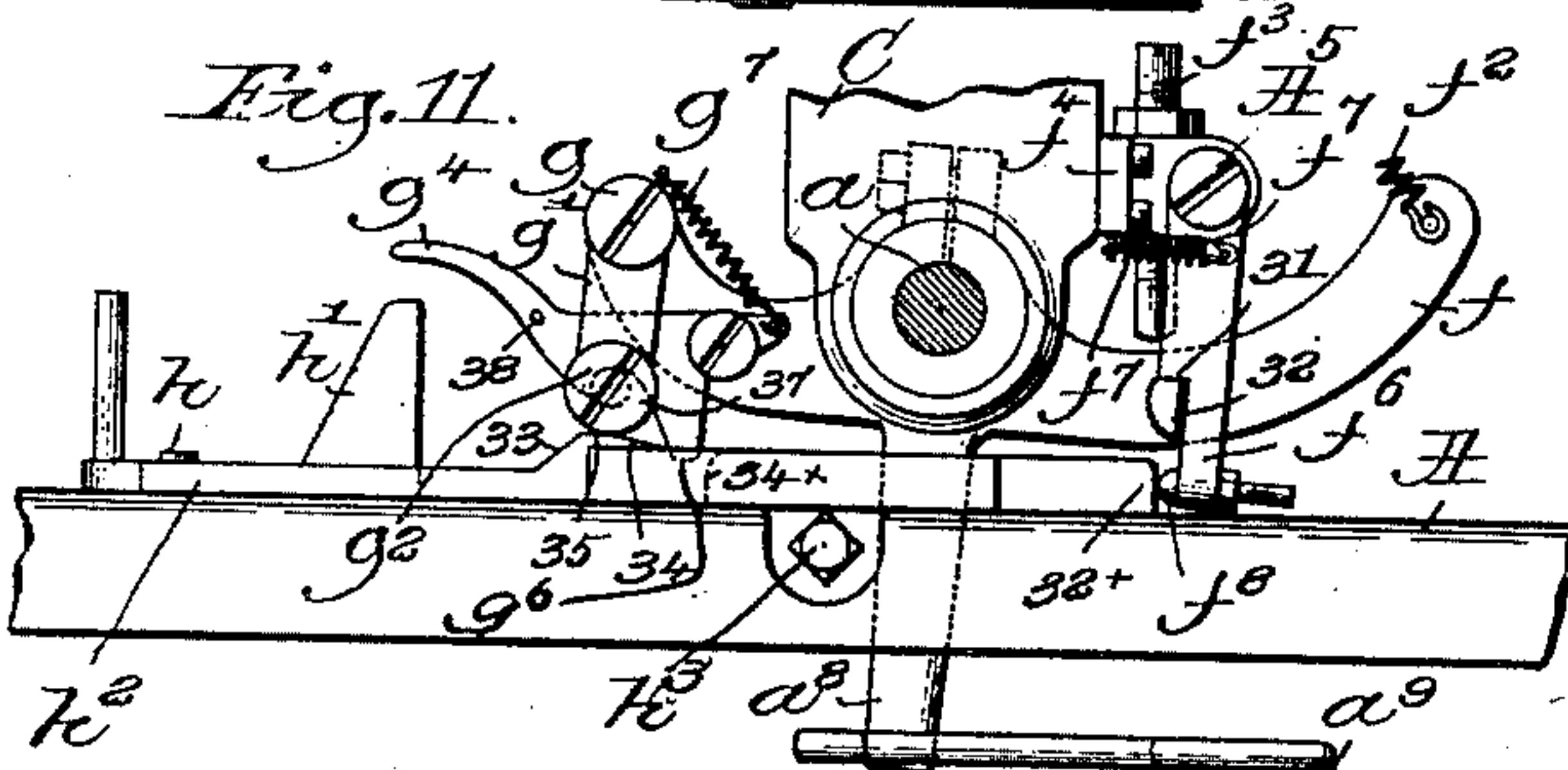
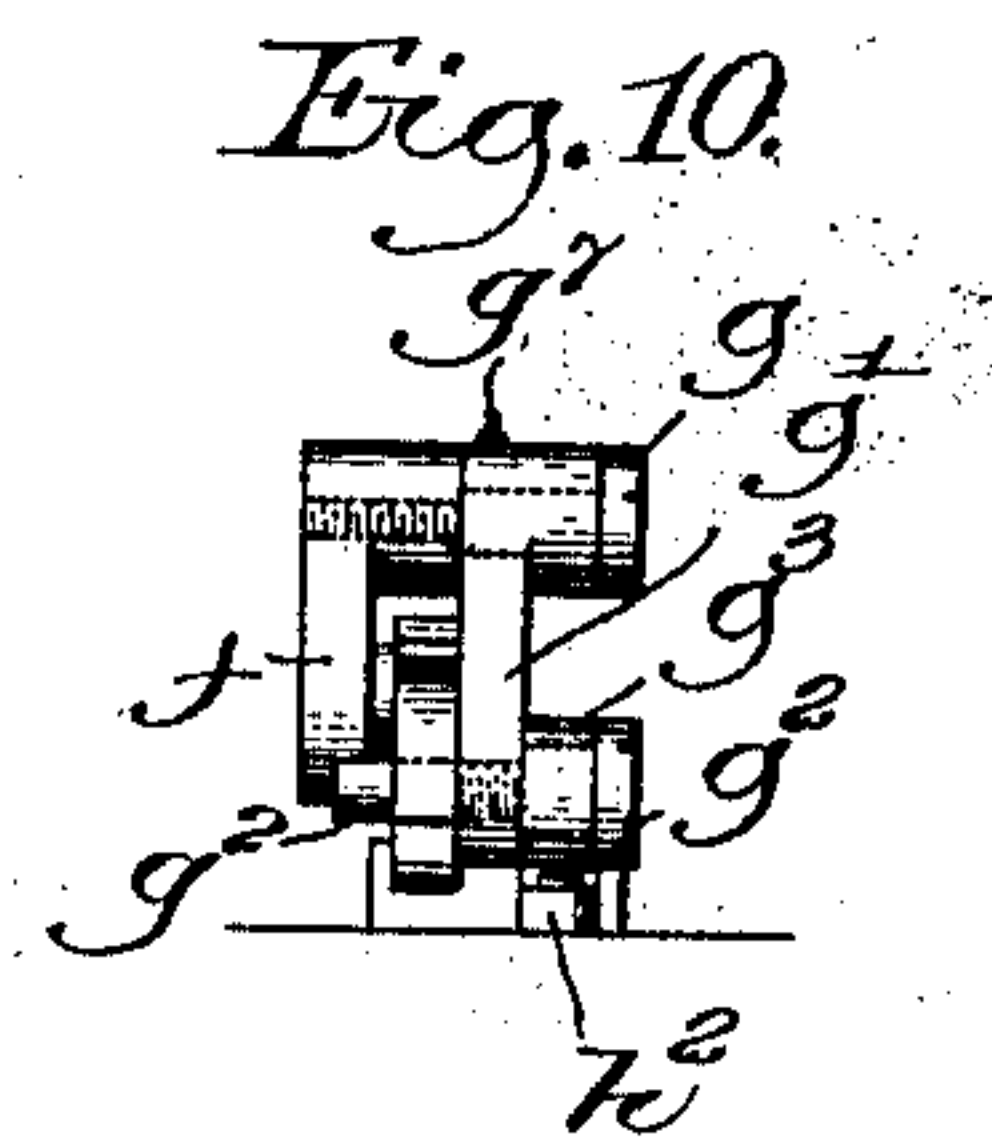
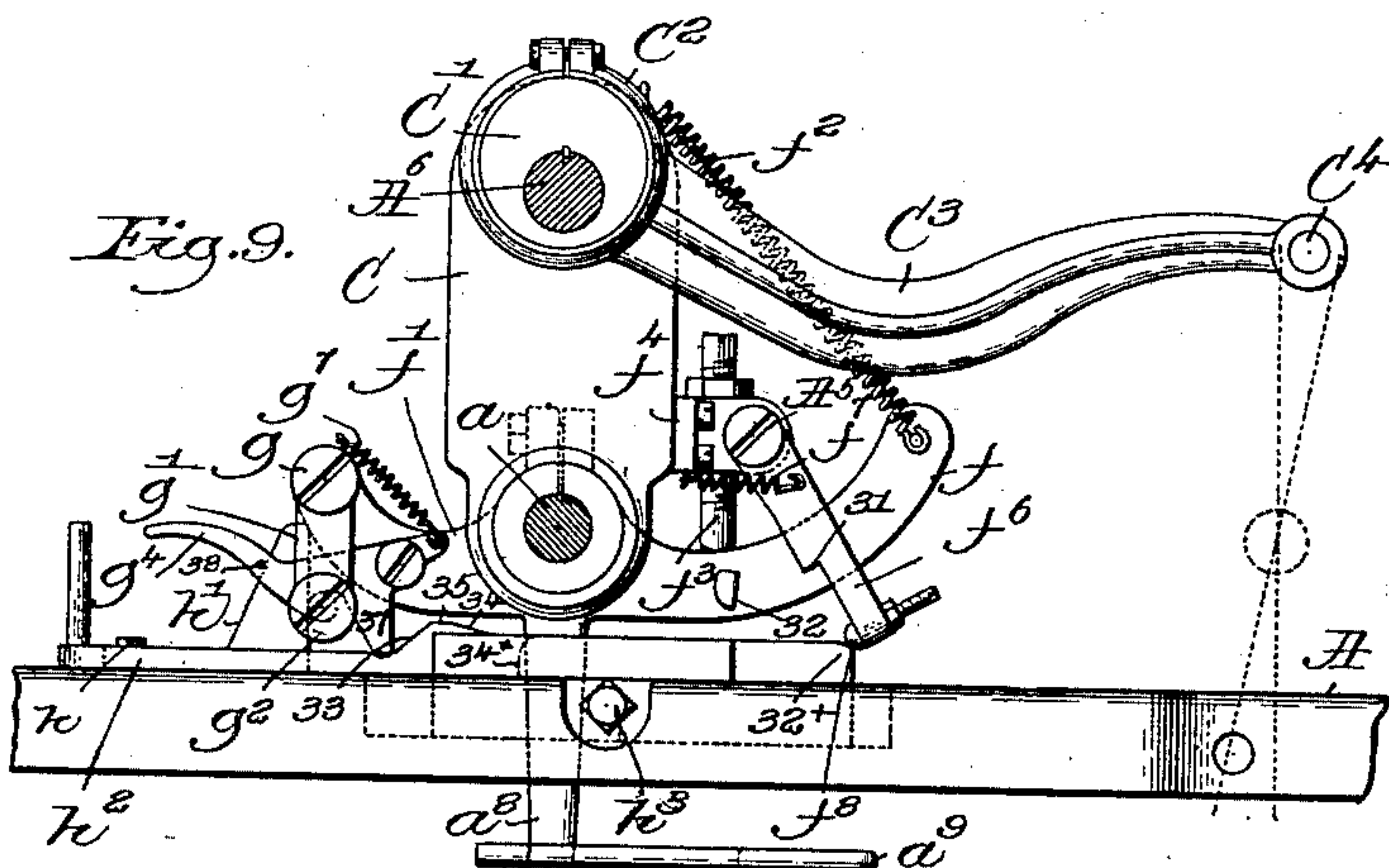
