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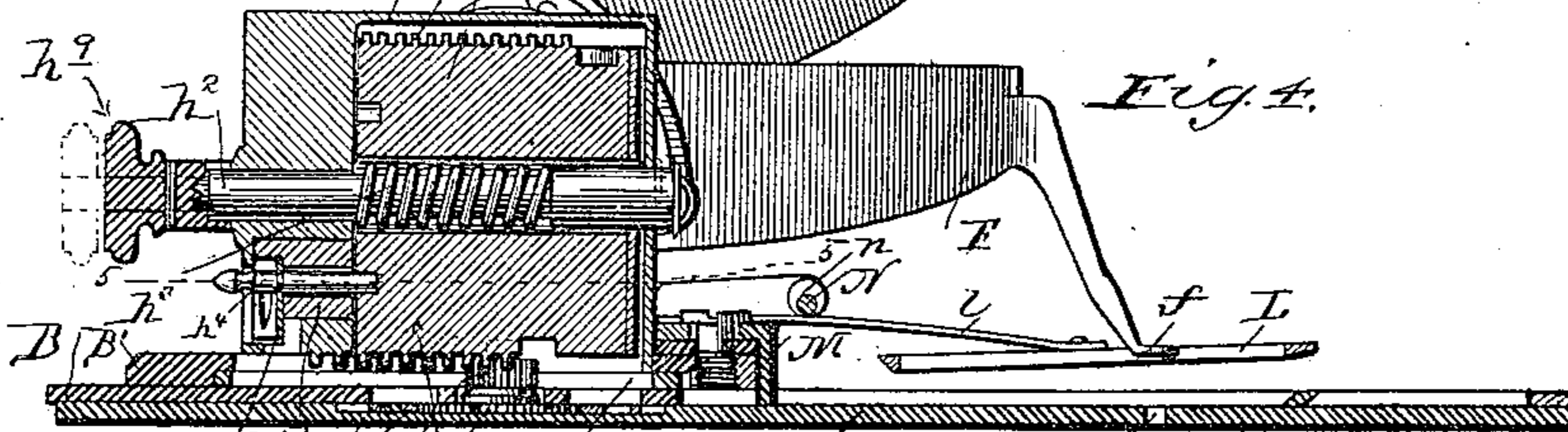
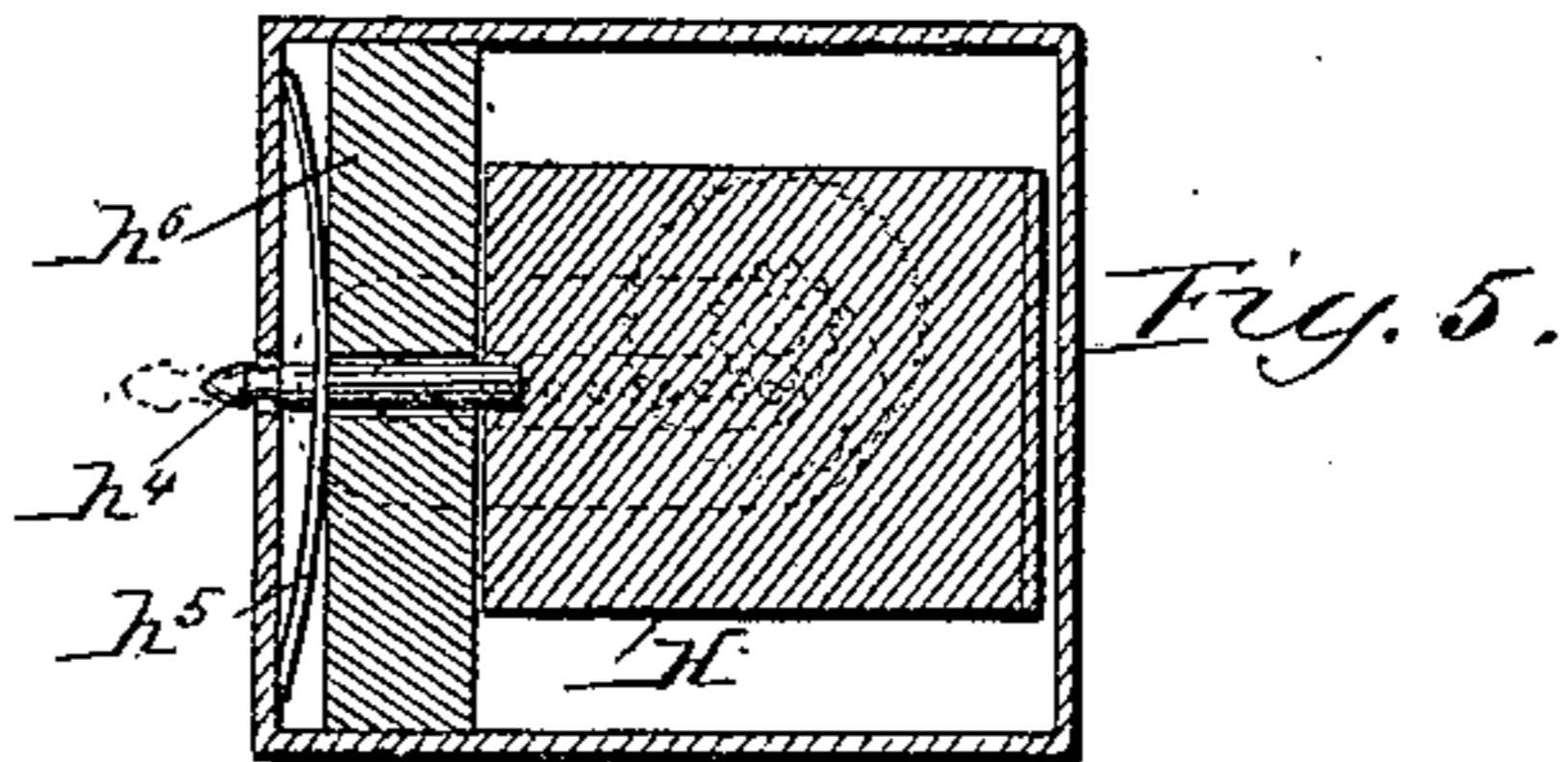
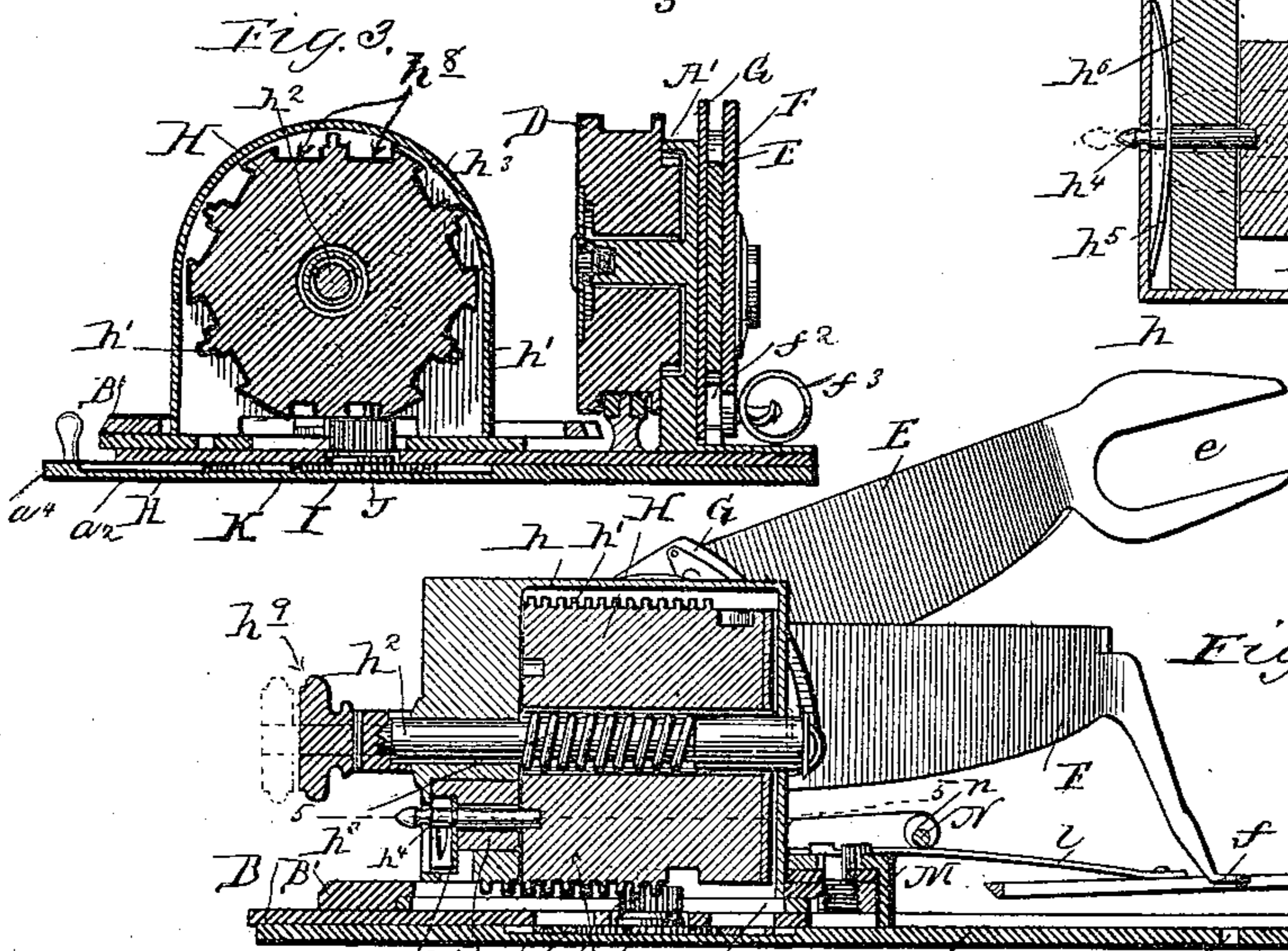
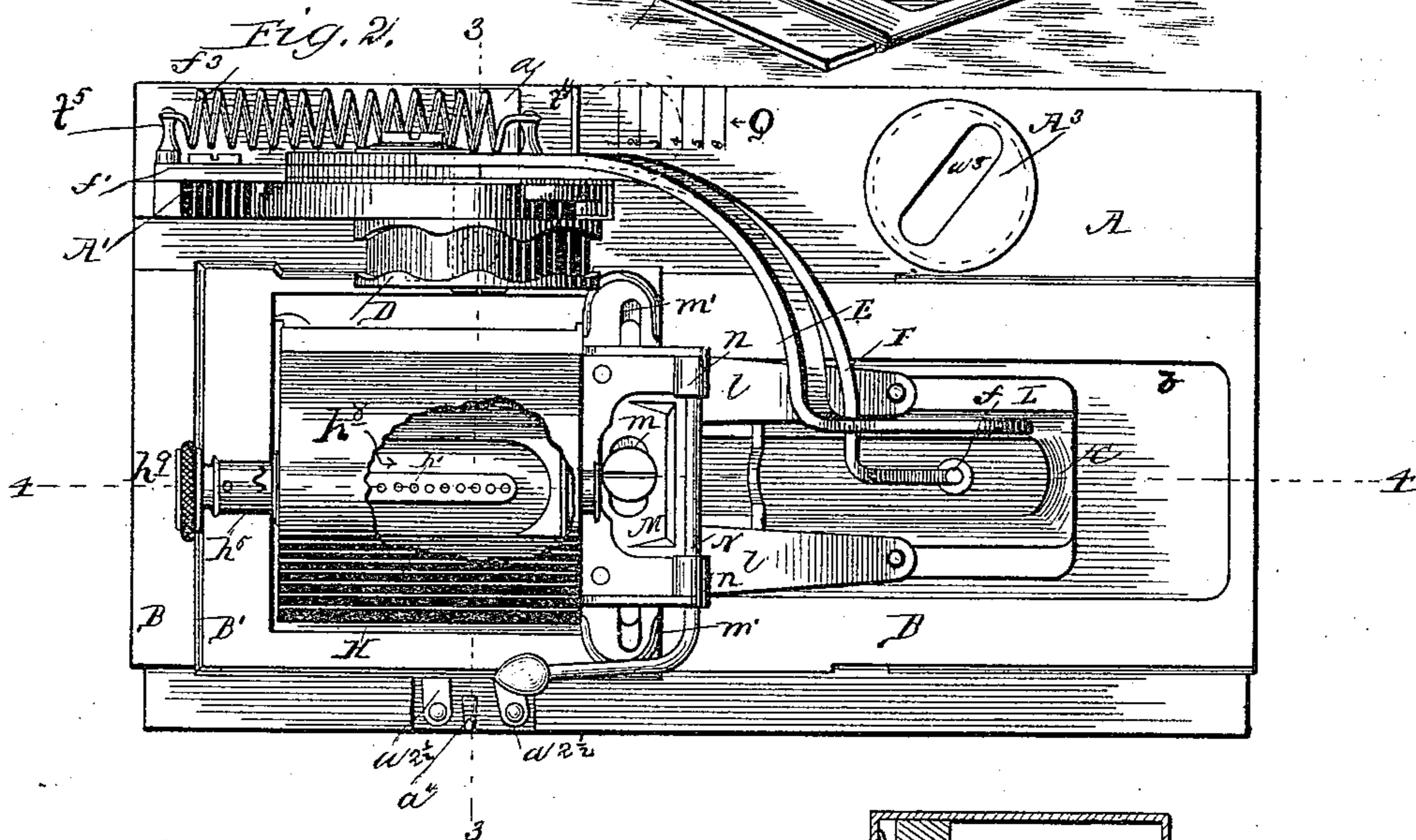
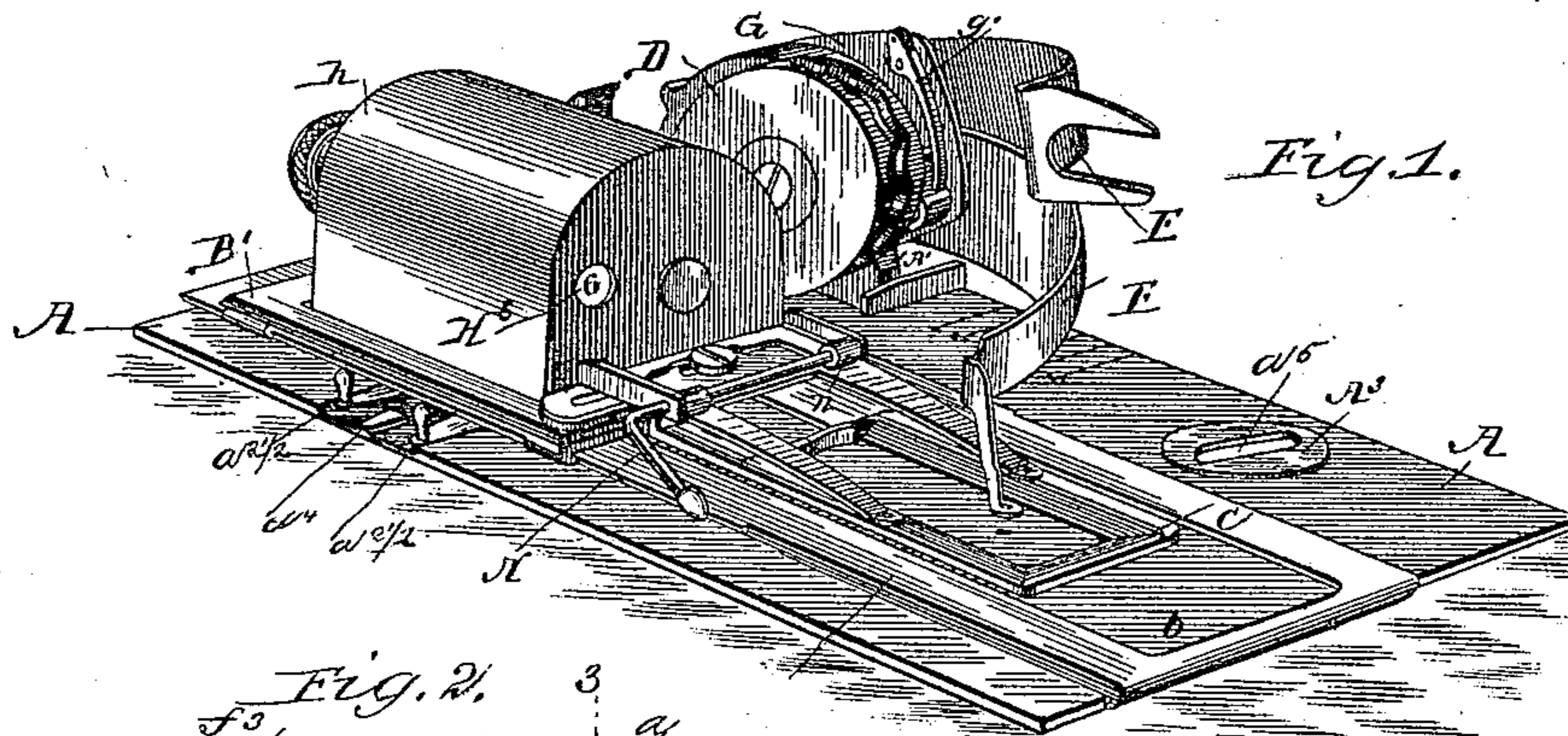
4 Sheets—Sheet 1.

