

(No Model.)

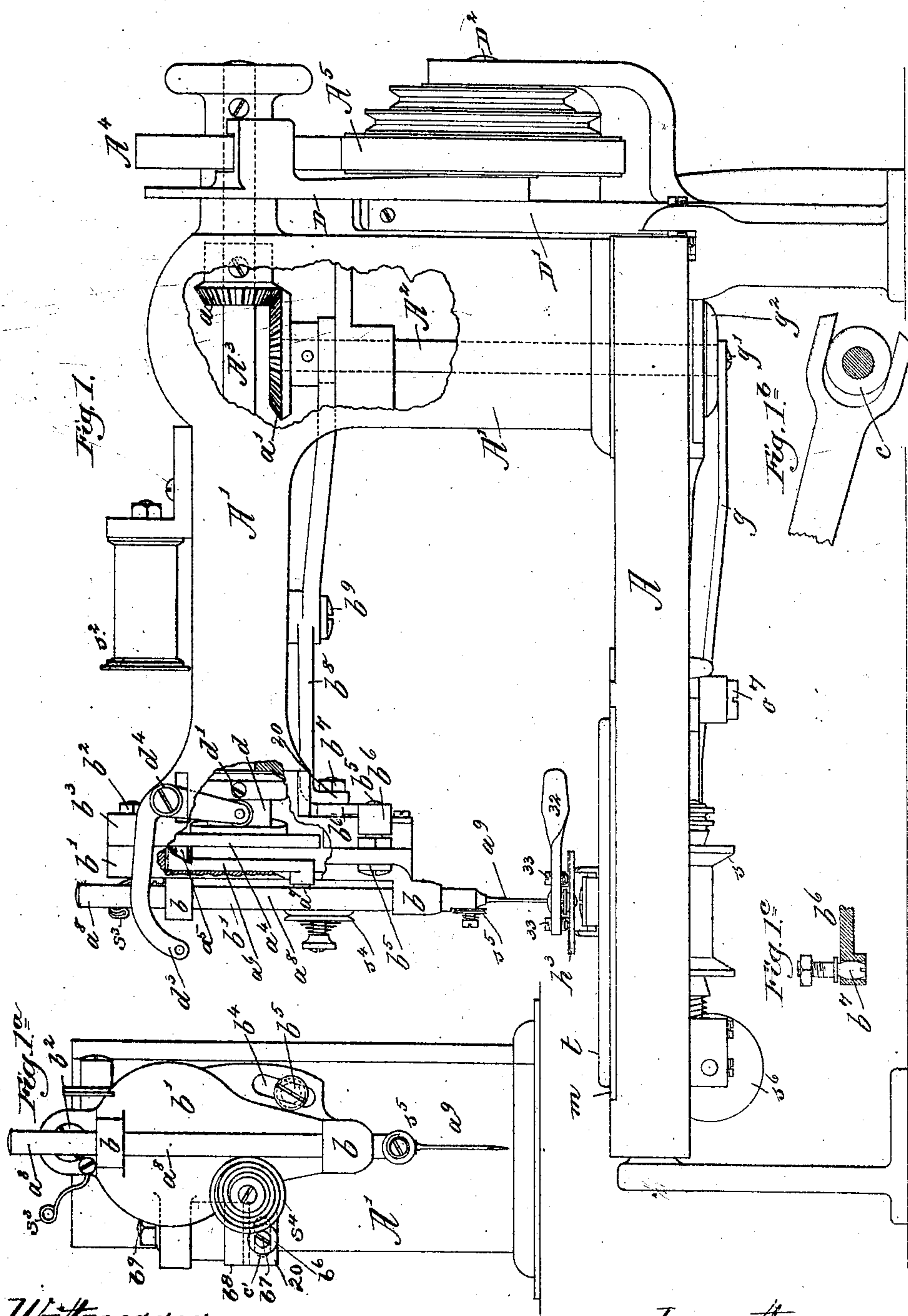
4 Sheets—Sheet 1.

J. W. LUFKIN.

BUTTON HOLE STITCHING MACHINE.

No. 355,878.

Patented Jan. 11, 1887.



Witnesses.

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Fig: 2.

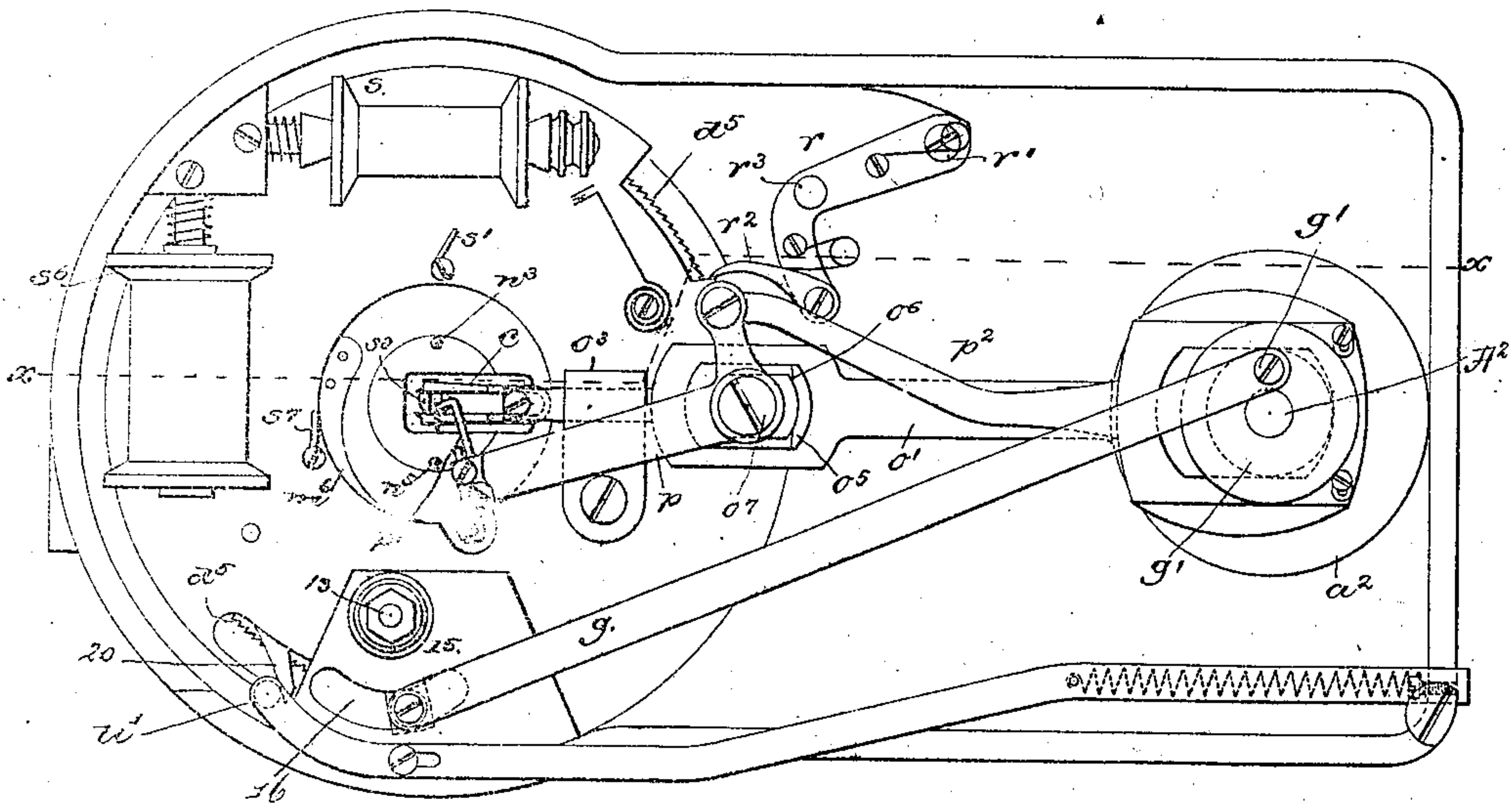


Fig: 3.