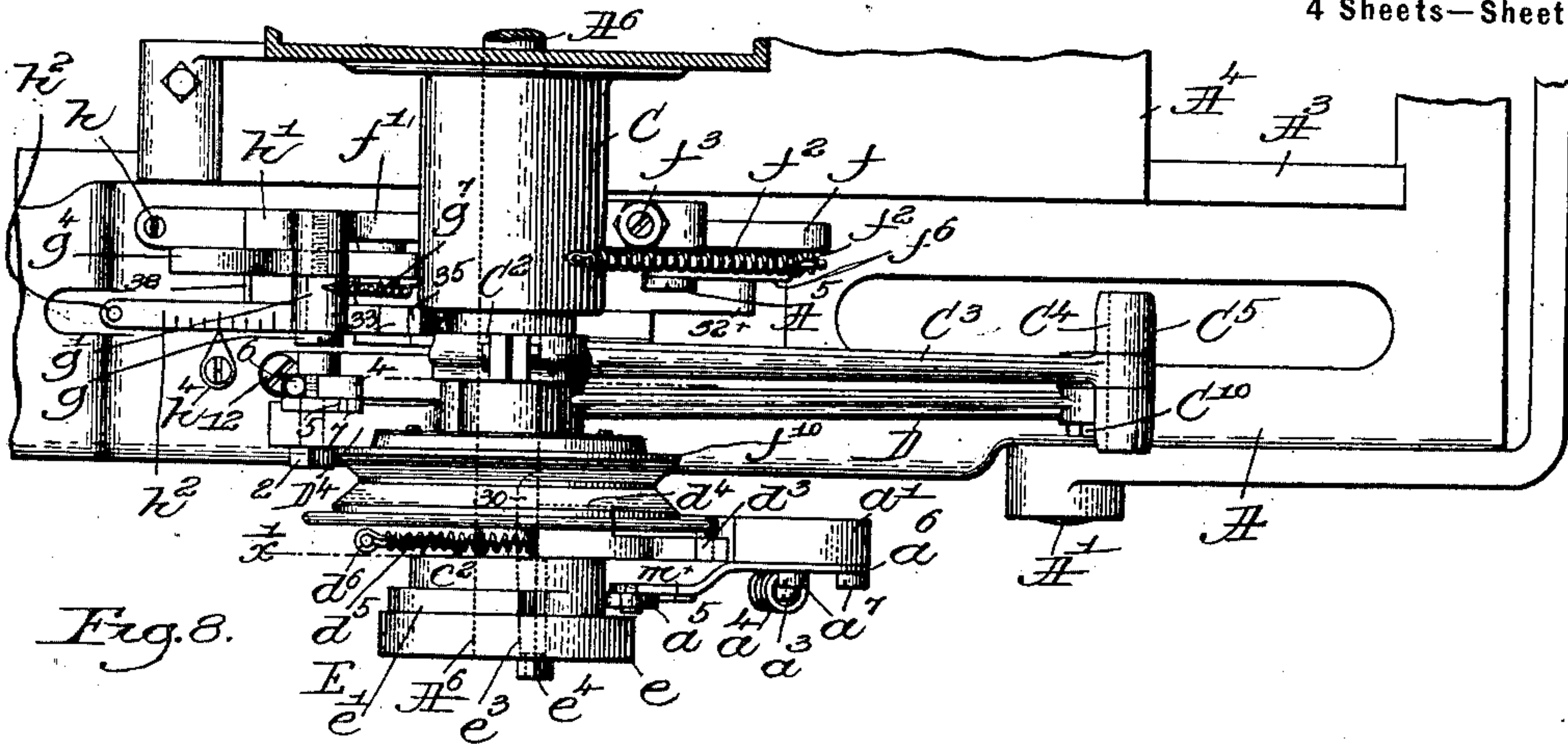
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BUTTONHOLE SEWING MACHINE.