T. POWELL.

BUTTON HOLE ATTACHMENT FOR SEWING MACHINES.

No. 442,695.

Patented Dec. 16, 1890.



Witnesses
J. Powell
James L. Mitchell

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(Model.)

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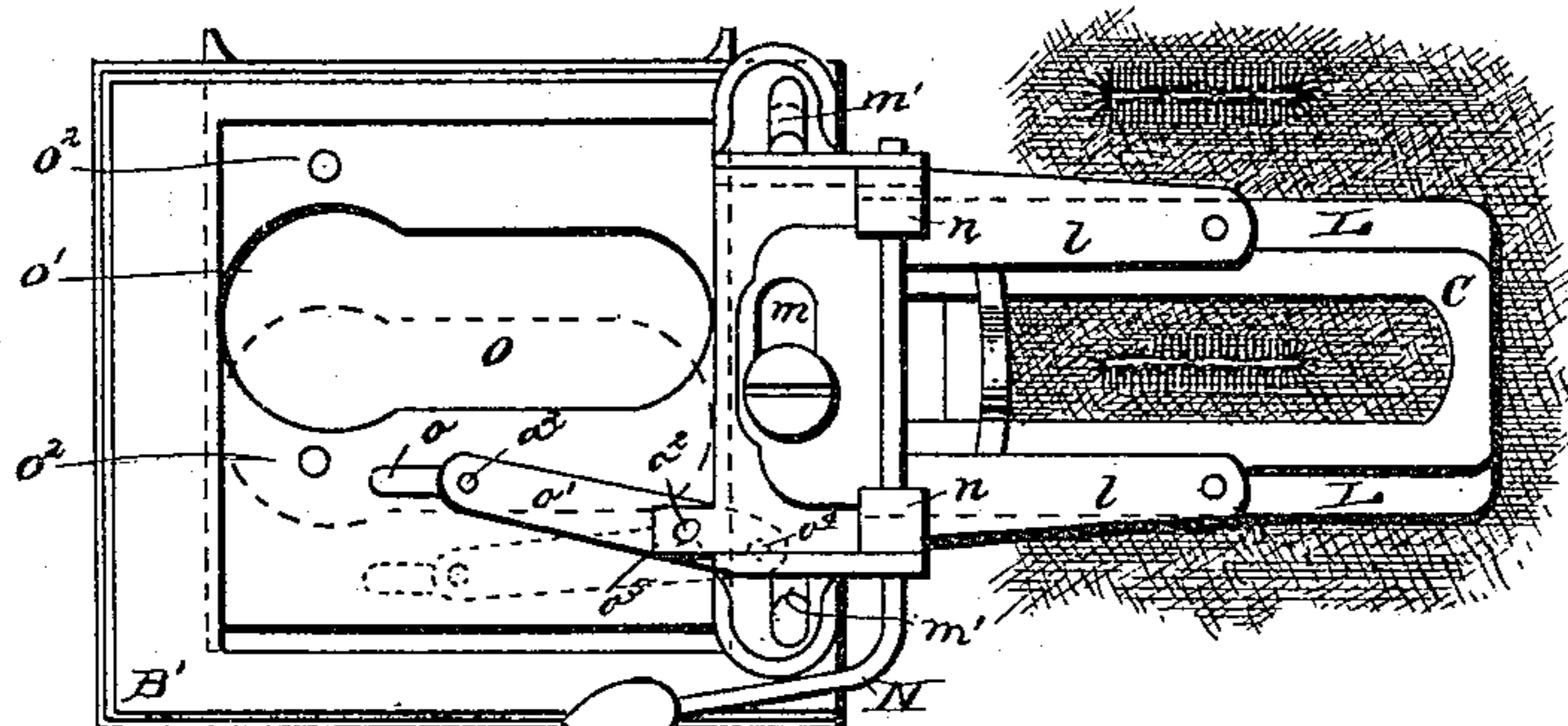