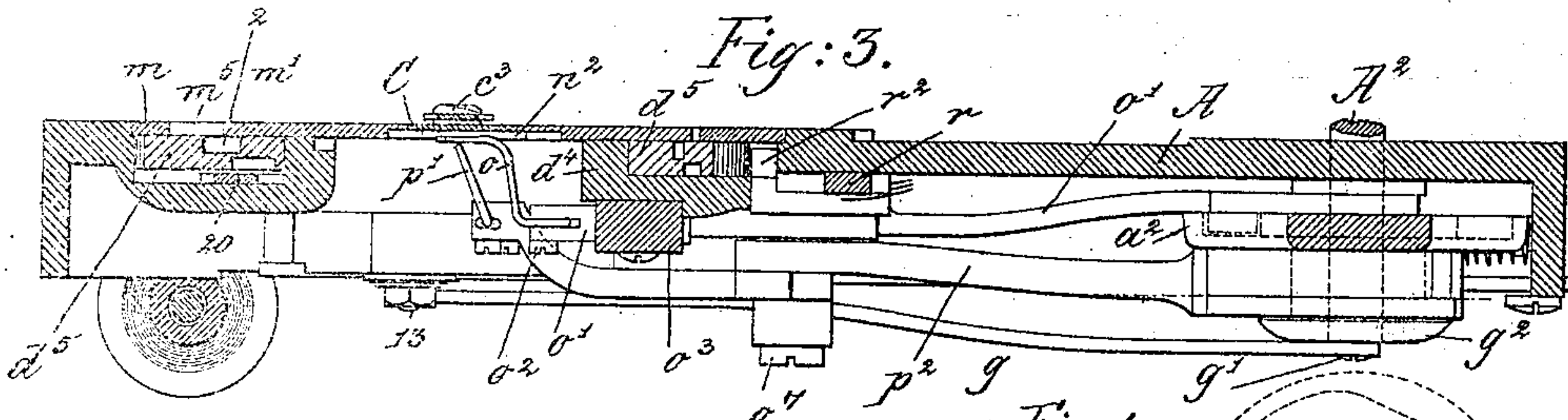


Fig: 4.

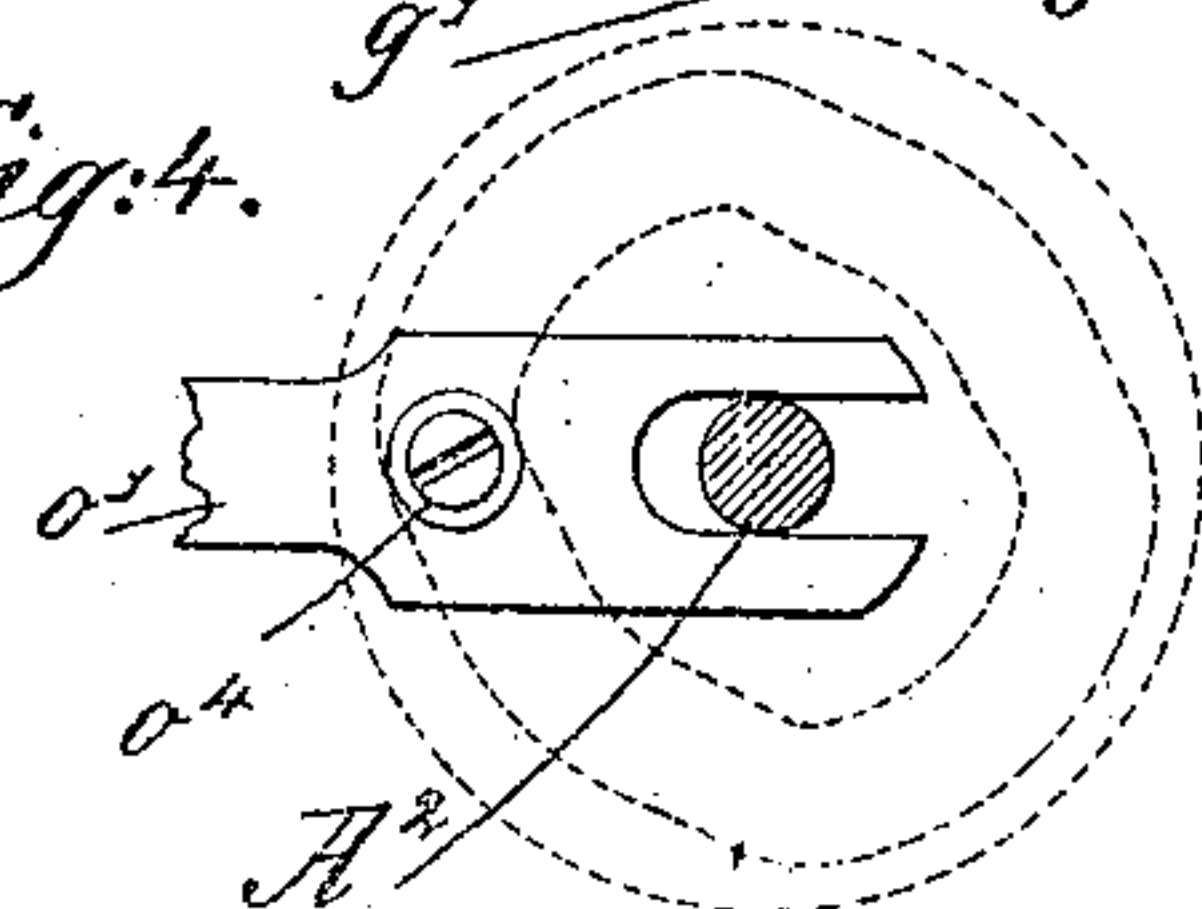


Fig: 6.