(Application filed Feb. 20, 1902.)

(No Model.)

4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

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BUTTONHOLE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 713,764, dated November 18, 1902.

Application filed February 20, 1902. Serial No. 94,869. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. HILL, a citizen of the United States, residing at Haverhill, in the county of Essex and State of Massachusetts, have invented an Improvement in Sewing-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

10 This invention has for its object improvements relating more especially to the so-called "Reece" type of buttonhole-sewing machine represented in United States Patents Nos. 349,359 and 655,637, the particular features of the invention to be herein claimed

15 being fully described in the following specification, the present improvements increasing the efficiency of the machine and simplifying the construction thereof.

20 Figure 1 is a right-hand side elevation of part of a sewing-machine of the type named containing my present invention, the clutch mechanism for actuating the feed-shaft being broken out. Fig. 2 is a detail of the inner side of the belt-pulley made to constitute

25 part of a clutch and the clutch-dog. Fig. 3 is an inside view showing the stop-wheel carrying the clutch-dog, said figure showing the cam that permits the clutch-dog to be moved to release the belt-pulley only at a definite

30 position of the stop-wheel and shaft carrying it. Fig. 4 is a sectional detail in the line x , Fig. 1. Fig. 5 is an under side view of the machine shown in Fig. 1 with the loose driving-pulley on the feed-shaft broken out. Fig.

35 6 is a detail looking at the left-hand side of the machine chiefly to show the parts instrumental in closing the clamp automatically or by hand and the starting-lever. Fig. 6^a is a sectional detail in the line x^2 , Fig. 5. Fig. 7

40 is a detail showing some of the parts represented in Fig. 6 removed and in a different position. Fig. 7^a is a longitudinal section of part of the pulley a^{15} , its hub, and the parts surrounding it, and the arm c , fixed to the

45 feed-shaft. Fig. 8 is a partial plan view of the right-hand side of the machine, showing the main shaft and some parts connected therewith. Fig. 9 is a detail of parts at the

50 right-hand side of the machine back of the

dotted line x' , Fig. 8. Fig. 10 is a detail looking at Fig. 9 from the left, the device h being omitted. Fig. 11 is a detail of some of the parts shown in Fig. 9, but in a different position. Fig. 12 is yet another detail showing the parts represented in Figs. 9 and 11 in other positions, and Fig. 13 is a plan view of part of the bed-plate with the controllers thereon.

The work-clamp-carrying frame A, pivoted 60 at A' on the stationary frame part A² and having suitable ways A³, one of which is shown in Fig. 8, on which may slide the clamp-frame, the stitch-frame comprising a plate A⁴, having an overhanging arm A⁵ and 65 a curb B, the overhanging arm having bearings for the stitch-shaft A⁶, that actuates stitch-forming mechanism comprising a needle-bar A⁷, carrying an eye-pointed needle A⁸ and free to slide in a gear A⁹, and comple- 70 mental parts located below the bed-plate, and an under-thread-carrying needle, and a looper are and may be all as fully described in said patents, and the stitch-forming mechanism used in the mechanism herein described 75 will be actuated by means common to said patents and therefore not necessarily herein fully illustrated, and the stitch-frame and clamp-frame will have their relative positions changed before stitching, while stitching, and 80 after the completion of the stitching, all as provided for in said patents.

The work-clamp B⁵, composed of plates b^x , having lugs on which are pivoted at b^x levers b^{13} , having hooked arms b^{12} and carrying the 85 pivoted feet b^{10x} , that may descend on the material sustained by the under plates b^x , the circular cam B', grooved at its upper and lower sides and having at its periphery worm-teeth to be engaged and rotated by the teeth 90 of a worm B², fast on the feed-shaft B³, sustained by said curb, are common to the Reece machine, one form of which is represented in United States Patent No. 655,637. The cam B' is provided with usual grooves to cause 95 the change of position of the stitch-frame, carrying the stitch-forming mechanism, with relation to the work-clamp B⁵, and said cam in practice will have at its upper side, about its center of rotation, as provided for in Fig. 100