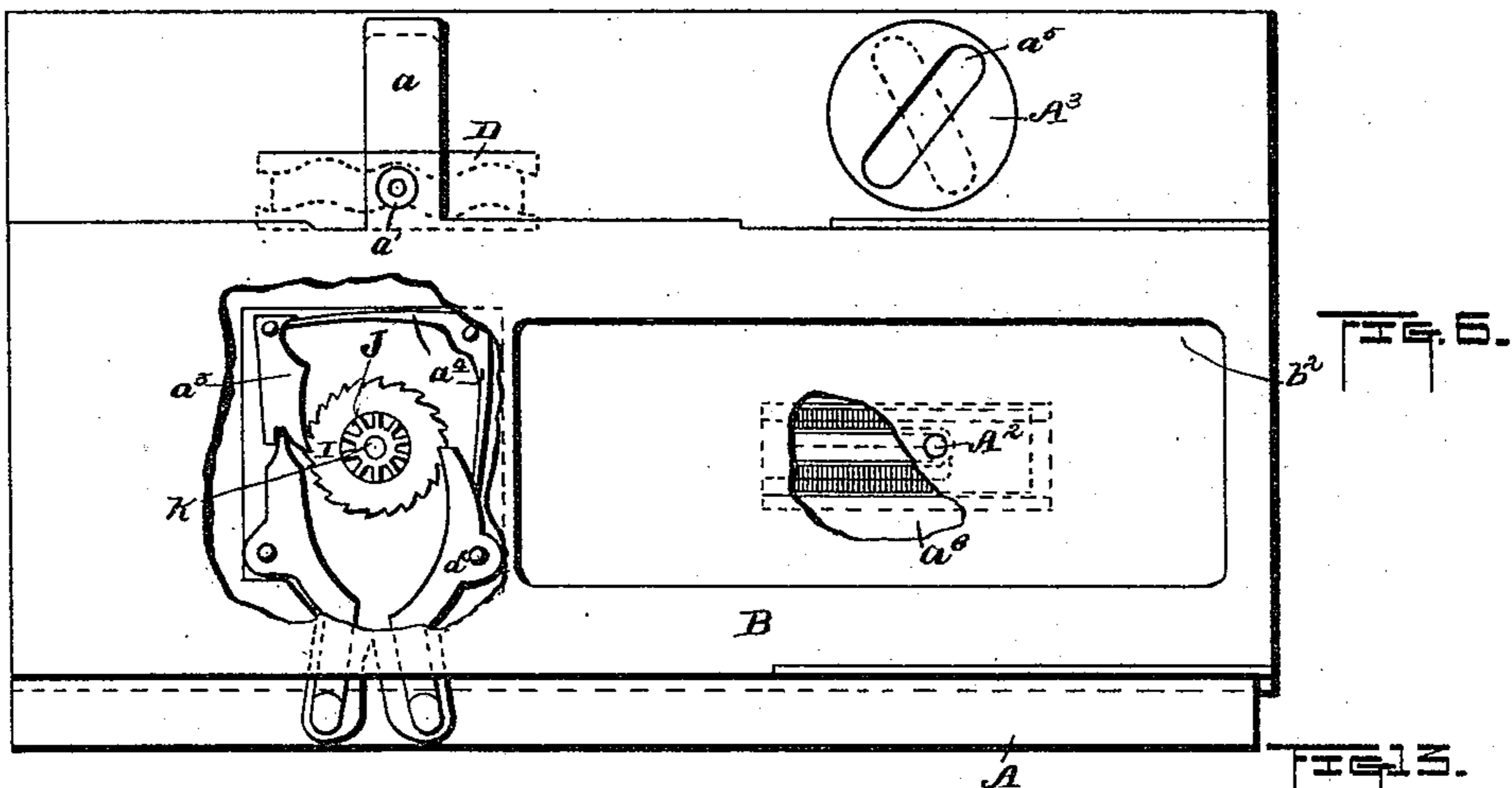
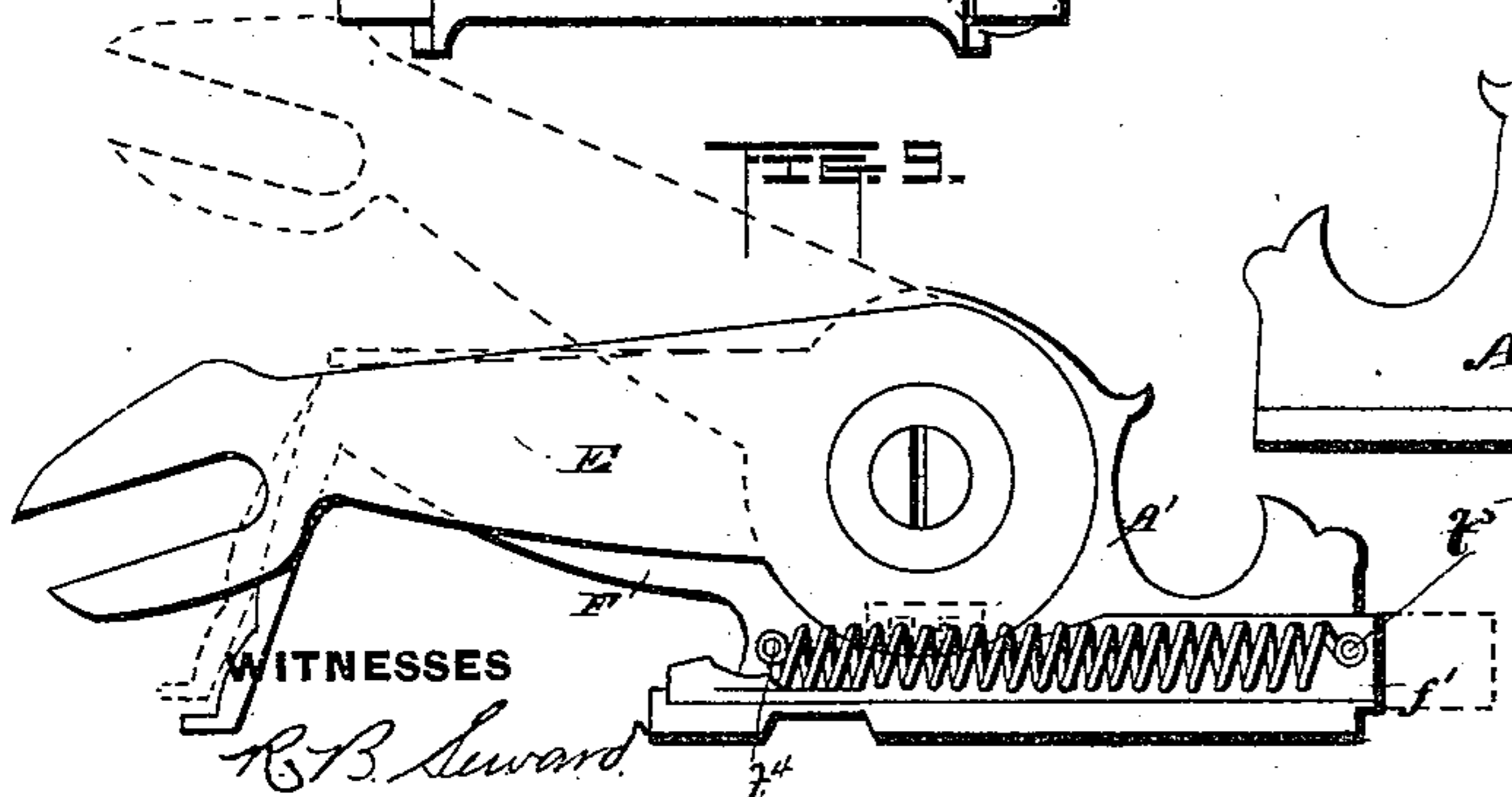
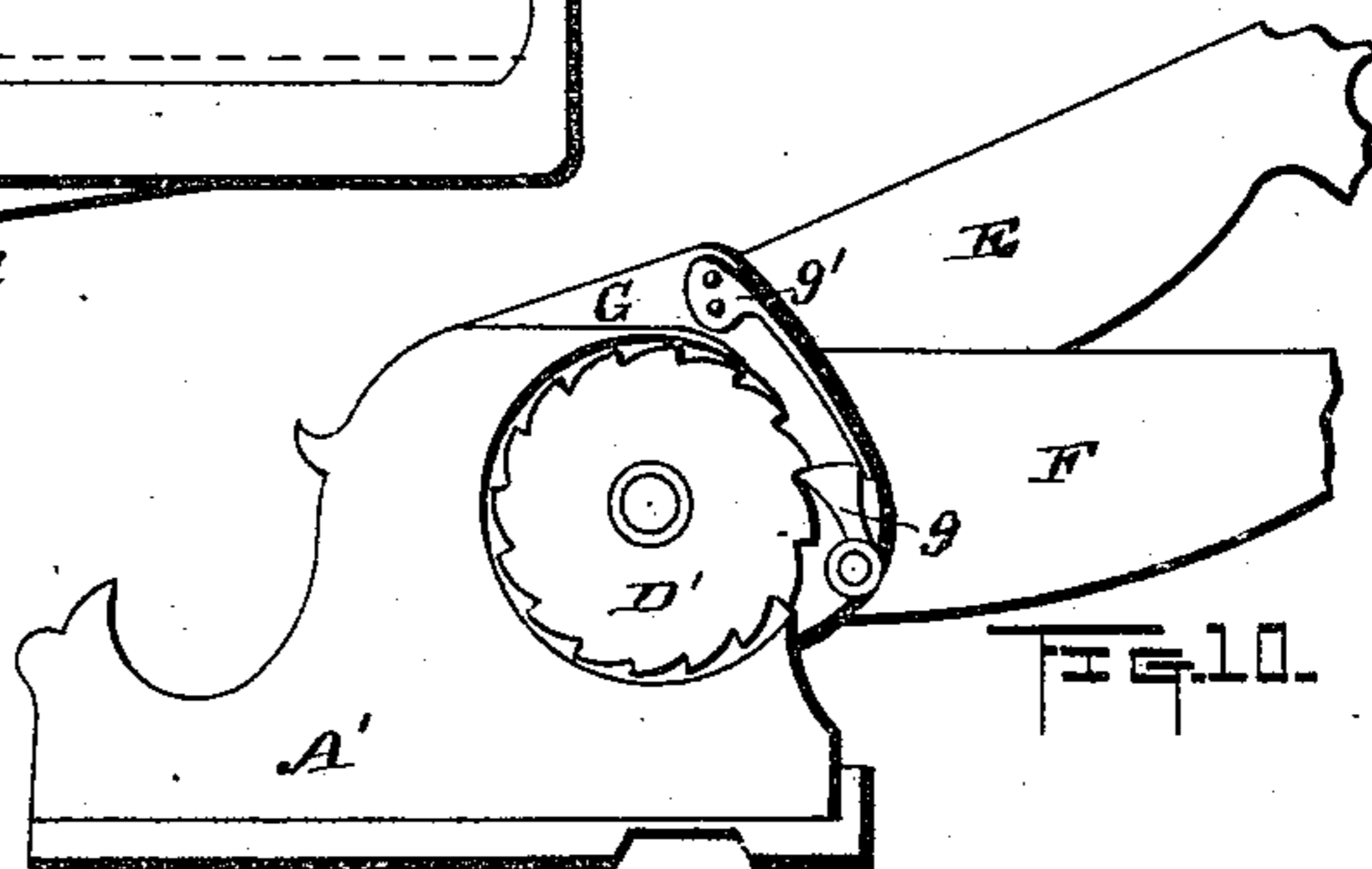
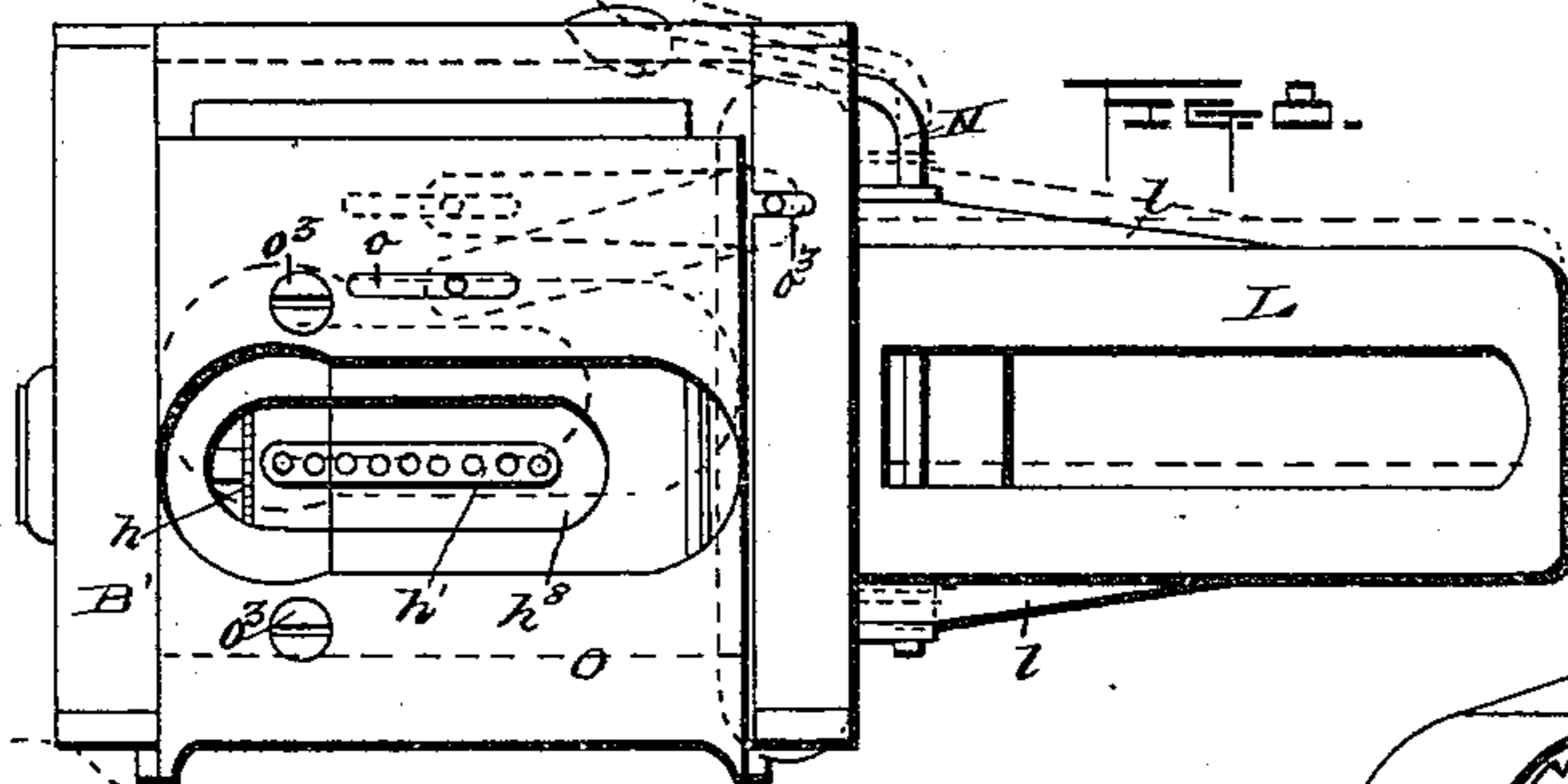
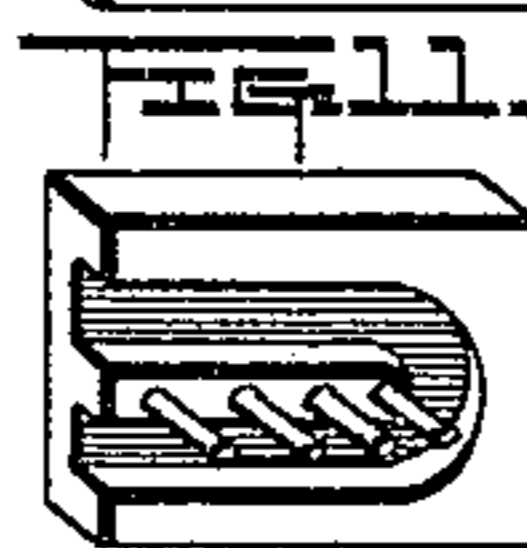
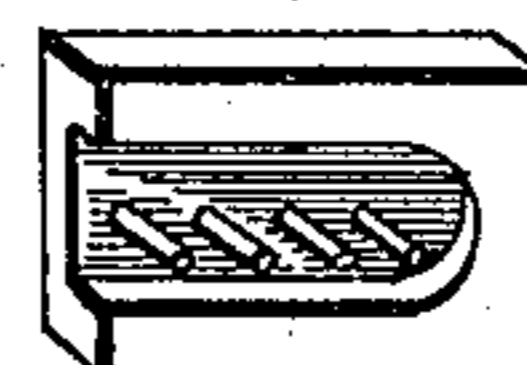