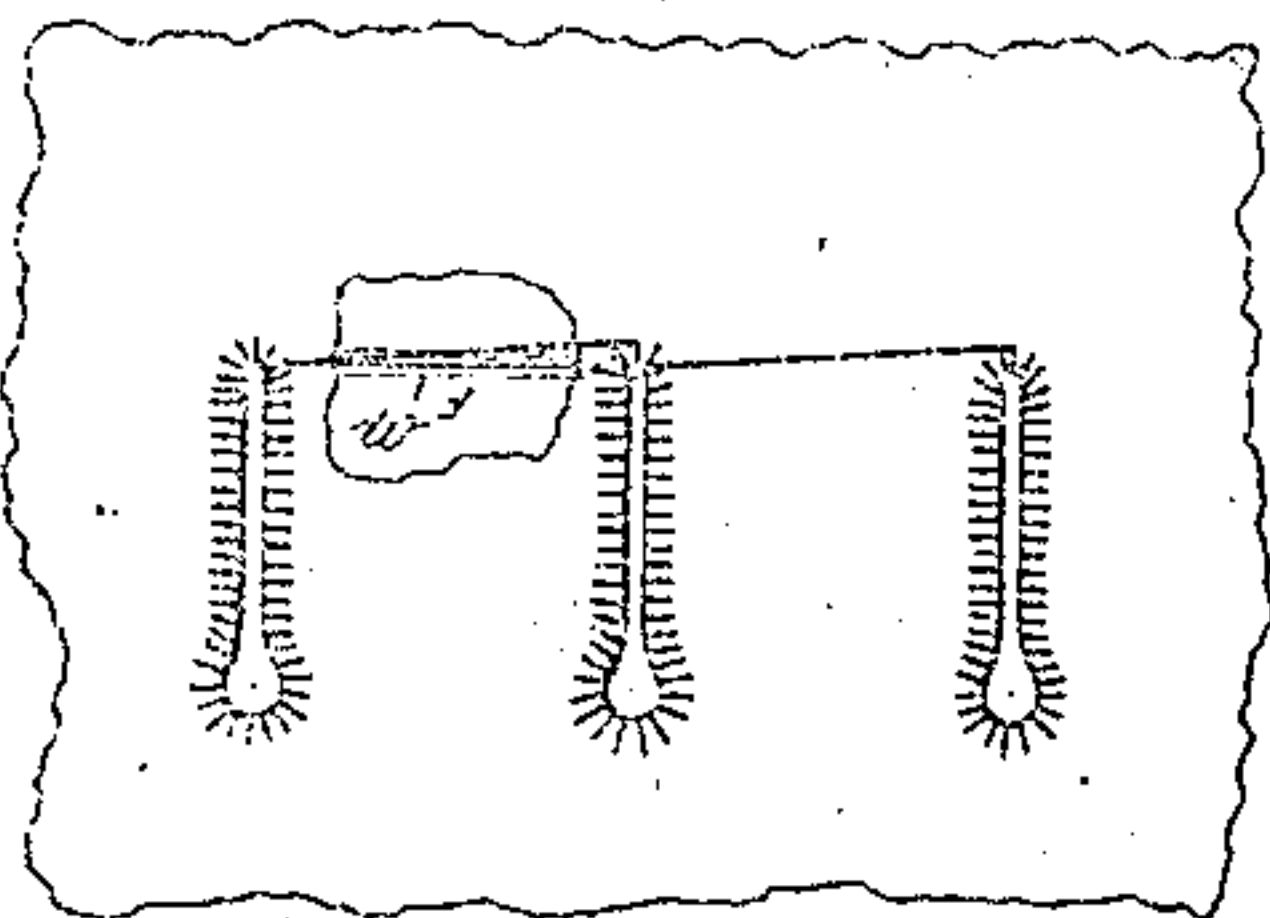
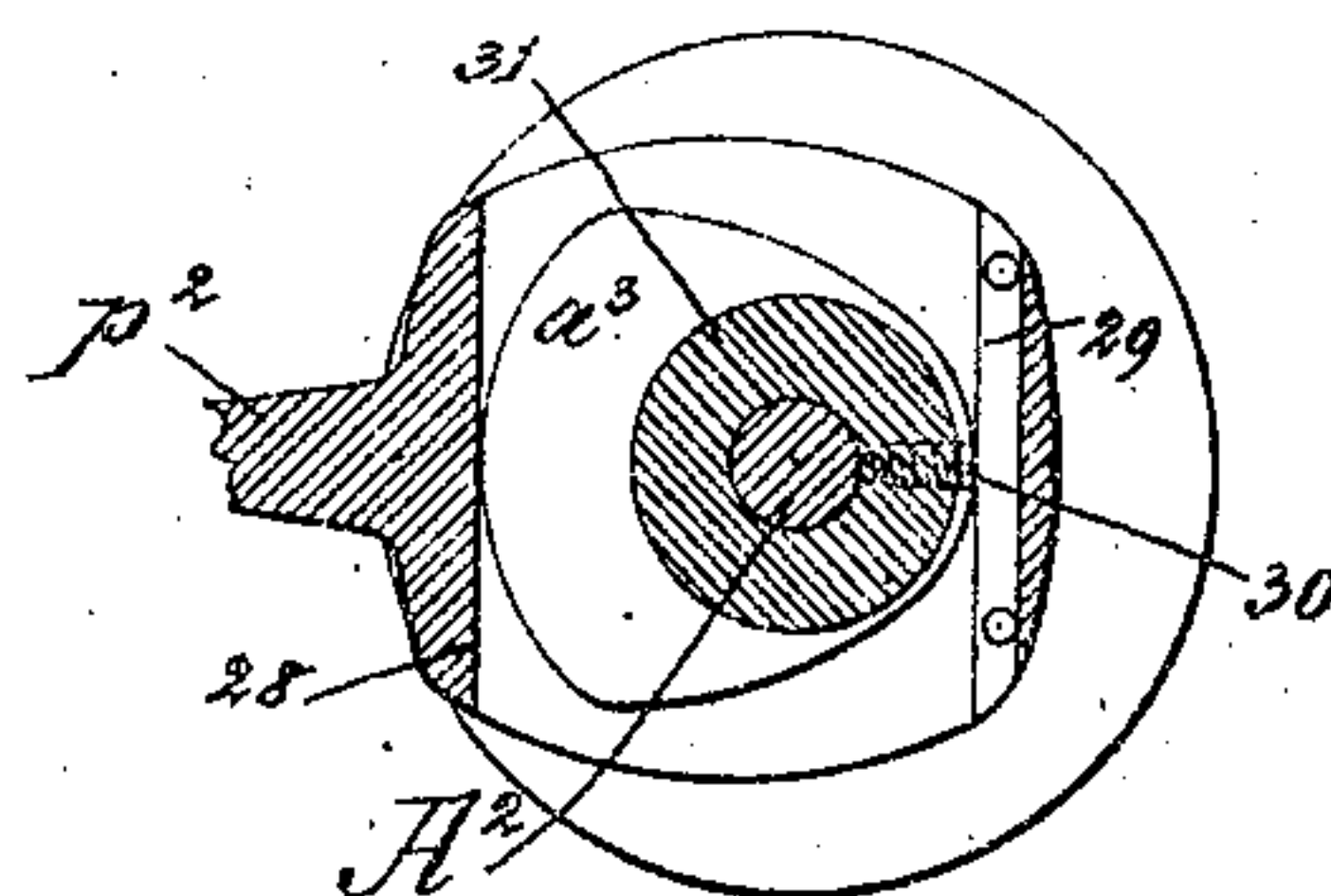


Fig: 5.



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Fig. 7.

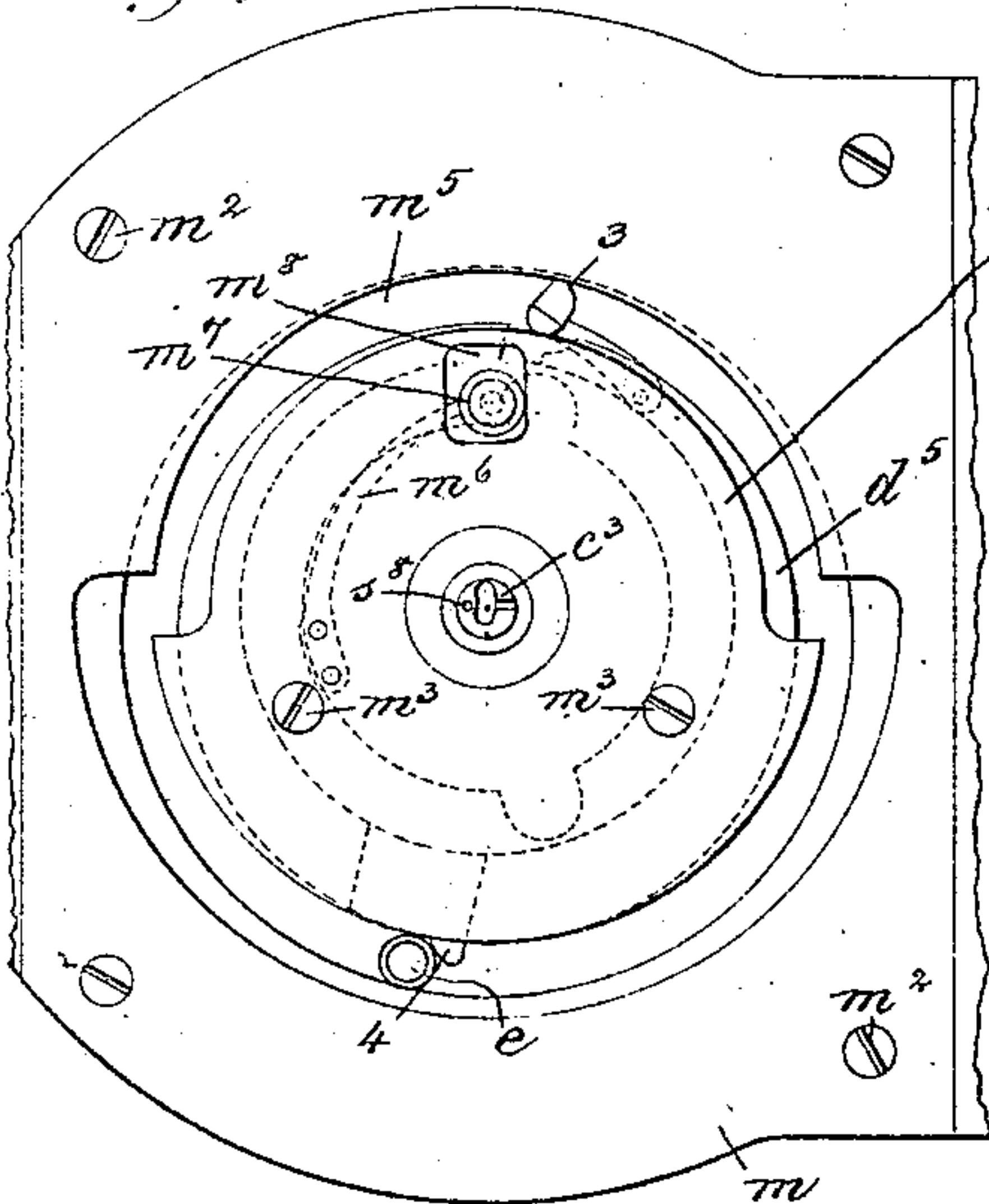


Fig. 11.