6 of said Patent No. 655,637, a suitable projection to actuate at the proper times buttonhole-cutting mechanism fully shown in that patent. The cam B' has at its lower side a recess B⁹ and a projection B⁶. (See Fig. 6.) The projection acts on a roller or other stud B⁷, mounted on a lever B⁸, pivoted at B^x on a lug connected with the curb and depresses said lever against the stress of a spring b¹⁵, and said spring lifts said lever when the roller arrives opposite the recess B⁹. The shaft A⁶ when rotated actuates, through devices fully shown in said patents, stitch-forming mechanism such as therein represented. The shaft A⁶, just outside the hub C, forming one of the bearings therefor, has an eccentric C', Fig. 9, that is embraced by the eccentric-strap C² of an arm C³, that is (see Figs. 8 and 9) connected by a suitable stud C⁴ with the upper end of a lever C⁵, jointed at its lower end by a suitable stud-screw C⁶ (see dotted lines, Fig. 1) with an arm C⁷, connected with one part C⁸ C⁹ of a reciprocating clutch, the part C⁹ having suitable inclined notches containing rolls C^{7x}, that when said part is moved in one direction engages the inner side of the second member of the clutch, shown as a flanged wheel C¹⁰, connected with and moving said feed-shaft B³. The wheel C¹⁰ is embraced by a suitable friction-band C¹², that prevents it from being moved farther than carried positively by the rolls. The feed-shaft B³ is rotated intermittently by the clutch C⁹ and C¹⁰ throughout the time that the stitch-forming mechanism is actuated to form stitches, and the separation of the depth-stitches one from another is regulated by the position of the stud C^{10x} (see Fig. 1) in the slot C^{12x} of the lever C⁵. The stud C^{10x} is carried at one end of a lever D, the hub of which (see Fig. 1) is fitted loosely over a boss D' of the stitch-frame, said hub being retained on said boss by means of a collar D², held in position by means of a set-screw D³. The lever D has a rearwardly-projecting arm D⁴, provided with a hole that receives a stud-screw 3. The stud-screw passes through a slot in an adjustable plate 4, and the threaded end of the screw enters a lever 6, having a notch 5, said screw forming the fulcrum for said lever. The plate 4 has a stud 7, that enters the slot 5, so that whenever the screw is loosened somewhat the lever may be turned and the plate 4 may be raised or lowered with relation to the end D⁴ of the lever D, to thereby place the roller or other stud 8, carried at the lower end of said plate, in proper position to determine the spacing of the stitches for the straight part of the buttonhole. Normally when the sides of the buttonhole are being stitched the roller 8 rests on the high part of the stitch controller-bar h⁵, adjustably secured to the bed A by means of a suitable screw, as 12, the adjustment of said bar providing for the stitching of buttonholes differing in length. The right-hand end, Fig. 1, of the controller is beveled, as at 13, and the roller 8 rolls down this bevel when

the stitching is being commenced at one side of the eye and remains in its low point while stitching the round part of the eye, the stitch-frame and stitch-forming mechanism at such time moving, let it be supposed, to the right, Fig. 1, and when the second side of the buttonhole is to be stitched the stitch-frame and stitch-forming mechanism are moved to the left, the roller 8 then riding up the incline 13 onto the top of the controller-bar. The roller 8 is kept in contact with the face of the controller by a suitable spring 14. The rock-shaft a has connected with its outer end a clutch-dog-actuating lever a', provided with a suitable groove (shown by dotted lines, Fig. 1) that receives a lug a², having a stud a³, to which is connected one end of a spring a⁴, said spring being connected at its lower end with a stud a⁵, fixed to the plate a⁶, secured to said lever by suitable screws a⁷, said spring normally acting to depress the dog a² into the position shown in Fig. 1. The opposite end of the rock-shaft a has a depending arm a⁸, forming part of a three-armed lever that actuates at times a lever a⁹, pivoted at a¹⁰, said lever having secured thereto by a screw a¹³ a finger a¹². The lever a⁹ has a backwardly-extended toe, one face of which is inclined, as at a¹⁷, and said incline contacts with a stud a¹⁸, (shown by dotted lines, Fig. 5,) made adjustable in a slot a¹⁹ in a lever a²⁰, located at the under side of the bed-plate, the forward end of said lever having a dog a²¹, all as shown in United States Patent No. 655,637, that is acted upon by the lower end a²² of a starting-lever a²³, the movement of which starts the machine to go through a cycle of operations, as provided for in United States Patent No. 494,280, dated March 28, 1893. The pulley a¹⁵ is actuated continuously and coupled to the feed-shaft whenever it is desired to rotate said shaft at high speed. The starting-lever a²³ is depressed whenever it is desired to cause the pulley a¹⁵, running loosely on the feed-shaft B³, to be engaged with and start said shaft B³, said pulley rotating said shaft at a faster speed as when the stitch-frame carrying the stitch-forming mechanism is being changed in its position with relation to the work-clamp and buttonhole-cutting mechanism that the buttonhole may be cut preparatory to starting the stitch-forming mechanism to stitch a buttonhole, and the starting-lever having been operated and a buttonhole cut a cycle of operations of the machine is performed continuously until a buttonhole is fully stitched and the stitch-frame and work-clamp have arrived in their starting position, when the clamp is opened and the movement of the stitch-frame is stopped. During the stitching of a buttonhole as soon as the material has been cut and the stitch-forming mechanism arrives in proper position with relation to the cut material in the clamp the pulley a¹⁵ is moved to release the shaft B³, that it while the stitch-forming mechanism is acting to stitch a buttonhole may be moved intermit-