FIG. 7.

FIG. 12.



WITNESSES

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(Model.)

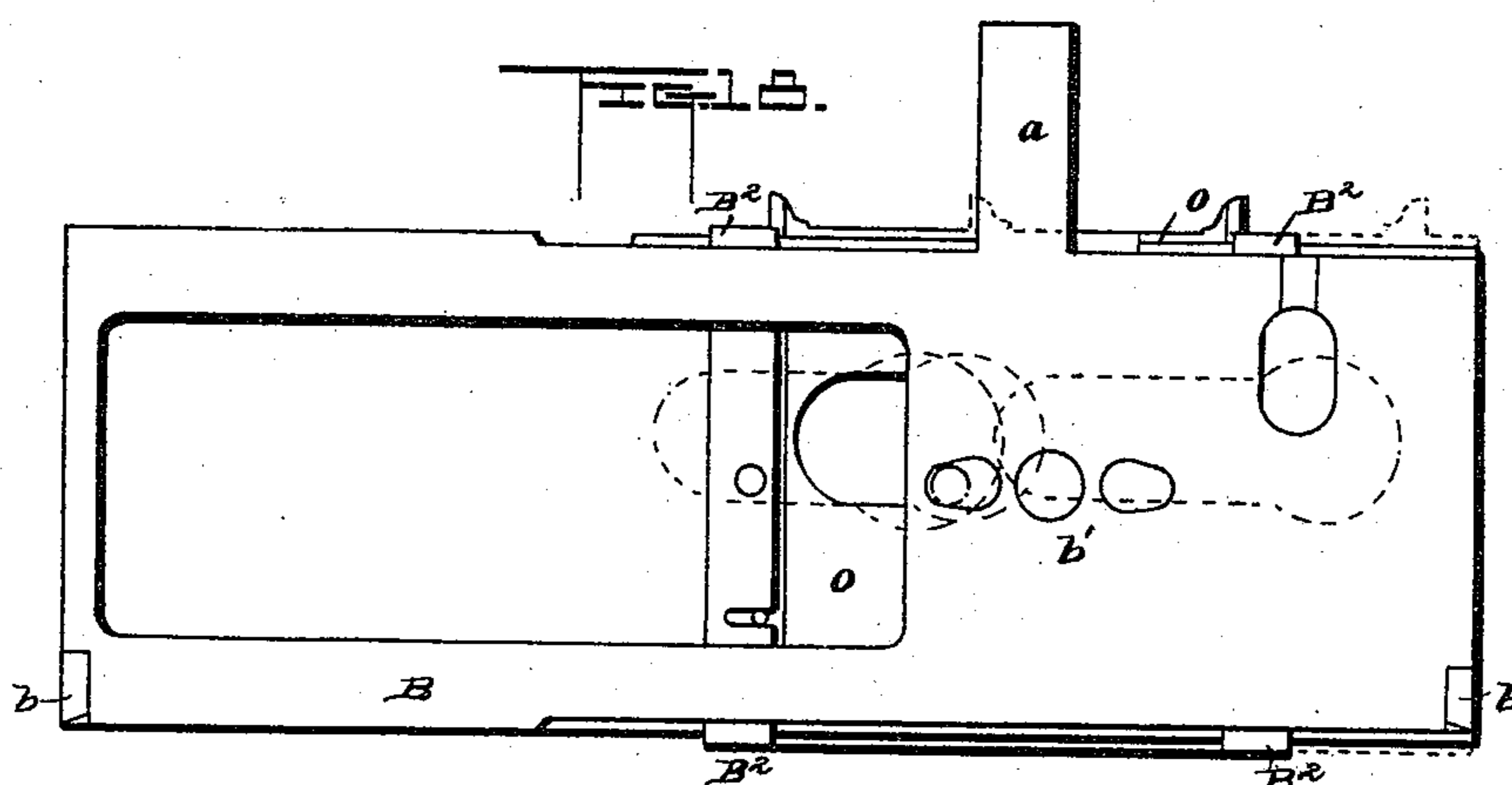
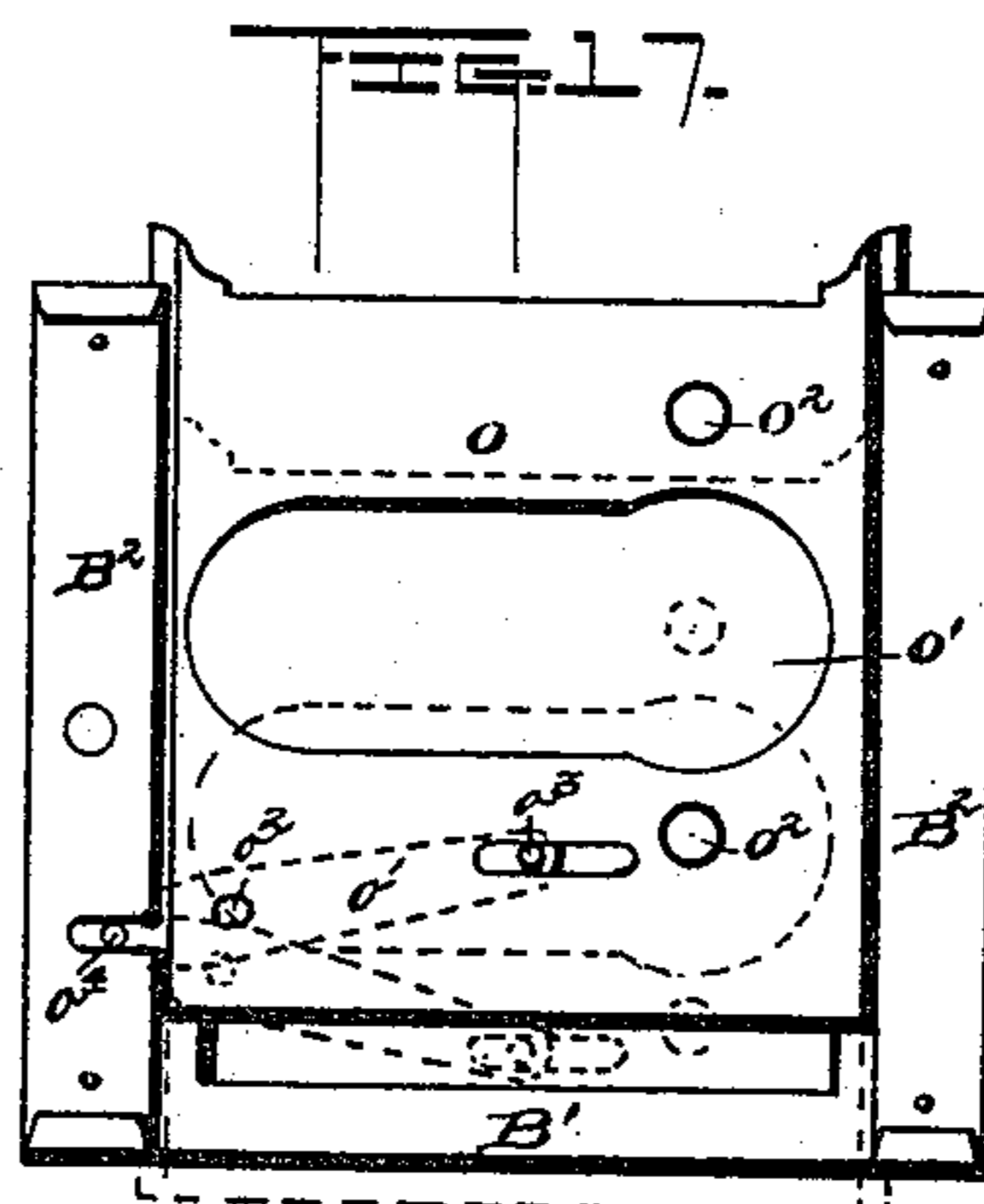