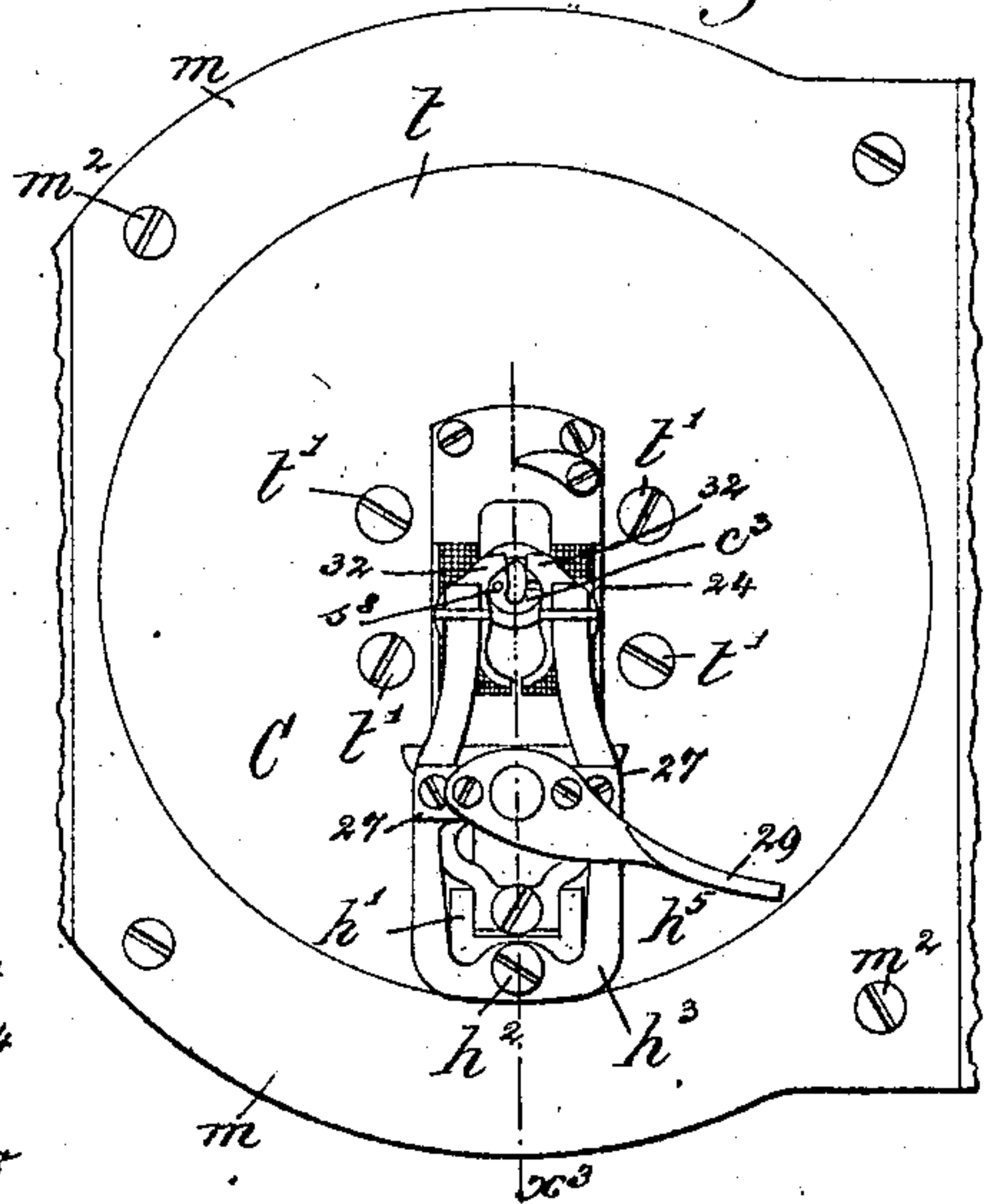


Fig. 13.

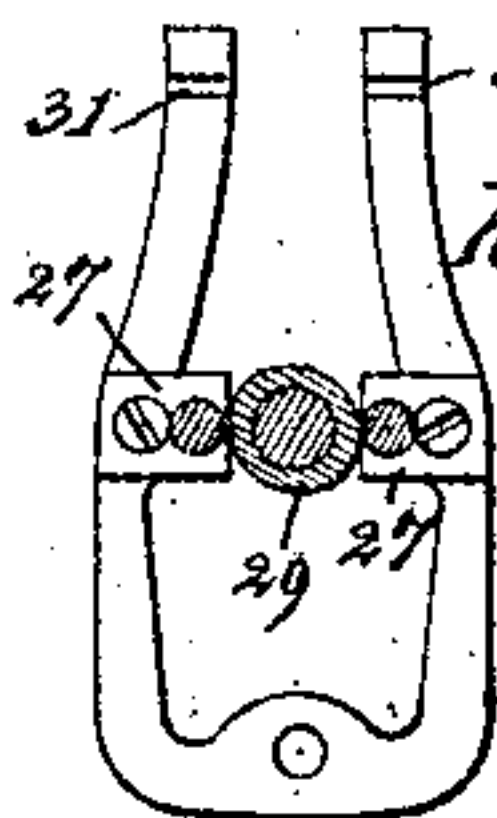


Fig. 14.

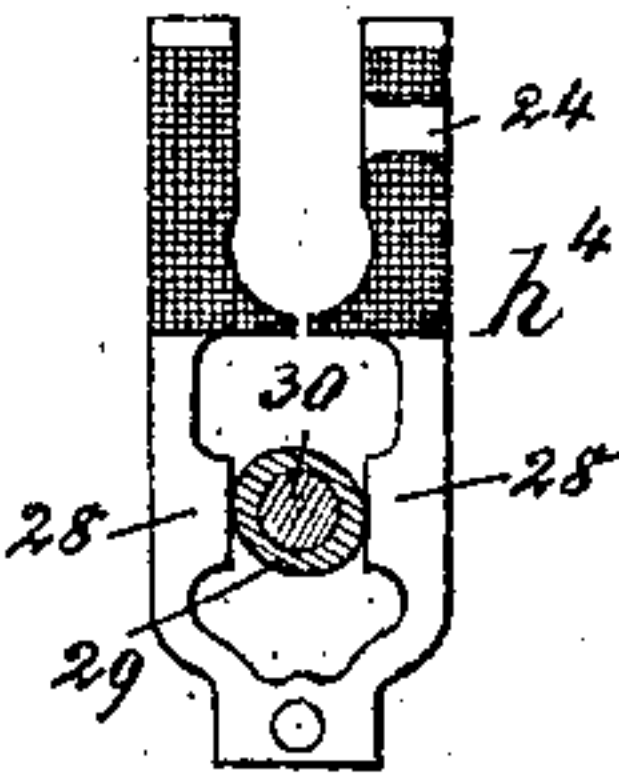


Fig. 8.