tingly, as described, at its slow speed, and the stitching having been carried entirely about the buttonhole the stitch-forming mechanism is stopped, and immediately thereafter the pulley a^{15} is again coupled to the feed-shaft B^3 , so that it immediately becomes the driver at a faster speed of the stitch-frame while the latter is moved into its starting position, when the belt pulley on the shaft A^6 and the pulley a^{15} on the shaft B^3 will be unclutched, leaving said shafts at rest. The arms b^8 , extend from the fulcrum b^9 and have projections b^{10} , that when the arms are moved in the direction of the arrow thereon, Fig. 7, engage the recessed lower ends b^{12} of the arms b^{13} of the cloth-clamp common to United States Patent No. 655,637, and one of said arms has a depending stand b^6 . The stand b^6 receives a stud b^5 , on which is pivoted one lever b^4 of a pair of toggle-levers, the second lever of the pair (marked b^2) being pivoted at b' on the clamp-frame, the two toggle-levers being jointed together at b^3 . The lever b^4 has an arm b^{20} , adapted to be acted upon by the lever B^8 . The descent of the lever B^8 turns the toggle-levers b^4 and b^2 until the connecting-pin is carried a little over the line of center, such movement of the levers firmly closing the clamp on the work and stretching the spring b^{15} , leaving the lever b^4 with its heel 60 in the position shown by dotted lines, Fig. 6. The clamp is opened automatically as the stitch-frame arrives in its starting position with relation to the work-clamp after the buttonhole has been fully stitched. The opening of the clamp is effected by the free end of the lever B^8 abutting the heel 60 of the lever b^4 , the end of said lever at the proper time in the movement of the stitch-frame toward its starting position permitting the roller B^7 to enter the space B^9 in the cam B' , and the free end of the lever having been raised said lever in the final movement of the stitch-frame into its starting position abuts the shoulder 60 and turns the said lever into the full-line position, Fig. 6, thus opening the clamp, and it is held open by the spring b^{15} ; but the cam B' is moved sufficiently before it is stopped to again depress the lever B^8 to substantially meet the arm b^{20} , as shown in Fig. 6, that the work-clamp may be closed and opened, if desired, by a manually-controlled device b , that I will now describe. In some instances, as when a thread breaks and a buttonhole has to be readjusted in order to commence the stitching of the same at the point where the stitching was left off due to the broken thread, and when stitching buttonholes where great accuracy in adjusting the material is desired it has been found very desirable to have means whereby the clamp may be closed and opened not only automatically, but also by hand, and consequently I have provided a manually-controlled device by which the clamp may be moved up and down at will to insure the correct placing of

the work preparatory to operating the automatic clamping means to start the machine.

The manually-controlled device herein shown consists of a lever b , pivoted on a stud b' and connected with the lever b^2 . When the lever b is turned in the direction of the arrow, Fig. 6, or forwardly, the levers b^2 and b^4 are turned in a direction to cause the clamp to clamp the material. The lever may be moved at will in either direction until the work is properly positioned under the work-clamp feet. Whenever the work has been properly positioned by the lever b , the clamp will be closed by turning said lever, and the toggle-levers will be carried fully to the left, the arm b^{20} being lowered away from the lever B^8 , and then the regular starting-lever a^{23} will be depressed to release the end a^{21} of the lever a^9 and let the spring 102 move the loose pulley a^{15} , to be described, and start the feed-shaft, the cam, and the stitch-frame at its faster speed, as hereinbefore provided for. If the clamp was closed automatically rather than by hand, the depression of the starting-lever would start the cam B' and cause the projection B^6 to meet the roller B^7 of the lever B^8 and depress said lever, so that its free end acting against the arm b^{20} of lever b^4 will turn the toggle-levers to close the clamp upon the work at the proper times, as provided for in said Patent No. 655,637, for a cycle of operations. The wheel a^{15} , loose on the feed-shaft B^3 , is substantially the same as represented in United States Patent No. 662,894, and the shaft B^3 has connected with one end thereof an arm c , provided with a lug c' , that whenever the wheel a^{15} is moved outwardly on the shaft B^3 by the lever a^9 , as when the feed-shaft is to be started at its high speed, is engaged by a lug c^2 , extended from one side of the pulley. The lug c^2 , herein shown, forms part of a collar c^3 , surrounding loosely the hub a^{14} of the wheel a^{15} , said collar being held against longitudinal movement on said hub by means of a suitable washer c^4 , held in place by a screw, as c^5 , and a spring c^6 , connected with a stud extended from said collar, and with a stud c^7 , extended from said wheel, normally acts to sustain the collar in such a manner that when the contact takes place between the lug c^2 and the lug c' the collar yields slightly to the impact of the blow, the spring c^6 permitting this to avoid shock in starting the machine. To adjust to a nicety the space between the lugs c' and c^2 , so that they may be engaged accurately at the desired times, I have provided the hub a^{14} of the pulley a^{15} with a grooved collar a^{16} , that is entered by the finger a^{12} , connected with one end of the lever a^9 , common to Patent No. 655,637, and to one end of this collar I have secured by a screw a^{21} a split ring a^{20} , that by the turning of a screw a^{22} effectually clamps the collar in any desired position on the hub of the pulley. This is shown in Fig. 7^a. The shaft A^6 for actuating the sewing mechanism

through means fully described and provided for in United States Patent No. 655,637 has loosely mounted upon it a belt-pulley f^{10} , substantially such as represented by like letter in United States Patent No. 655,637. The outer end of the stitch-shaft A^6 has a tapered key-seat 30, (see Fig. 4,) and said shaft receives a stop-wheel, represented as a hub E, comprising a hand part e , a cam e' , and a notched surface e^2 . The hub E is secured to the shaft A^6 by means of a key e^3 , tapered from the inner side of the hub outwardly to its outer side, the outer end of the key being the smaller and being threaded to receive a suitable nut, as e^4 , so that by the rotation of said nut and the movement of the key longitudinally the hub E may be firmly secured on the shaft, and the hub may be removed from the shaft by removing the nut from the key.