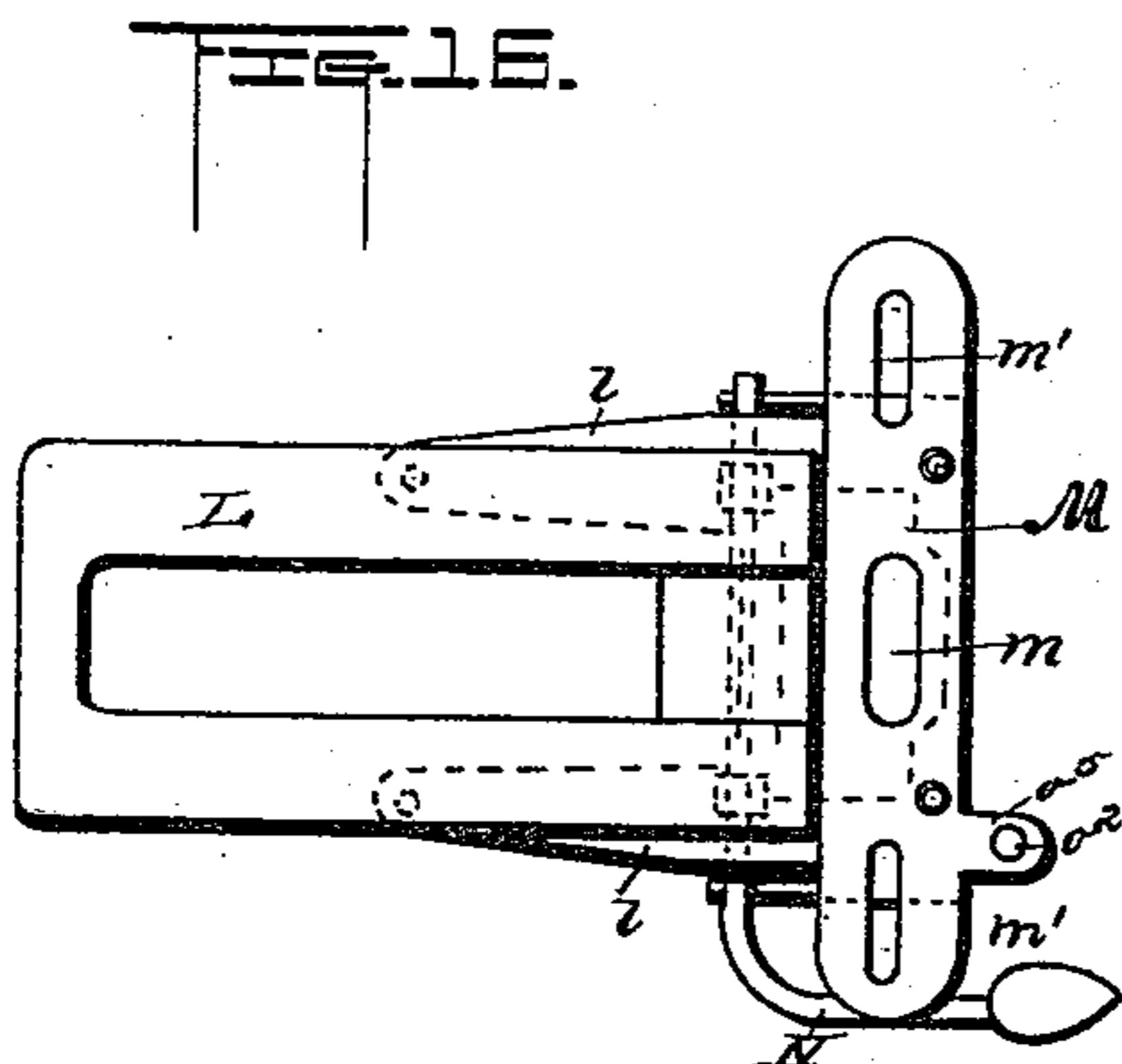
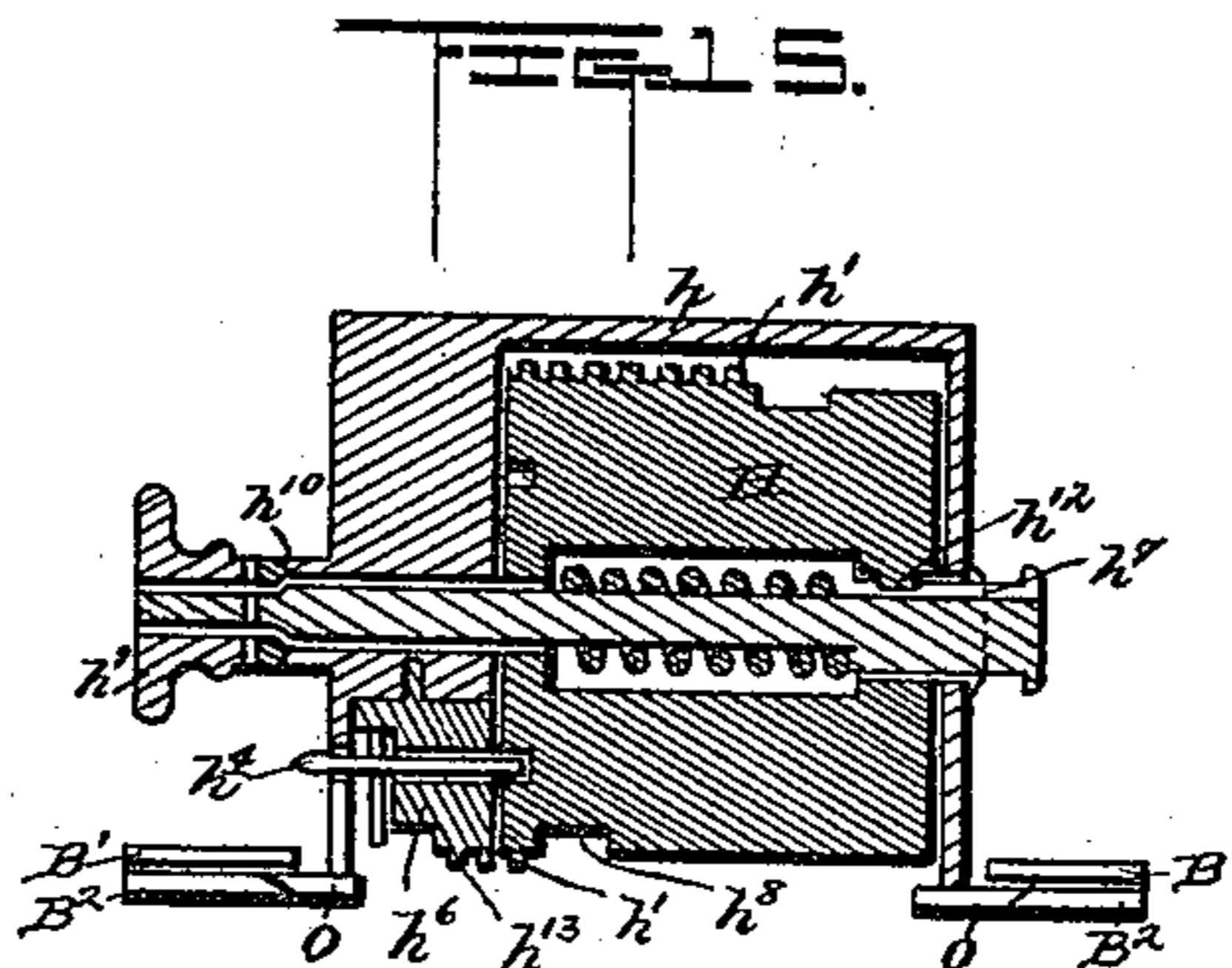
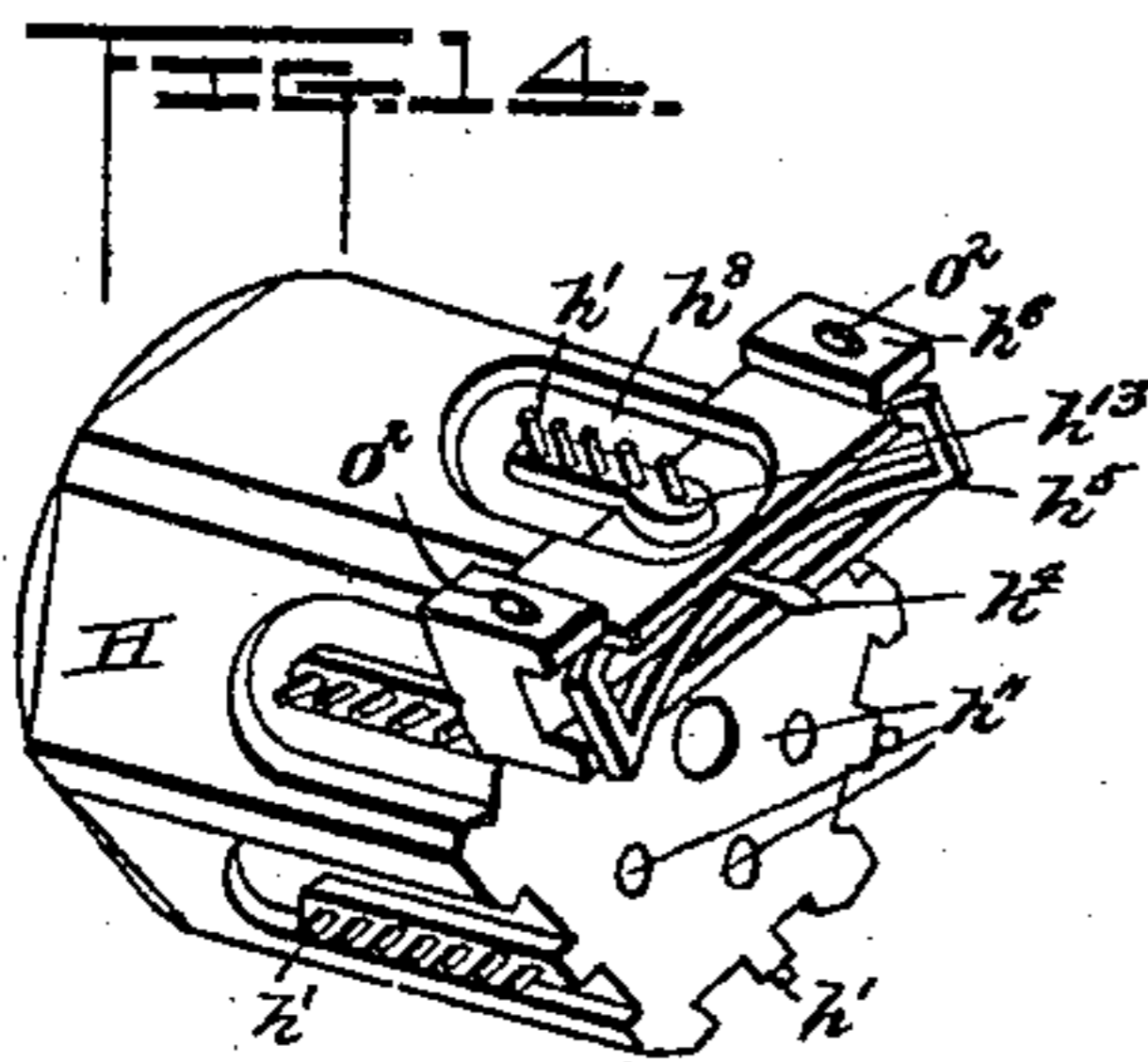
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WITNESSES