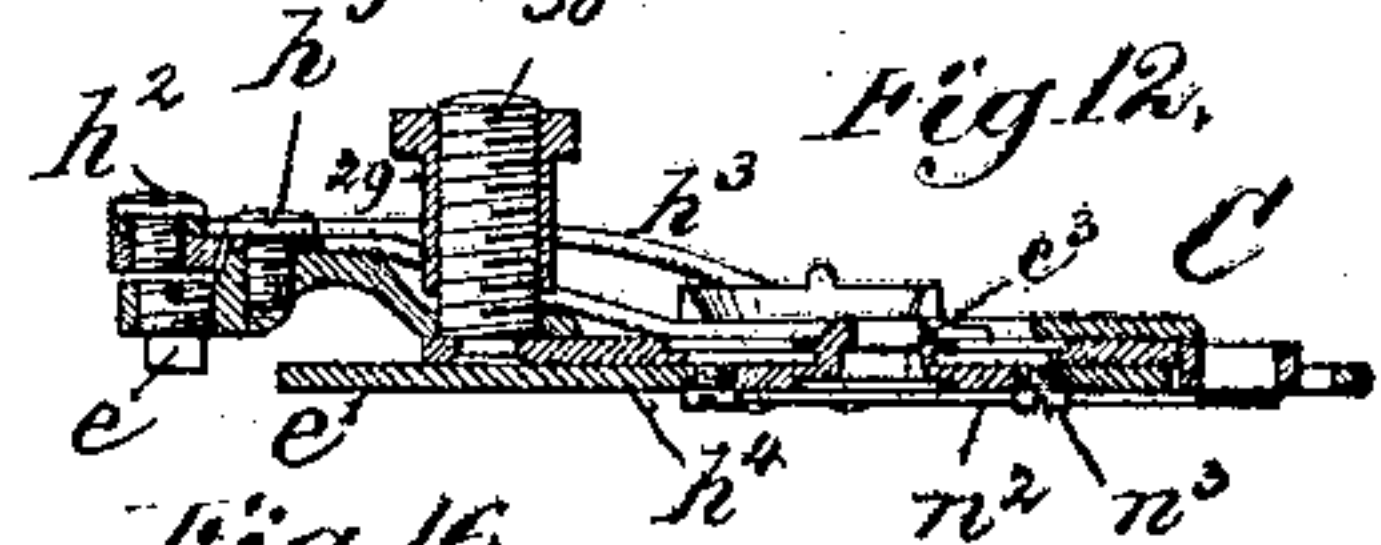
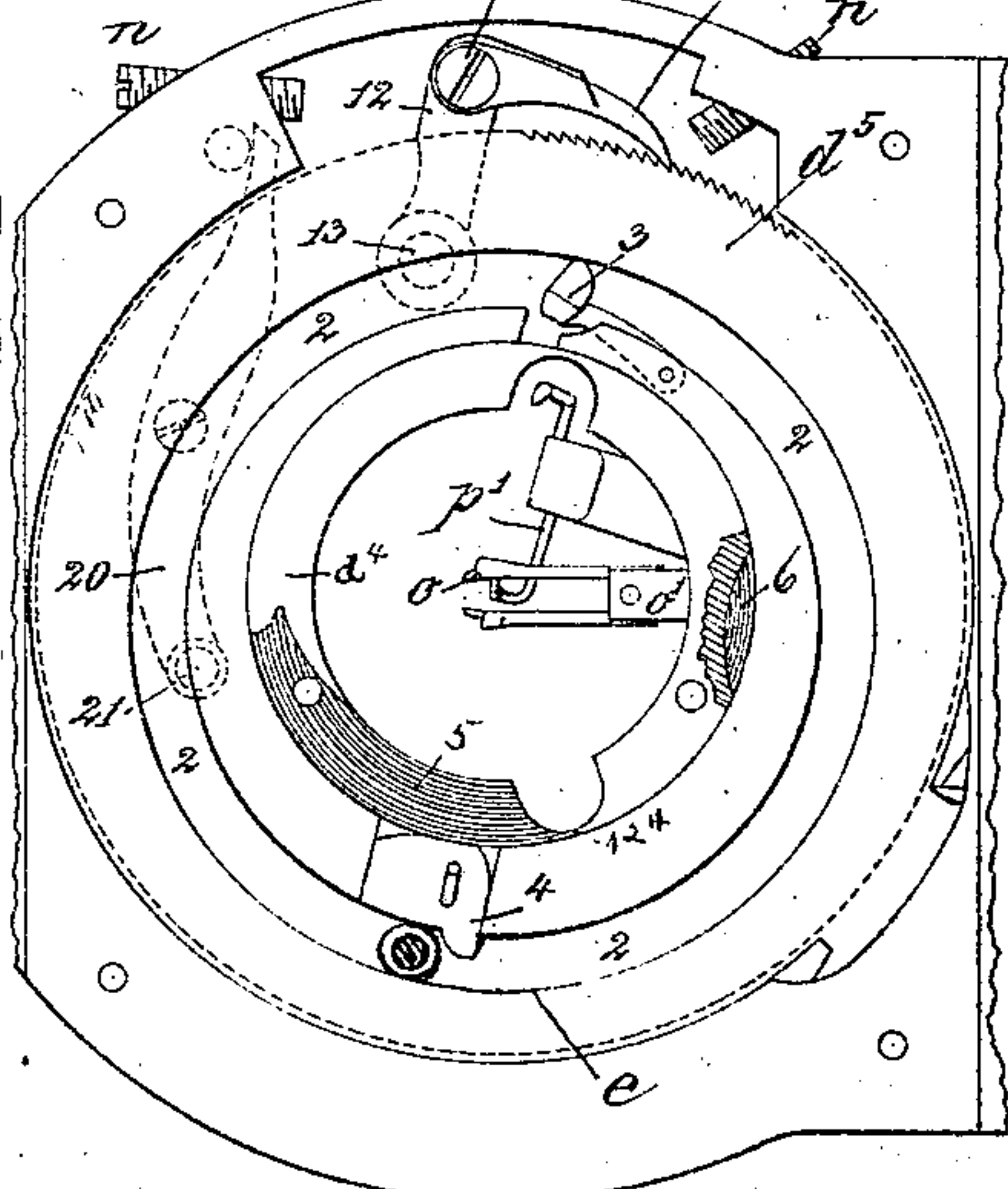


Fig. 15.

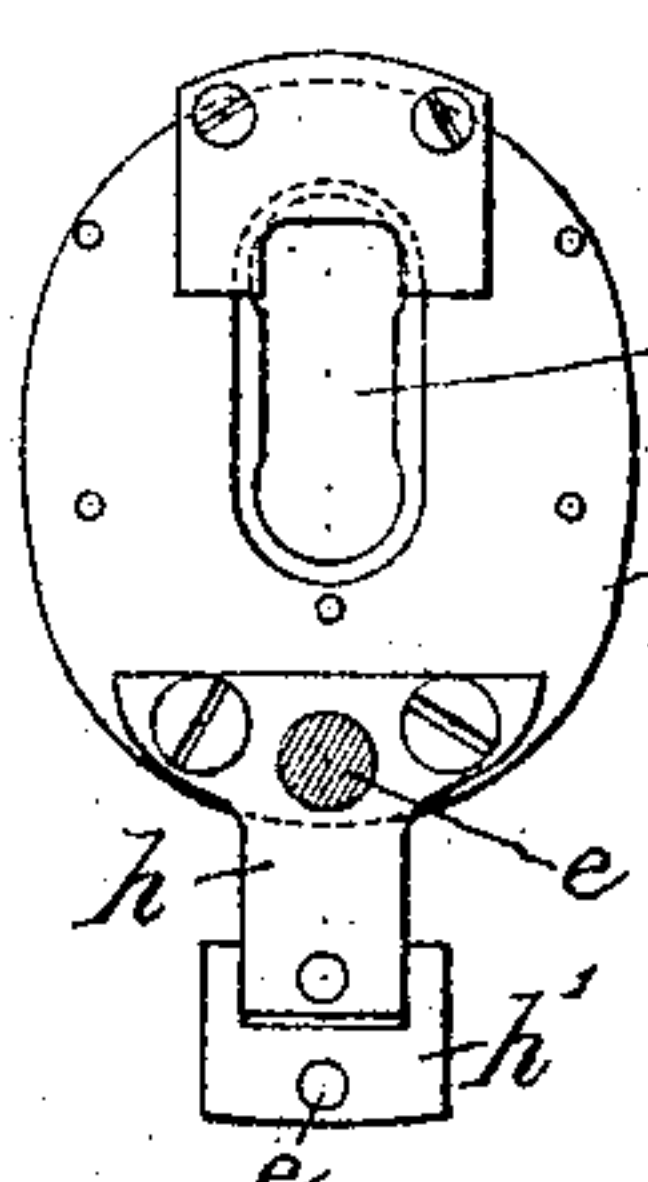


Fig. 17.