The hub E receives a pin d^2 , extended from the usual clutch-dog d^3 , having at its inner end a lip or projection d^4 , a suitable spring, as d^5 , connected with said clutch-dog and with a stud d^6 , also held in said hub, acting to keep the projection d^4 of the clutch-dog in contact with the cam d' of the belt-pulley while the stitch-forming mechanism is being actuated to stitch a buttonhole. While the belt-pulley is acting to rotate the shaft A^6 , the clutch-dog-controlling lever a' occupies such a position to the right of the position, Fig. 1, that the lug a^2 , carried by said arm, is out of the range of movement of the tail d' of the clutch-dog d^3 ; but whenever the stitch-forming mechanism is to be stopped the lever a' is moved in a direction to place the lug a^2 in the path of movement of the tail d' of the clutch-dog, so that when said tail meets said lug the clutch-dog will be turned to free the pulley f^{10} , so that thereafter said pulley driven constantly by a belt, (not shown, but fully provided for in said patent,) may run without turning the shaft A^6 , and the action of the stitch-forming mechanism will be instantly arrested. The cam e' of the hub E is shaped to act upon a stud e^5 , carried by the lever a' or by the plate a^6 , said stud being provided, preferably, with a roller, so that whenever the shaft a is turned in the direction to place the lug a^2 of the lever a' in position to meet the clutch-dog and release it from the cam d' to stop the rotation of the shaft A^6 the stud prevents the lug from meeting the clutch-dog only when the cam e' is in a defined position, and hence the unclutching of the belt-wheel can be effected only at an exact point. As the shaft A^6 is stopped to suspend the operation of the stitch-forming mechanism in the machine described in United States Patent No. 655,637 the arm a^8 is moved immediately, and as described in said patent the pulley a^{15} is clutched to the feed-shaft to start it to complete the cycle of operation of the machine and place the stitch-frame and work-clamp in their starting position. In said patent should the lever a' be released after the tail of the dog in the rotation of the belt-wheel passes the line of movement of the lug the tail of the clutch-dog would not be struck to turn said clutch-dog to release the belt-wheel from the shaft A^6 ; but the engagement of the pulley a^{15} with the feed-shaft would be effected and said shaft would be started, and during the premature start of the feed-shaft the needle, which might then be in the work, would be bent and the thread broken. The cam e' and stud e^5 obviate such accident, and the lug can catch and trip the clutch-dog only when the stud e^5 enters the low part of the cam e' , and consequently the shaft B^3 cannot be engaged with the pulley a^{15} to rotate said feed-shaft until the shaft A^6 is at rest. Whenever the stud enters the space of the cam just before the clutch-dog arrives in position to be struck by the lug then occupying a position in the path of movement of the clutch, the belt-wheel will be immediately released and the pulley a^{15} will be clutched to shaft B^3 for the final movement of the stitch-frame. The bed A has connected with it by a screw h a stop h' , alongside of which is located the length-controlling bar h^2 , the position of which controls the length of buttonhole to be stitched. The bar h^2 is held in position by a set-screw h^3 , adjustment of the bar controlling the length of the buttonhole, a suitable pointer h^5 being employed in connection with marks on said bar to indicate the length of the buttonhole. The bar h^2 is provided with an incline 33, a high part 35 immediately following said incline, and the bar at the right of the high part 35 is cut away to avoid friction of the roller g^2 , to be described, on said bar, and said bar also has an incline 34. The arm a^8 , depending from the rock-shaft a , hereinbefore described, has two arms f f' extended therefrom. The arm f has a projecting stud 32 and a pin near one end, with which is connected a spring f^2 , that acts normally to lift the arm f against an adjustable stop f^3 , held in a stand f^4 , connected with the stitch-frame and provided with a projection f^8 . The stand has a stud-screw f^5 , on which is pivoted a latch f^6 , having a shoulder 31, that at times engages the lug 32 of the arm f , a spring f^7 acting normally to hold the latch in position to engage said lug, said latch being disengaged automatically from said lug when the stitch-frame is moved from the position Fig. 12 to the left into the position Fig. 9 in the latter part of the cycle of operations of the machine, the projection f^8 then meeting the right-hand end 32^x of the bar h^2 . The arm f' receives a stud-screw g , on which is pivoted a radius-bar g' , provided with a stud g^2 , that receives at one side said bar a roller-stud g^3 , the inner end of said stud (see Fig. 10) being shown as extended beyond the rear side of the arm f' . The arm f' also has pivoted upon it at 36 a device, shown as a lever g^4 , provided with a toe g^6 and a pin 38, the lever being notched at 37 to at times engage the stud g^2 . A spring g^7 , connected with the arm f' and the

lever g^4 , acts normally to hold the lever in a position shown by full lines, Fig. 9. Assuming that the stitch-frame containing the usual stitch-forming mechanism common to said Patent No. 655,637 is in the positions Figs. 2 and 9 and that the material to be stitched in the formation of a buttonhole is to be inserted in the open clamp that it may be cut, in this position of the parts the roller-stud g^3 occupies a position at the left of the incline 33, and the constantly-moving belt-pulley f^{10} is being turned freely about the shaft A^6 , that actuates the stitch-forming mechanism, and the pulley a^{15} is also loose on the feed-shaft B^3 .

At this time the operator, if he desires to position the material with great accuracy in the clamp, may engage the manually-controlled device or lever b , turn the same, and close the clamp onto the material, and then move the lever to release the clamp from the material, or if the buttonhole has been partially stitched and the thread broken and the material has been removed and is to be again inserted in the clamp that the stitching may be completed the operator will by the lever b assure the correct position of the material in the clamp. The material being properly located in the clamp, the operator depresses the starting-lever a^{23} and effects the clutching to the shaft B^3 of the fast-running pulley a^{15} , said pulley being moved laterally on said shaft through the lever a^9 , common to United States Patent No. 655,637. The clutching of the pulley a^{15} to the feed-shaft B^3 starts the cam B' , that through the mechanism before described closes the clamp on the material, and immediately thereafter the cutter (not herein shown, but such as fully provided for in said Patent No. 655,637) is actuated to cut the material.

Change in the relative positions of the stitch-forming mechanism and the work-clamp is effected by moving, as herein shown, the stitch-frame to place the stitch-forming mechanism in proper position with relation to the material in the clamp to enable the stitching to be commenced.

To start into action the stitch-forming mechanism, the lever a' must be turned in a direction to remove the lug a^2 from its engagement with the clutch-dog d^3 , that the latter may be moved by the spring d^5 to engage the cam d' of the belt-pulley f^{10} , thereby causing said pulley to be clutched with and rotate the shaft A^6 . As the stitch-frame is being moved, as described, to the right to place the stitch-forming mechanism in proper relation to the material, that said mechanism may be started into operation, the roller g^3 , locked by the lever g^4 in the position Fig. 9, the notch 37 of said lever engaging the stud g^2 meets and rides up the incline 33, and in so doing the three-armed lever $f f' a^8$ is turned to move the rock-shaft a and lever a' in a direction to release the clutch-dog, and immediately thereafter the stitch-forming mechanism is started and stitching is commenced at one end of the buttonhole, preferably the