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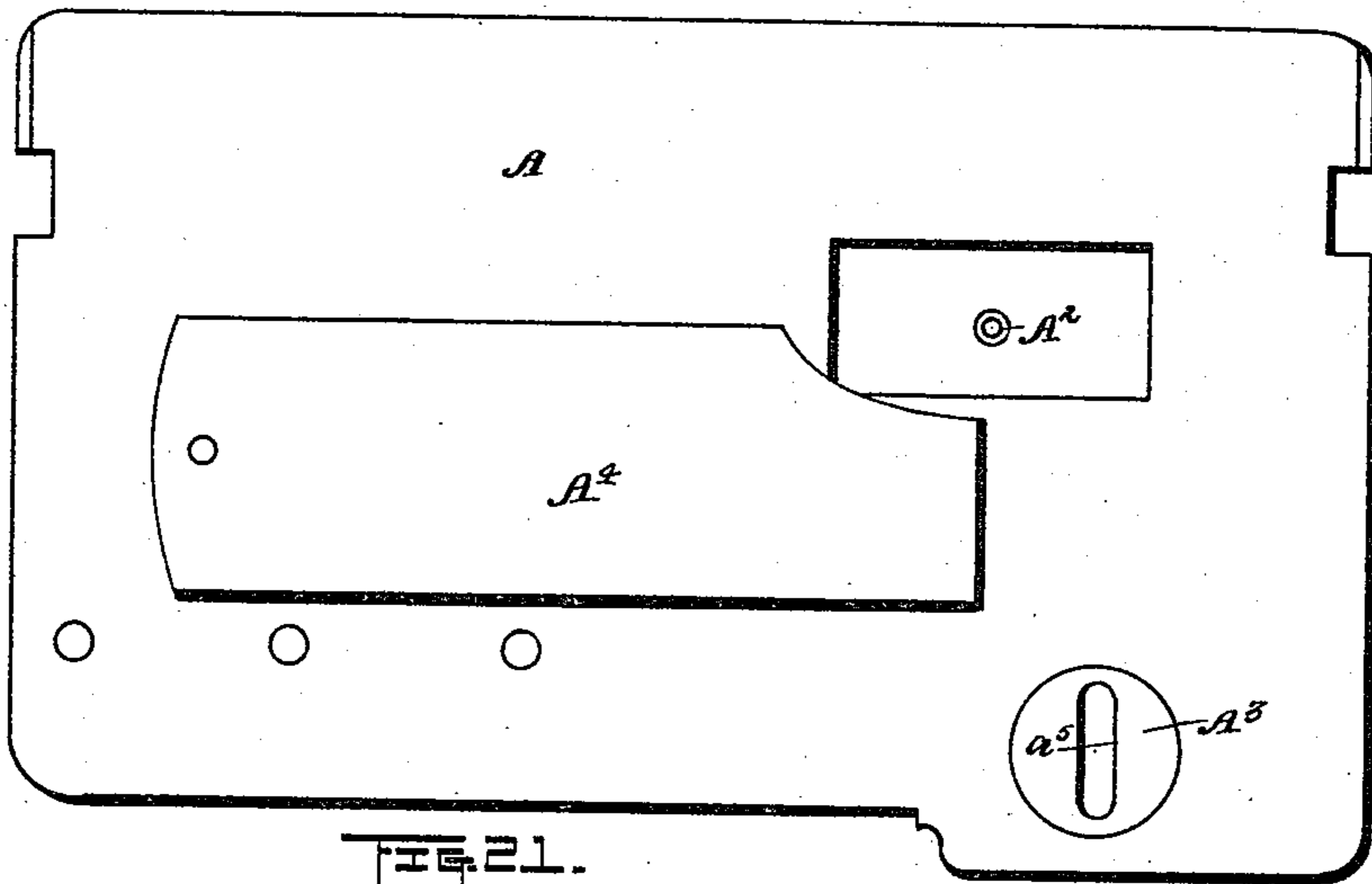
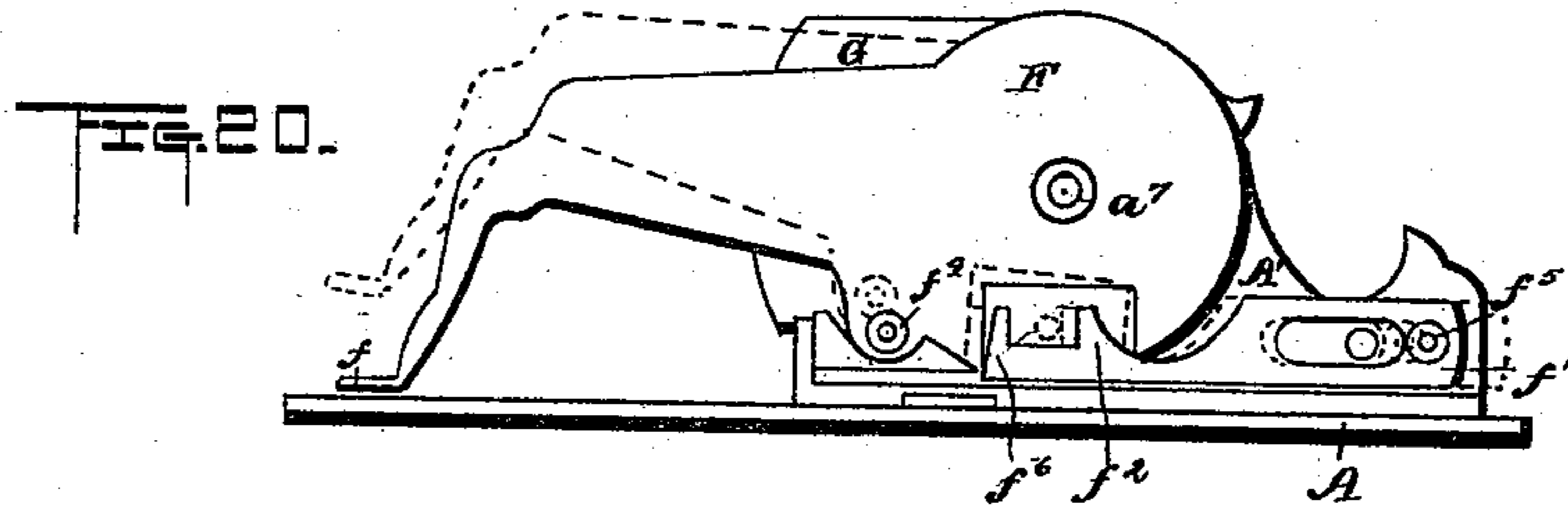
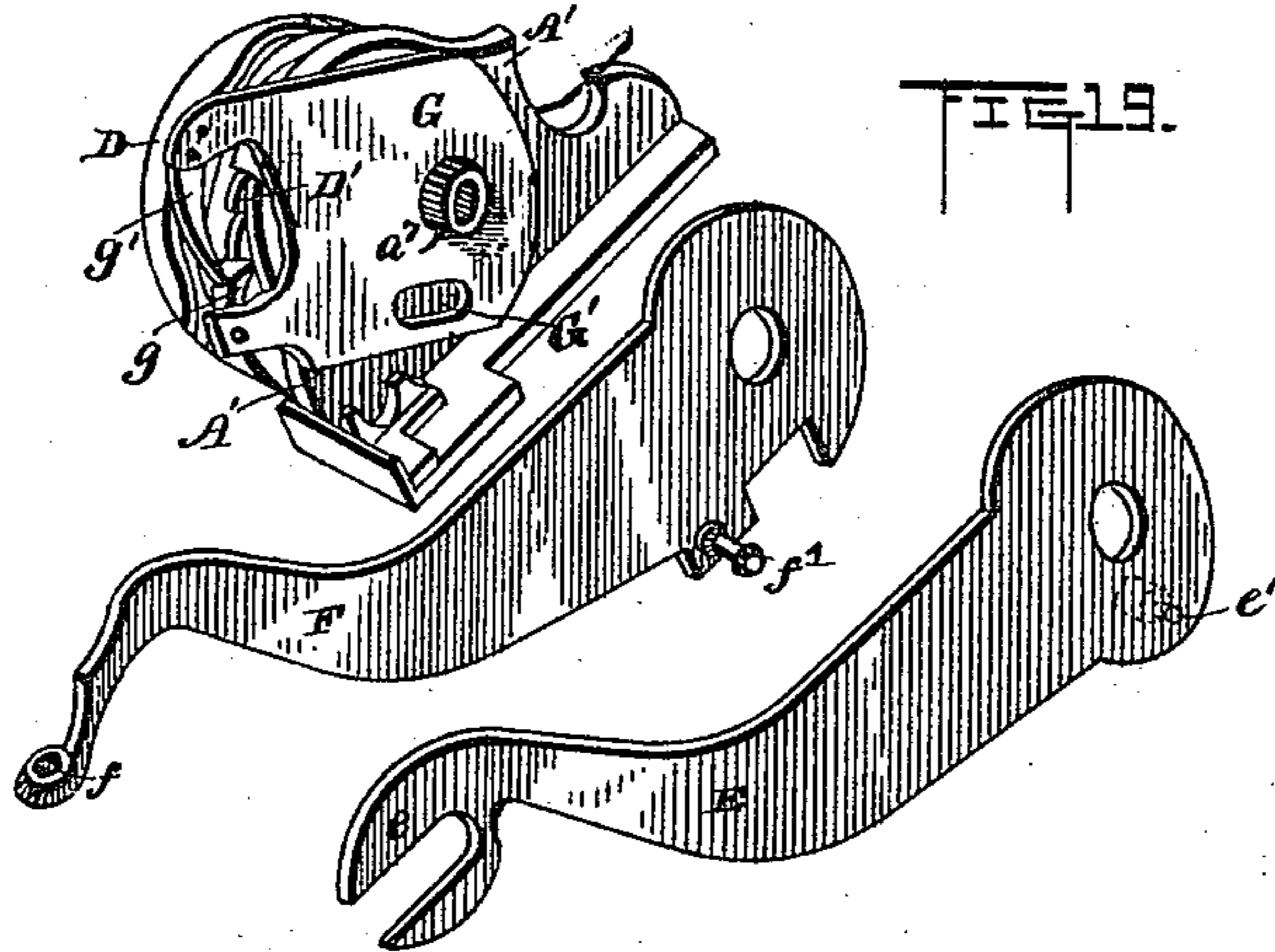
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WITNESSES

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UNITED STATES PATENT OFFICE.

THOMAS POWELL, OF FORT SCOTT, KANSAS.

BUTTON-HOLE ATTACHMENT FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 442,695, dated December 16, 1890.

Application filed July 23, 1888. Serial No. 280,842. (Model.)

To all whom it may concern:

Be it known that I, THOMAS POWELL, of Fort Scott, county of Bourbon, and State of Kansas, have invented certain new and useful Improvements in Button-Hole Attachments for Sewing-Machines, of which the following is a specification.