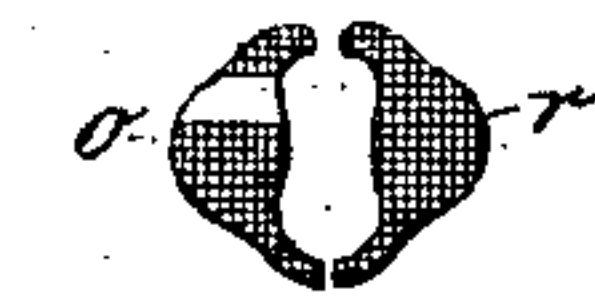


Fig. 18.



Fig. 10.

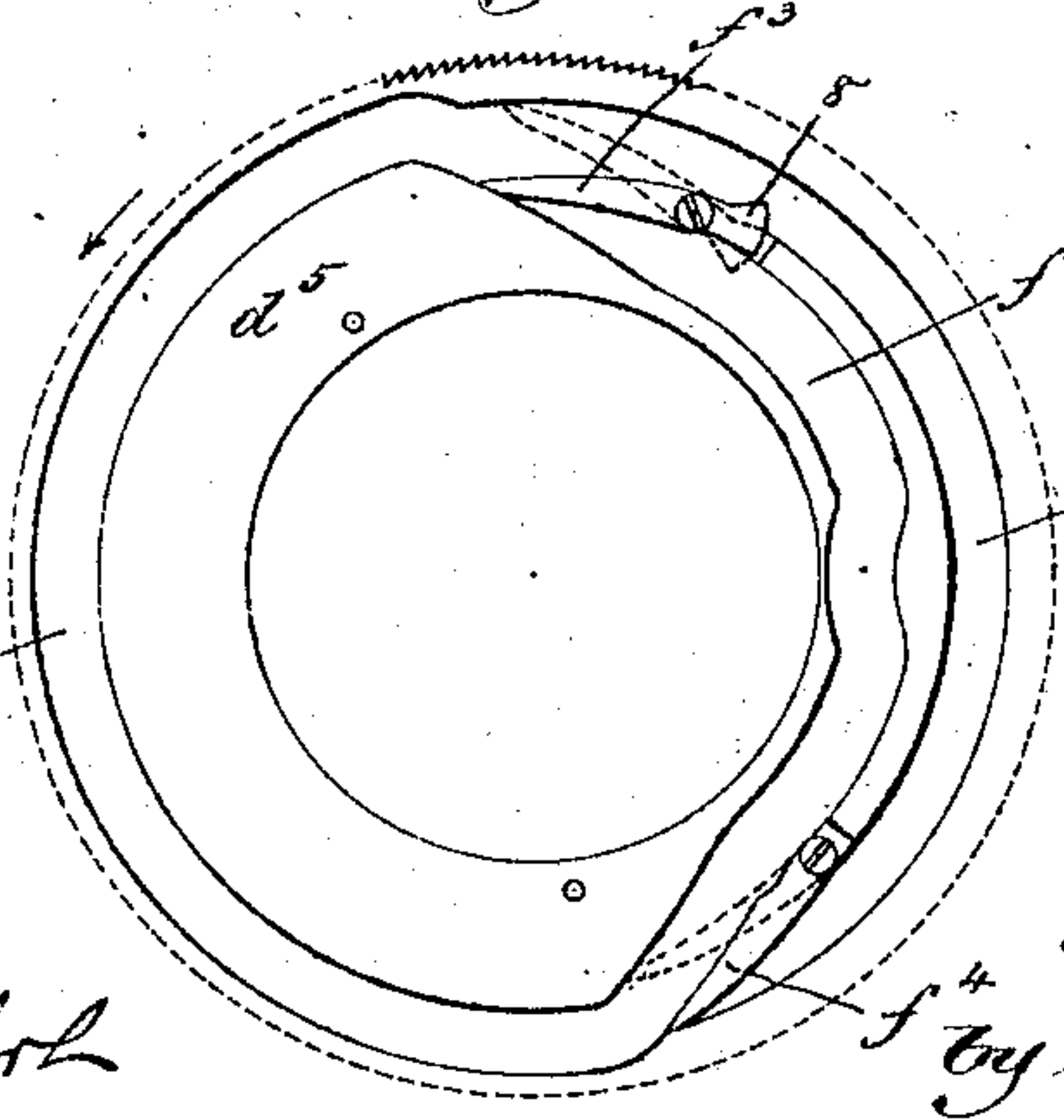


Fig. 9a.

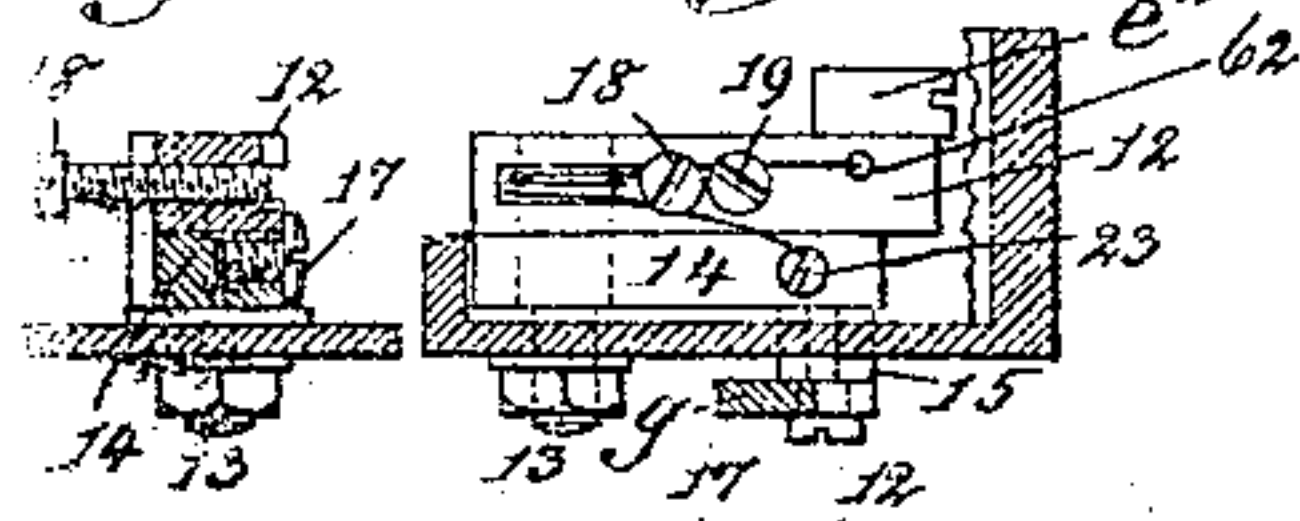


Fig. 9.

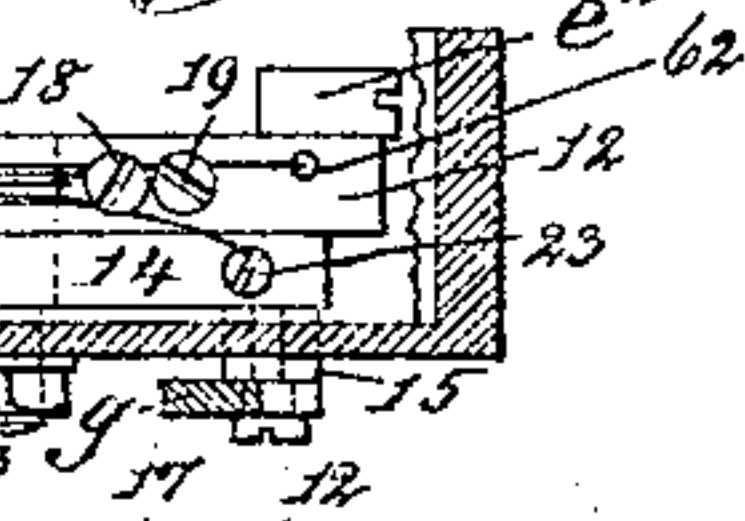


Fig. 9b.