inner end, and as the belt-pulley is engaged with the shaft A^6 the pulley a^{15} , through the movement of the lever a^9 , is immediately disengaged from the feed-shaft B^3 , that said shaft may be rotated while the stitching of the buttonhole is being done solely by the action of the levers C^3 and C^5 and the clutch parts C^9 and C^{10} , the movement imparted to the feed-shaft B^3 at such time being an intermittent movement and at a slower speed than when the shaft is rotated by the pulley a^{15} . As the roller g^3 rides up the incline 33 of the bar h^2 and the stitch-frame is moved to the right from the position Fig. 9 into the position Fig. 11 the arm f , connected with the shaft a , is lowered away from the stop f^3 , letting the spring f^7 act on the latch f^6 , causing the shoulder 31 thereof to engage the stud f^3 , and said latch holds said arm and the connected arms f , f' , and a^8 in the position Figs. 11 and 12 throughout the cycle of operations of the machine or throughout the period of stitching a buttonhole. If the lever g^4 should hold the radius-bar g' in the position Figs. 9 and 11 as the stitch-frame is moved to the right in stitching the first side of the buttonhole the roller g^3 would be held frictionally in contact with the surface of the cam-bar h^2 ; but to obviate this and leave said radius-bar and roller free the toe g^6 of the lever g^4 as the stitch-frame moves to the right viewing Fig. 11 meets the incline 34^x of said bar, thus releasing the lever g^4 from its engagement with the stud g^2 , permitting the spring g^7 to turn the radius-bar and lever into the position Fig. 12 and thereafter in the further movement of the stitch-frame to the right, as from Figs. 11 to 12, and also while the stitch-frame is being moved back into its starting position after stitching the eye and the second side of the buttonhole the said roller is maintained in the position Fig. 12. While the parts are being moved from the position Fig. 11 into the position Fig. 12, it will be supposed that the stitching is being done at the eye end of the buttonhole in usual manner. The eye having been overstitched, the stitch-frame must be moved in the opposite direction to stitch the second side of the buttonhole, and when doing this the stitch-frame is moved from the position Fig. 12 into the position Fig. 9, and in its movement the projection f^8 of the latch meets the right-hand end 32^x of the bar h^2 , causing the latch to be disengaged from the stud 32 and permitting the spring f^2 to turn the shaft a and the lever a' in a direction to enable the lug a^2 to engage the clutch-dog, as described, to immediately free the belt-pulley f^{10} from the shaft A^6 and stop the further movement of the stitch-forming mechanism, and, as has been hereinbefore described, if the lug a^2 comes into position at just the proper moment in the movement of the cam e' to release the clutch-dog and stop the shaft A^6 the feed-shaft B^3 is immediately started to complete the cycle of operations of the machine,

and the shaft B³, having completed the full movement of the stitch-frame, the stitch-forming mechanism being at rest, returns the stitch-frame into its starting position. The stud g² meets the stop h' and is pushed into the position Fig. 9, ready to again act as described whenever the material has been properly inserted in the clamp and the machine is to be again started for another cycle of operations. Maintaining the radius-bar in the position Fig. 12 is also advantageous for the reason that as the roller is about to approach the bar h² the latch f⁶, having been moved to release the arm f, said roller cannot be arrested by the high part 35 of said bar, but is to descend immediately to the bar at the left of the incline. If the roller should descend on the high part 35 and should retard the movement of the lever a', more stitches might be made at the last side of the buttonhole to be stitched. Immediately after or just as the stud g² meets the stop h' the roller B⁷ enters the space B⁹ of the cam B' and enables the lever B⁸ to rise, so that its end meets the heel 60 of the lever b⁴ and turns it to effect the opening of the clamp, and thereafter the cam part a¹⁷ of the lever a⁹, traveling with the stitch-frame, acts against the stud a¹⁸ of the lever a²⁰ and moves said lever, so that the finger a¹², entering the groove of the collar a¹⁶, is moved outwardly on the shaft B³ to thus free said pulley from its driving engagement with said shaft, thereby stopping instantly the feed-shaft, leaving all the parts of the machine, with the exception of the belt-pulley and pulley a¹⁵, at rest. Sometimes it is very desirable to be able to run the stitch-frame throughout one or more cycles of its operation without, however, actuating the stitch-forming mechanism, and whenever this is desired the operator, with the parts as shown in Figs. 2 and 9, engages the free end of the lever g⁴, turning it into the position Fig. 12. Said radius-bar is retained in the position shown in Fig. 12, while the stitch-frame travels back and forth. By changing the position of the screw f³ the extent of engagement or overlapping of the lug a² on the tail of the clutch-dog may be regulated to a nicety. The lever a' has pivoted upon it the usual positioning-pawl m, (fully shown in said Patent No. 655,637,) acted upon by a spring m', that serves normally to keep the free end of said pawl against the part e² of the stop-wheel hub E, so that whenever the shaft A⁶ is stopped said pawl will meet a shoulder m³ of said stop-wheel and insure the stopping of the shaft always in the same position with the needle out of the material. This pawl is common to said Patent No. 655,637. Herein, however, to obviate the frictional contact of the end of the pawl m with the part e² of the stop-wheel, I have provided the lever a' with a holder m^x, having a hook at its free end to partially embrace the pawl m, that acts when the lever a' is in a position to enable the shaft A⁶ to be rotated to hold the pawl away from the face e².

The stationary plate A herein employed to hold the work-clamp has a downwardly-projecting stud that enters a heart-shaped cam in the upper side of the rotating cam B', so that as said cam B' rotates its open center, fitting a hub rising from the bottom of the curb B, the cam B' and the stitch-frame are made to travel longitudinally, so that the stitch-forming mechanism may act from the small end of the eye along the side thereof about the enlarged end of the eye and back along the side of the eye to the end where the stitching was commenced. This pin on the plate A is lettered j⁴ in United States Patent No. 349,359, dated September 21, 1886, and is common to all the so-called Reece machines and is employed in United States Patent No. 655,637.

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

1. In a buttonhole-stitching machine, a work-clamp, and mechanism to close the same automatically on the material, the work-clamp-closing mechanism having manually-controlled means whereby the work-clamp may be closed on the work to properly position the same prior to starting the machine.
2. In a buttonhole-stitching machine, a work-clamp, mechanism to close the same automatically on the material, the work-clamp-closing mechanism having manually-controlled means whereby the work-clamp may be closed on the work to properly position the same prior to starting the machine, and a manually-controlled starting device to start the relative change of position of the stitch-frame and work-clamp to effect the stitching of a buttonhole.
3. In a buttonhole-stitching machine, a work-clamp, toggle-levers connected therewith, and automatic means including a lever and means to move it to turn said toggle-levers in one direction to close the work-clamp on the material prior to stitching a buttonhole, thereafter turning said toggle-levers in the opposite direction to enable the clamp to be opened automatically when the buttonhole has been stitched.
4. In a buttonhole-stitching machine, a work-clamp, toggle-levers connected therewith, and automatic means including a lever to turn said toggle-levers in one direction to close the work-clamp on the material prior to stitching a buttonhole, and to turn said toggle-levers in the opposite direction to enable the clamp to be opened automatically when the buttonhole has been stitched, said toggle-levers having a connected handle whereby the clamp may be opened and closed by hand when desired.
5. In a buttonhole-stitching machine, a work-clamp, levers having projections to engage portions of said clamp to close and open the same, a plate sustaining the work-clamp, toggle-levers for closing and opening said clamp, one of said levers turning on the plate

sustaining the work-clamp, and the other on a depending bracket of the lever having the projections to engage the work-clamp to open and close the same, and means to actuate said toggle-levers in one and then in the opposite direction to effect the closing of the clamp preparatory to starting the stitching of a buttonhole, and to open the clamp after the stitching of a buttonhole.