My said invention consists in the introduction of certain new elements into machines of this class and in the new and improved arrangement of new and old elements, whereby the working of button-holes in garments may be done on the ordinary sewing-machine.

The objects specially aimed at in my present invention are, first, durability; second, that simplicity in construction which will insure that ease of management required to meet the wants of persons unskilled in the management of machinery; third, that fixedness of parts which will insure infallibility in performance; fourth, rapidity and certainty in changing from one size of button-hole to another; fifth, the ability to set for any given button not only in a moment of time, but with full assurance of fitting the same without trial or experiment; sixth, the ability to work button-holes over, or, rather, beyond, the thick edges that sometimes occur in garments, and also across seams or other inequalities that may be found in places where button-holes are wanted; seventh, to backstitch both ends of the button-hole for the purpose, not only of giving greater strength where it is most needed, but for the additional purpose of securing the ends of the threads, thus obviating the necessity for employing hand-work to complete the job; eighth, to be able to work the button-hole either before or after it is cut, and, ninth, to so construct said attachment that it can be adapted to a sewing-machine of any make by changes few and simple.

The following is a clear and explicit specification of my invention, reference being had to the accompanying drawings, which are made a part hereof, and in which similar letters of reference indicate similar parts.

Figure 1 is a perspective view of my button-hole attachment. Fig. 2 is a plan view of the same. Fig. 3 is a vertical cross-section on the line 3 3 of Fig. 2. Fig. 4 is a central vertical section on the line 4 4 of Fig. 2. Fig. 5 is a detail section on line 5 5 of Fig. 4. Fig.

6 is a plan view of plates A and B, with part of B broken away to show the form and arrangement of the intermediate mechanism, also showing to the right the throat-hole and through dotted lines and a break in plate A the space milled out on the underside of the latter plate to provide for the play of the feeder of the sewing-machine, thus preventing it from striking or interfering with the bed-plate. Fig. 7 is a detail plan view of cloth-clamp and contiguous parts, a piece of fabric being shown also with a button-hole (somewhat exaggerated) represented as finished, while a second one is only partially completed. Fig. 8 is an inverted plan of Fig. 7, with the addition thereto of one face of the polysided drum which lies immediately above plate O as it appears through the oval opening in the latter. Fig. 9 is a detail side elevation of the operating-fork pressure-lever F and the spring and slide through which it is brought into action. Fig. 10 is a detail view of the bracket A', Fig. 1, with the cam D removed so as to show the ratchet and other parts by which the cam is actuated. Fig. 11 is a perspective view of a movable plate having a groove and rack which may be substituted for the drum H in building my button-hole attachments. Fig. 12 is a perspective view of another form of plate which may be used for the same purpose. Fig. 13 is a perspective view of a plate or block having a complete rack and groove constructed thereon, which may be made in sets of appropriate lengths and substituted in the construction of my attachment for other parts having the same function. Fig. 14 is an inverted perspective view of the hexagonal drum, exhibiting its rack-sections, the variable lengths of the latter, and showing the block h^6 with its rack-section h^{13} in working position with one face of said drum. The lock-pin h^4 , with its spring h^5 and the several holes h^{11} in the said drum, by which said drum and block are held in working position, are also here shown. Fig. 15 is a vertical longitudinal section of a drum polygonal in cross-section within its case and showing in particular the lug h^{12} , projecting from the body of said drum into the groove h^7 of the shaft h^2 so as to compel the drum and shaft to rotate together and yet permit said shaft to be drawn far enough longitudinally to

free the serrations on base of knob h^9 from the corresponding serrations on the drum-case that the drum may be rotated when desired. Fig. 16 is an inverted plan view of the cloth-clamp, (the jaws and closing device of which may be of any convenient construction,) having as its new and essential feature the transverse piece M, with slots $m m' m'$, the arm o^5 , with its hole o^3 to engage stud o^2 of the link o' , Figs. 7 and 17. Fig. 17 is an inverted plan view of the square sliding frame B' , showing the transverse strips $B^2 B^2$, the shifting plate O, resting in the groove formed by said strips, as shown in section in Fig. 15. Fig. 18 is an inverted plan view of the oscillating plate B, showing the clasps $b b$ and the arm a , by which it is attached to the bed-plate. Here is also shown the clasps $B^2 B^2 B^2 B^2$ of the square sliding frame B' , Figs. 2, 7, 8, and 17. Fig. 19 is a perspective view of the bracket A' , showing the relative position of the parts connected to it, the levers F and E being shown as removed from the stud a^7 , so that the slot G' of the pawl-plate G may be clearly seen. Fig. 20 is a detail side elevation of the bracket A' , with pressure-lever F in position on the stud a^7 , and showing by dotted lines how the pressure-foot is elevated by the action of the inclined end of the slide f' against face f^6 of the square notch in the base portion of the said lever. Fig. 21 is an inverted view of the bed-plate A, showing the shuttle-race slide A^4 , which, together with the universal washer A^3 , is the means by which my button-hole attachment is secured to the sewing-machine.

Referring to Figs. 1 and 2, A is the foundation or bed-plate. B is an overlying plate, having an arm a , which is loosely embraced by a notch in the base of the bracket A' , while the corners of said plate, which are remote from said arm, are turned downward and made to grasp the bed-plate, thus forming with the aforesaid arm and bracket not only a means of attachment to plate A, but also guides for its oscillating movements.

Beneath the throat-hole A^2 in plate A at a^6 , Figs. 4, 6, and 20, a recess is milled out to bridge the feeder of the sewing-machine, and thus avoid interference. A piece is here broken out of plate A so that the feeder below may be seen. Plate A is also milled out on its upper surface near the opposite end to about one-half its thickness to provide a recess beneath the overlying plate B for the ratchet-wheel I, and the pawls, levers, and springs connected therewith, as shown in Fig. 6.

The pawls $a^3 a^2$, the double spring a^4 , and the releasing-lever a^{23} , Fig. 6, are each riveted to the bed-plate A, while the ratchet-wheel I is carried laterally to and fro by the overlying and oscillating plate B, the said wheel having a boss on its upper surface which fits a hole b' , Fig. 18, in said plate and serves as a pivot.

The oscillating movement of the plate B is communicated to it by the cam D acting upon

the cam-rolls a' , Fig. 6. The distance traveled in this oscillating movement is about three thirty-seconds of an inch, the length of the stitch employed in working button-holes. Since the pawls a^2 and a^3 are fixed to the bed-plate A, while the ratchet-wheel I is carried to and fro by the plate B, it follows that the teeth of said wheel are alternately and necessarily engaged by the aforesaid pawls and in such a way as to cause it and with it the pinion J to revolve intermittingly from right to left. The pinion J is fixed to the ratchet-wheel I and carries upon its summit a roller K, and being pivoted into plate B the said pinion is enabled to drive the rack h' , Fig. 4, with which it gears, and which is arranged to slide along said plate in a longitudinal direction, carrying with it the cloth-clamp L, Figs. 4, 7, and 8. To provide for the aforesaid movement of the cloth-clamp, the latter is mounted on a frame B' , which is provided at both its front and rear ends with a transverse strip B^2 , Fig. 8, the four ends of which are bent downward, so as to grasp the beveled edge of the plate B on opposing sides, thus forming the necessary guides, as well as means of attachment. The two transverse strips aforesaid, combined with the oscillating plate B beneath and the square frame B' above, are made to serve as a channel for the play of the lateral shifting plate O, Fig. 7. On the upper side of plate O and directly over the wide slot in the same is fixed the drum-case h , Fig. 1. In Fig. 4 this drum is shown in longitudinal section and in Fig. 3 in transverse section. In the rear end of said drum is a fixed block h^6 , having on its under surface a part or section of a rack. This section may be of any convenient length, but preferably with only two teeth, as shown in section at h^6 , Fig. 4.

On each of the several faces of the hexagonal drum H, Fig. 4, there is mounted a corresponding rack-section. These are of different lengths to provide for button-holes of different sizes. The rack-sections on this drum are incomplete in themselves, but complementary to the section which is on the fixed block h^6 . Surrounding these rack-sections, both on the block h^6 and on the faces of the revolving drum H, there is a groove h^8 , Fig. 8, which at all points is equidistant from the rack, and which, like the rack, is composed of two parts, the one movable and the other fixed. When any given section on the drum is in line with the fixed section on the block h^6 , a complete rack is formed, and the groove is endless, as seen at h^8 , Fig. 8. On the top of the pinion J is the roller K. In operation the groove h^8 engages the roller K, and through this means holds the pinion J in working contact with the rack h' , Figs. 2, 3, and 4. Now when a rotary movement is given to the pinion J, the rack is driven forward until the end of the rack is reached, when the plate O and with it the rack aforesaid shifts over, describing a semicircle in

obedience to the curved portion of the endless groove aforesaid. Having now passed to the opposite side of the rack, the pinion continues its action upon it; but because of the change of relationship the rack is now driven in the opposite direction. On reaching the other end of said rack the plate O shifts again, but in the opposite direction, thus completing one revolution of the rack about the pinion J. The cloth-clamp L, being attached indirectly to said rack, is thus made to automatically advance, swing around the end to the other side of the button-hole, and to return to the starting-point.

In order to secure strength and durability the dimensions of the aforesaid pinion and its roller, together with the groove in which the latter travels, must be so great that the cloth-clamp would, if attached directly to the plate O, be carried so far laterally that the work of the needles intended for the parallel sides of the button-hole would be thrown too far apart. To obviate this the modifying lever or link o' is introduced, its rear end resting by means of a stud in the slot o in plate O, its front end by its stud in the slot o^3 in the square frame B, while a similar stud arising from it enters a hole o^2 in an arm on the base of the cloth-clamp L. The said cloth-clamp base is slotted at m , Fig. 7, for the attaching-screw m^2 and at $m' m'$ for the guiding-studs $m^3 m^3$. By this arrangement the link o' operates as a lever of the second class, o^3 being the fulcrum, o^2 the resistance, and o' the power. The plate O therefore in its lateral movement carries the cloth-clamp by the pivotal stud o^2 with it, but to a greatly modified extent, or only far enough for the cloth-clamp to bring the fabric in position for the needle to act upon the opposite side of the button-hole.

Since the shifting of the plate O takes place while the roller K is traversing the semicircular portion of the endless groove h^8 , Fig. 8, it is manifest that the advance of the cloth-clamp will be gradually retarded until the roller reaches the center of this semicircular portion, after which it will be accelerated until the parallel portion of the groove is reached, whence it will advance at an even rate, as on the opposite side. It is further manifest that while the movement of the cloth-clamp is thus retarded in rounding these curves the needle of the sewing-machine maintains a constant rate, the result being that the stitches are not only placed closer together, but that in the center of the curve they overlap each other, practically back-stitching the ends of the button-hole, and thus giving additional strength where it is most needed. The object in making the rack and groove aforesaid in two sections—the one fixed and the other movable—is twofold, first, to provide for instantaneous changes from one size of button-hole to another by simply turning the drum H, on which the movable rack-sections are mounted, so as to bring that one into line with that on the

fixed block h^6 , which will make up a complete rack of the desired length, and, second, to be able to avoid interference with pinion J and roller K, all of which is done by making changes only while the said pinion and roller are engaging exclusively the fixed section on the block h^6 , Fig. 4. When the drum H has been placed in any given position, it is necessary that it shall so remain. To prevent trouble that would ensue from accidentally or carelessly leaving the drum in such position that the rack and groove would be out of line, it is also desirable that when a change is attempted the drum shall automatically assume some one of its working positions. Both of these requirements are provided for and in the following manner: The shaft h^2 , on which the drum turns, is provided with a knob h^9 with a serrated boss, (a tooth for each face of the drum H,) which rests in a seat of similar formation and fixed on the drum-case h . To change for a different size of button-hole, the operator grasps the knob h^9 , draws it out of its seat, turns until the proper number can be seen through the peep-hole, as at H^6 , Fig. 1, and then, releasing his grasp, the knob h^9 is driven into its seat by the retraction of the spring h^3 . By this arrangement it is manifest that if the drum is turned either too far or not far enough the serrations on the boss and its seat, combined with the action of the spring h^3 , will compel it to take a working position.