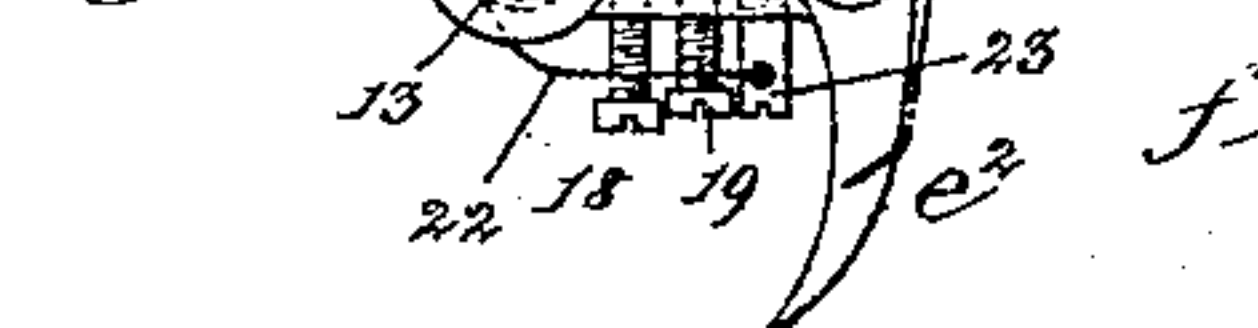


Fig. 20.

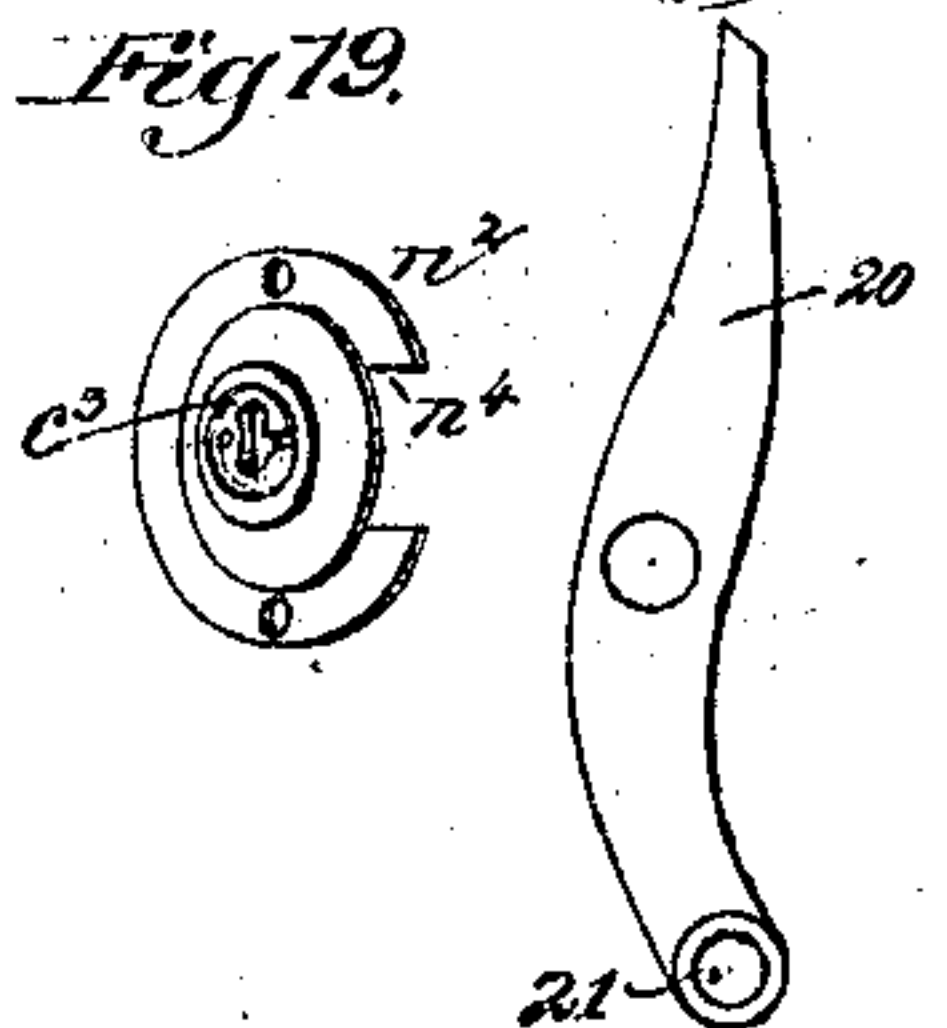
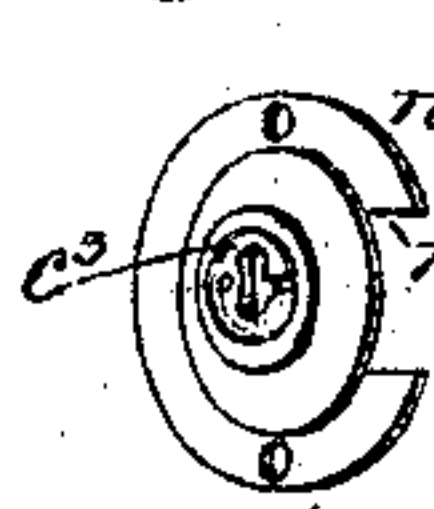


Fig. 19.



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(No Model.)

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Fig: 21.

Fig: 22.

Fig: 23.

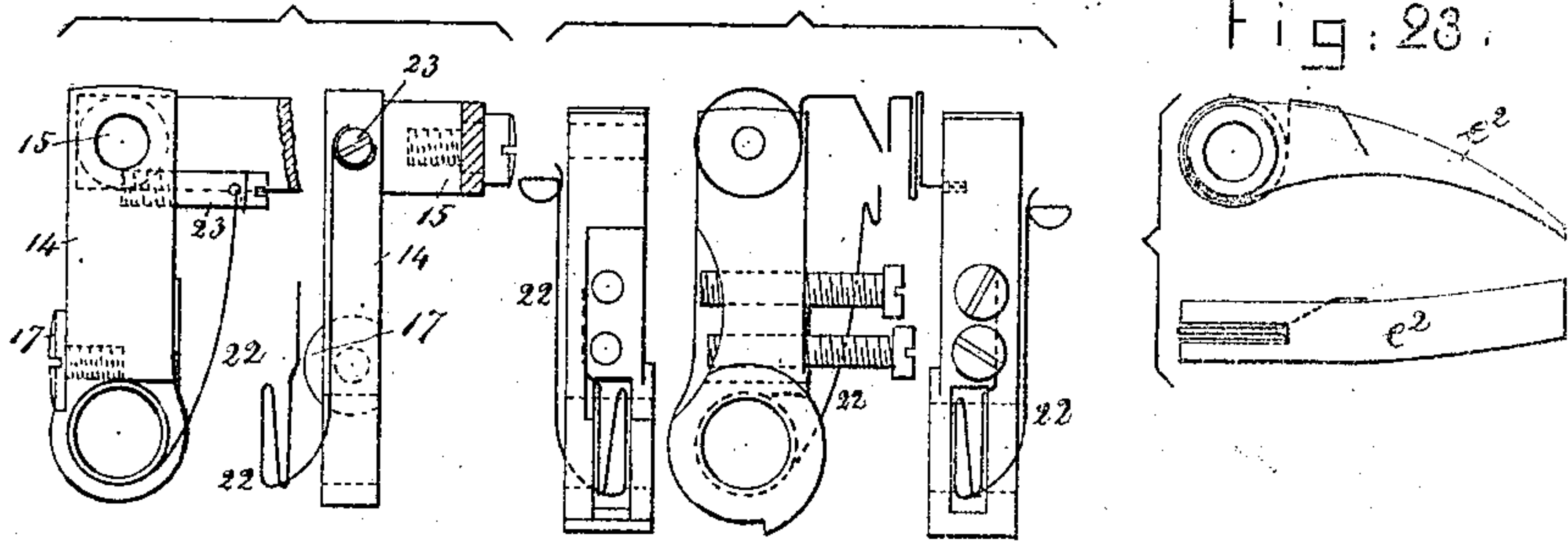


Fig: 24.