6. In a buttonhole-stitching machine, stitch-forming mechanism, a stitch-frame, a shaft therein for actuating said stitch-forming mechanism, a belt-pulley loose on said shaft, a stop-wheel fast on said shaft and having a clutch-dog pivoted thereon, and a shoulder, a lever to control said clutch-dog, means to actuate said lever automatically, a spring-controlled pawl to engage the shoulder of said stop-wheel to stop the rebound of the shaft carrying said stop-wheel, and a device carried by said lever to hold said pawl away from the stop-wheel while the clutch-dog engages the belt-pulley to effect the rotation of said shaft.

7. In a buttonhole-stitching machine, stitch-forming mechanism, a stitch-frame containing a shaft, and means for actuating the stitch-forming mechanism, a belt-pulley loosely mounted on said shaft, a stop-wheel fast on said shaft, clutching means intermediate said stop-wheel and belt-pulley to enable the belt-pulley to rotate said shaft, means to disconnect the belt-pulley from the stop-wheel, and a cam movable with said stop-wheel to enable the means for disconnecting said clutch to effect the disengagement of the belt-pulley only when the said cam occupies a definite position.

8. In a buttonhole-stitching machine, stitch-forming mechanism, a bed-plate, a stitch-frame, means to move the same over the bed-plate, a shaft in the stitch-frame for actuating in usual manner the stitch-forming mechanism for making overedge-stitches, a belt-pulley loose on said shaft, a stop-wheel provided with a clutch-dog, a clutch-dog lever to control said clutch-dog and cause it to engage said belt-pulley to start said shaft or to move the clutch-dog to release the belt-pulley, a three-armed lever connected with the rock-shaft carrying said clutch-dog-controlling lever, means coacting with said three-armed lever to turn it and the clutch-dog-controlling lever to cause the clutch-dog to engage the belt-pulley, and a device to lock the three-armed lever in such position during the movement of the stitch-frame in stitching a buttonhole.

9. In a buttonhole-stitching machine, stitch-forming mechanism, a bed-plate, a stitch-frame, means to move the same over the bed-plate, a shaft in the stitch-frame for actuating in usual manner the stitch-forming mechanism for making overedge-stitches, a belt-pulley loose on said shaft, a stop-wheel provided with a clutch-dog, a clutch-dog-control-

ling lever to cause said clutch-dog to be engaged with said belt-pulley to start said shaft or to move the clutch-dog to release the belt-pulley, a three-armed lever connected with the rock-shaft carrying said clutch-dog-controlling lever, means coacting with said three-armed lever to turn it and the clutch-dog-controlling lever to cause the clutch-dog to engage the belt-pulley, a device to lock the three-armed lever in such position during the movement of the stitch-frame in stitching a buttonhole, and means to release automatically said locking means to enable the clutch-dog-controlling lever to move said dog and release said belt-pulley from said shaft.

10. In a buttonhole-stitching machine, buttonhole-cutting mechanism, a stitch-frame, stitch-forming mechanism therein, a frame to sustain a work-clamp, a feed-shaft, a clutch mechanism to move said shaft intermittently while stitching a buttonhole, and independent mechanism to move said feed-shaft at a faster speed between the completion of one buttonhole and the commencement of the next hole and preparatory to and after cutting the material in the clamp, a stitch-shaft in said stitch-frame, a link moved by said stitch-shaft, a lever moved by said link to actuate said clutch mechanism, a fulcrum for said lever, and means to change automatically the position of the fulcrum for said lever when stitching the large eye of the buttonhole to properly space the stitches about the eye.

11. In a buttonhole-stitching machine, a stitch-frame, stitch-forming mechanism therein, a work-clamp, means to change the relative positions of said frame and work-clamp while stitching a buttonhole, a stitch-shaft in said stitch-frame, a clutch on said shaft, a bar for controlling the length of a buttonhole, a clutch-controlling lever, and means including an arm provided with a radius-bar carrying a roller and moved by said length-controlling bar to move said clutch-controlling lever and effect the release of said clutch and stop said stitch-shaft leaving the stitch-forming mechanism at rest according to the position of said bar and the length of the buttonhole being stitched.

12. In a buttonhole-stitching machine, a stitch-frame, stitch-forming mechanism therein, a work-clamp, means to change the relative positions of said frame and work-clamp while stitching a buttonhole, a stitch-shaft in said stitch-frame, a clutch on said shaft, a bar for controlling the length of a buttonhole, a clutch-controlling lever, and means including an arm provided with a radius-bar carrying a roller and moved by said bar to move said clutch-controlling lever and effect the release of said clutch and stop said stitch-shaft leaving the stitch-forming mechanism at rest according to the position of said bar and the length of the buttonhole being stitched, and means to maintain said radius-bar in its inoperative position to enable the

relative positions of the stitch-frame and cloth-clamp to be changed without actuating the stitch-forming mechanism.

13. In a buttonhole-stitching machine, 5
stitch-forming mechanism, a stitch-frame having a stitch-shaft to actuate said stitch-forming mechanism, a clutch on said stitch-shaft, a clutch-controlling lever having an arm provided with a radius-bar, a locking device 10
connected with said arm to lock said radius-bar in its inoperative position, a controlling-bar to act on said radius-bar and turn said clutch-controlling lever to release said clutch to enable the latter to actuate the stitch-shaft, and means coacting with said locking 15
device to maintain said radius-bar out of contact with said controlling-bar throughout the stitching of a buttonhole.

14. In a buttonhole-stitching machine, a 20
clutch-controlling lever having a plurality of arms, one provided with a stud and another with a radius-bar, a controlling-bar to be acted upon by said radius-bar to turn said

clutch-controlling lever, and a latch to engage the stud of one of said arms and hold 25
the clutch-controlling lever in place while a buttonhole is being stitched.

15. In a buttonhole-stitching machine, a clutch-controlling lever having a plurality of 30
arms, one provided with a stud and another with a radius-bar, a controlling-bar to be acted upon by said radius-bar to turn said clutch-controlling lever, and a latch to engage the stud of one of said arms and hold 35
the clutch-controlling lever in place while a buttonhole is being stitched, and means to move said latch to release said bar as the stitching of a buttonhole is completed.

In testimony whereof I have signed my name to this specification in the presence of 40
two subscribing witnesses.

GEORGE S. HILL.

Witnesses:

GEO. W. GREGORY,
EDITH M. STODDARD.