The attempt to set the drum H when the pinion is acting upon that section of the rack which the drum carries would be liable to disarrange the machinery and cause trouble. Such attempt at such a time is made futile by means of a lock-pin h^4 , which enters a hole in the drum H and there remains until it is drawn by action of the roller K against the lower edge of the spring h^5 , Fig. 5, it being in the path of said roller as the latter rounds the curve of the groove on the fixed block h^6 , Fig. 4.

To persons of a practical turn of mind the question will arise: What can be done in case the thread breaks while a button-hole is being worked? it being impossible to stop the machine at the very moment this occurs. Such an accident is fully provided for in my invention, and may be readily understood by reference to Figs. 1, 2, and 6. Here it will be seen that the pawls a^2 and a^3 may be thrown out of action by grasping the pins on the ends of the releasing-levers $a^{2\frac{1}{2}}$ $a^{2\frac{1}{2}}$ so as to bring them both into contact with the stop a^1 , Figs. 1 and 2. This releases the ratchet-wheel I, Fig. 6, whereupon the drum H and with it the cloth-clamp L may be moved so as to begin anew at the point where the thread broke.

One of the most serious difficulties encountered in working button-holes by means of an attachment to a sewing-machine is the inability to always get the fabric in the cloth-clamp taut enough to prevent it from lifting

with each upward stroke of the needle. In such a case the loop is often so imperfectly formed that the shuttle fails to enter it, in which event the work is seriously marred by missing stitches. Another difficulty scarcely less serious has been encountered in the seams and other inequalities that are often found in or near the place where the button-hole must be made. Both of these difficulties I have overcome in my invention by the introduction, as an element of my attachment, a pressure-lever with suitable foot whose function it is to hold the fabric firmly down upon the bed-plate A from or about the time the needle enters it on the descending until it leaves it on the ascending stroke. Various devices may be used for this purpose. In my present invention I have found it convenient to use the lever or arm F, Figs. 1, 2, and 4. This is pierced at its rear end by a large hole, by which it is hung upon the same stud a^7 that bears the operating-fork E. Extending forward from this stud it is curved laterally to the left until the hole or slot in its foot or extremity rests over or corresponds with the needle-hole in the bed-plate A. Its position on the stud aforesaid is between the fork E and the pawl-plate G, Fig. 10. In action it has a slight up-and-down movement.

At f^4 , Figs. 2 and 9, is shown a stud projecting outward from the lower front margin of the arm or lever F. On the rear end of the slide f' is another stud f^5 of similar form and function. Said studs are drawn toward each other by the spiral spring f^3 . Beneath the stud a^7 on which the pressure-lever plays the said pressure-lever is cut away, leaving a right-angled notch, as shown by the vertical and horizontal arms of the dotted line f^6 . Provision is thus made for the front end of slide f' to occupy the same plane with the said pressure-lever, while the vertical face f^6 of said notch forms for said slide a suitable stop. The point of contact between slide f' and the aforesaid stop is such that the pressure of the spring f^3 is not only annulled by such contact, but is now exerted against the lower portion of the vertical face f^6 of the pressure-foot lever and tends to release and lift the foot from the fabric. (See Fig. 9.) During this release of the pressure-foot the fabric is moved into position for the next stitch. In order to bring the spring f^3 to bear downward upon the pressure-lever the operating-fork E must descend until the stud e' is brought into forceful contact with the horn f^2 of the slide f' . This action begins at the moment the needle enters the fabric and ends when it emerges from it on its upward stroke. The pressure thus afforded obviates the lifting of the fabric, insuring a perfect loop and therefore the unfailing action of the shuttle at all times, and especially during the crossing of seams and other inequalities.

Referring again to the stud e' , Fig. 9, I desire to show that it has another function than that of throwing the horn of the slide out of

engagement with the presser-foot lever to cause the spring f^3 to press the foot down. Its length is such as to reach inward beyond the horn f^2 into a short slot G' in the pawl-plate G. During the descent of the fork E in which it is fixed the front end of the pawl-plate G is forced downward for another bite of the pawl g upon the ratchet-wheel d' . Returning, it engages the opposite end of the aforesaid slot, driving the pawl-plate upward, rotating the ratchet-wheel d' and with it the cam D, to which it is attached.

The cam D may have any convenient number of turns, but these must coincide in number with the teeth in the ratchet-wheel d' .

In order to facilitate attachment to various machines I have provided the universal washer A^3 , Figs. 1, 2, and 6. It is beveled on its lower edge to fit a corresponding bevel in the bed-plate A, and is suitably held in position. By loosening these screws it may be turned until some part of the slot a^5 is in position to admit the gage-screw of the machine. On the right margin of the bed-plate A, Fig. 2, is the button-gage Q, having six divisions, numbered from 1 to 6, inclusive. These correspond in length with the racks described in a previous paragraph and point to corresponding numbers on the front end of the drum H, as shown at H^6 , Fig. 1.

Having now fully described the construction and action of its several parts, I will now briefly describe the action of my button-hole attachment as an entirety.

Removing the presser-foot and the back shuttle-race slide of the sewing-machine, the slide on the under side of the bed-plate A is caused to take the place of the one removed. At the same time the fork e of lever E is caused to embrace the needle-screw of the machine. The gage-screw is then passed through the slot a^5 in the universal washer A^3 and driven home, binding the attachment to the bed of the machine. My attachment is now in readiness, provided the cloth-clamp is at its extreme forward position. If not, operate the treadle of the machine until it assumes this position. The fabric is now placed between the jaws of the clamp, and the lever N is brought over forward, as in Fig. 1. The button to be used is now laid on the gage Q and the size noted. Then grasping the knob h^9 , draw it from its seat and rotate it until a number appears at the peep-hole in the front of the drum-case which corresponds with the size of the button, as indicated by the gage. On operating the machine the motion of the needle-bar is transmitted by the fork E to the cam D, which in turn causes the plate B to oscillate in a lateral direction, carrying with it the cloth-clamp. It is so arranged that these movements shall be effected while the needle is out of the fabric. Because of the combined oscillating and longitudinal movements of the cloth-clamp the needle is caused to pierce the fabric alternately right and left, advancing meanwhile up one side of

the hole and returning automatically down the other to the starting-point, leaving behind a button-hole which can scarcely be equalled by any other means and at a rate of speed about fifteen times that of the most facile hand.

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

10 1. A button-hole attachment for sewing-machines, comprising a pivoted lever, a slide, and means for holding and moving the fabric, the presser-foot lever and operating-lever having an engagement with the slide, and a
15 spring connecting the slide with the presser-foot lever, substantially as set forth.

2. In combination, the supporting-bracket provided with studs projected from its sides, the cam-wheel carrying a ratchet-wheel
20 mounted on one of the studs, a pawl-plate carrying a spring-actuated pawl to engage the ratchet-wheel, a presser-foot lever and an operating-lever, the pawl-plate and presser-foot lever and operating-lever being mounted on
25 the stud on the opposite side of the bracket, a cloth-holder, and intermediate mechanism connecting the cloth-holder and cam-wheel, substantially as set forth.

3. In combination, the bed-plate provided
30 with a recess, the reciprocating plate carrying the ratchet-wheel I, the latter located in the recess in the bed-plate, actuating-pawls secured to the bed-plate within the recess and adapted to engage the ratchet-wheel, and
35 spring-actuated levers for releasing the pawls, substantially as set forth.

4. In combination, a reciprocating frame carrying a ratchet-wheel, a pair of pawls secured to a support stationary with respect to
40 the reciprocating frame and held in engagement with the ratchet-wheel, and a fabric-carrying mechanism actuated by the intermittent motion of the ratchet-wheel, substantially as set forth.

45 5. The combination, with the fabric-feeding mechanism and a pair of pawls for actuating the said mechanism, of springs for holding the pawls in engagement with their work and a pair of releasing-levers within convenient
50 reach of the operator for releasing the pawls against the tension of the springs, substantially as set forth.

6. In a button-hole attachment for sewing-machines, the combination, with a bed-plate
55 provided with an opening therethrough, of a washer seated in said opening so as to rotate freely therein, and provided with an elongated slot for the passage of the ordinary gage-screw of a sewing-machine through the
60 bed-plate, and which may be turned so as to register with screw-holes in varying positions in different machines, substantially as set forth.

7. The fabric holding and feeding mechanism comprising the frame B', the clamping-frame secured thereto and having a limited
65 movement relatively thereto, a frame secured

to the frame B' so as to have a sliding movement relatively thereto, actuating mechanism secured to the said last-named frame, and
70 a lever fulcrumed on the frame B' and connecting the two frames secured thereto, substantially as set forth.

8. The combination, with the frame B', provided with the guide-strips B² and the guide-studs m³, of the clamping-frame L, provided
75 with slots to receive the studs m³, the sliding frame O, provided with an opening to receive actuating mechanism, and a reducing-lever fulcrumed on the frame B' and having a
80 loose connection with the frame O and frame L, substantially as set forth.

9. The combination, with the frame B', provided with the guide-strips B² and the guide-studs m³, of the sliding frame secured between the strips B², the clamping-frame secured on the studs m³, the sliding frame and the clamping-frame having parallel motions,
85 and a lever fulcrumed on the frame B', its short arm connected with the clamping-frame and its long arm connected with the sliding frame, substantially as and for the purpose set forth.

10. The combination, with the reciprocating plate B, of the plate B', having a motion
95 transversely thereto, the plates L and O, linked together and having motions transverse to that of the plate B', and means for communicating the motion of the plate B to the plates B', L, and O, the work-clamp, and
100 means for actuating the same, substantially as set forth.

11. The combination, with a rotary drum provided with a single rack-section and a series of rack-sections arranged to supplement
105 the single rack-section, of a fabric-clamp connected with the racks, a pinion in engagement with the racks, and means for actuating the pinion, substantially as set forth.

12. The combination, with a rotary drum provided with a single rack-section and a series of rack-sections of various lengths arranged to successively supplement the single rack-section, of locking mechanism for holding the rack-sections in alignment, a fabric-holder connected with the racks, and means
115 for actuating the racks, substantially as set forth.

13. The combination, with a rack-section surrounded by a guide-groove, a rotary drum
120 provided with rack-sections on its periphery adapted to supplement the single rack-section, a serrated boss, and a series of teeth adapted to fit the serrations in the boss, one secured to the drum-support and the other to
125 the drum, the said serrations corresponding to the several racks, of a fabric-holder connected with the drum and means for actuating the drum, substantially as set forth.

THOMAS POWELL.

Witnesses:

HARRY HODGES,
A. D. WILLIAMS.