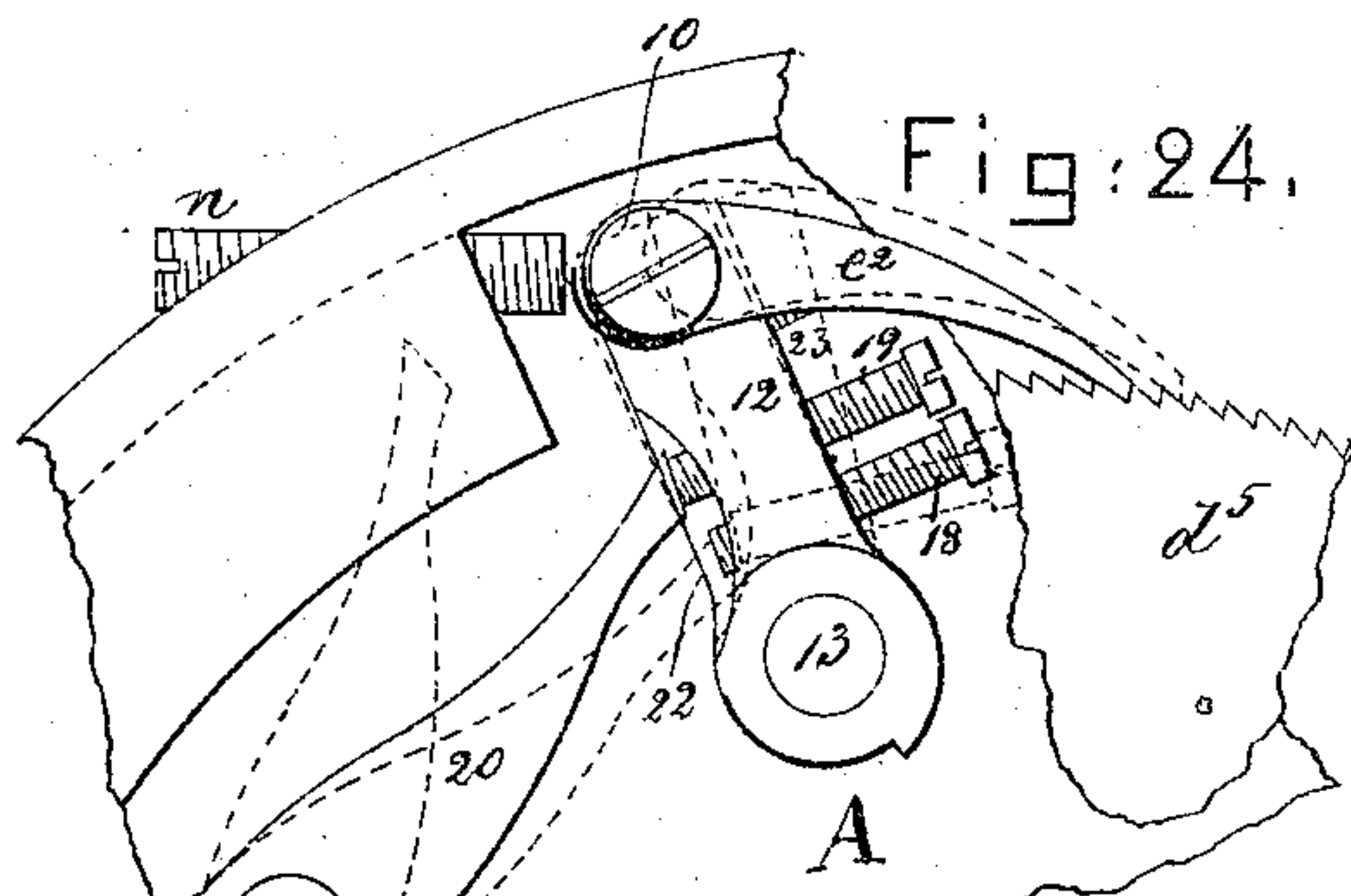
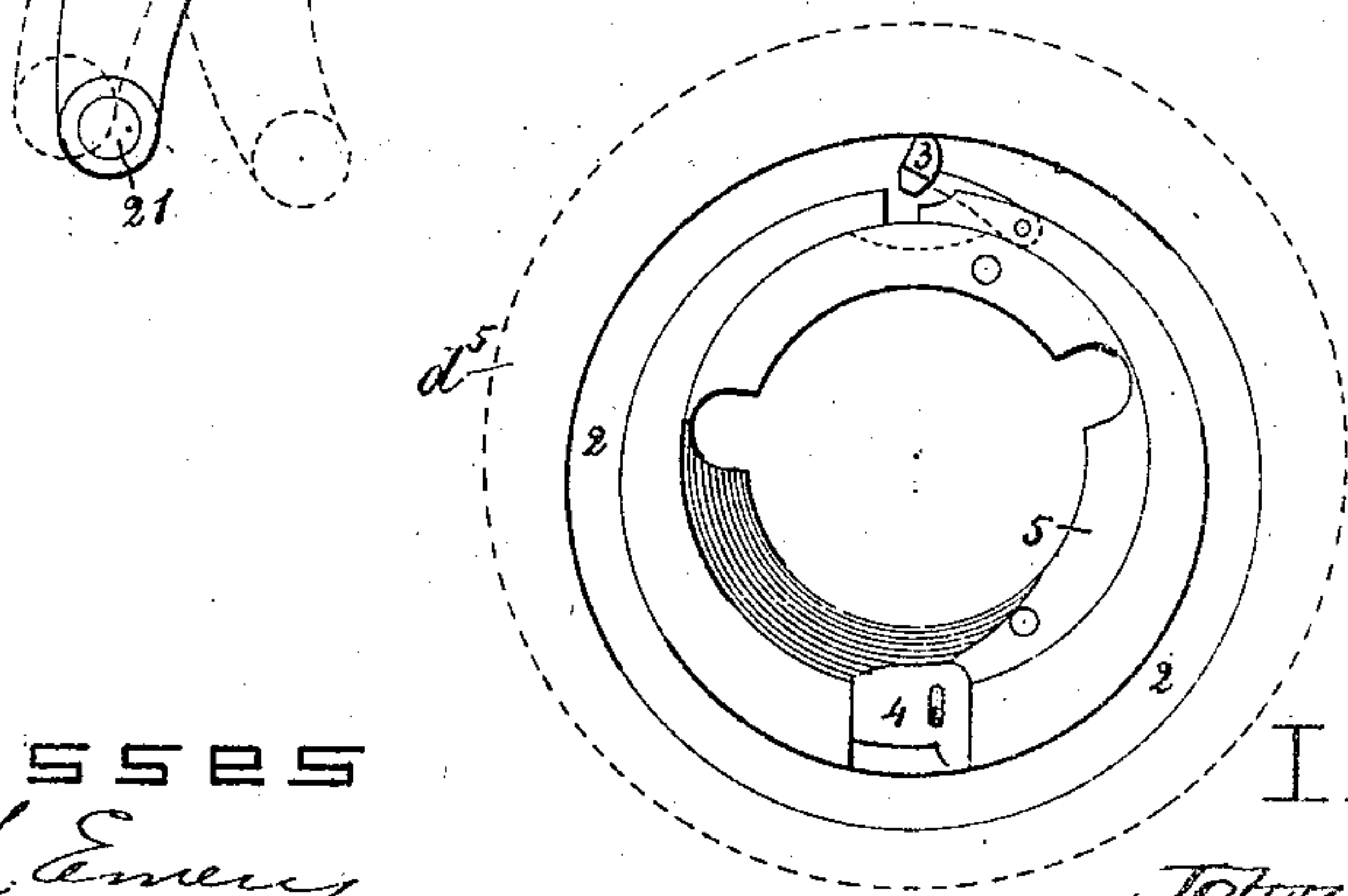


Fig: 25.



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UNITED STATES PATENT OFFICE.

JOHN W. LUFKIN, OF WINCHESTER, MASSACHUSETTS.

BUTTON-HOLE-STITCHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 355,878, dated January 11, 1887.

Application filed December 19, 1885. Serial No. 126,182. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. LUFKIN, of Winchester, county of Middlesex, and State of Massachusetts, have invented an Improvement in Button-Hole-Stitching Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object to improve the construction of that class of button-hole-stitching machines wherein the cloth or other material containing the hole or slit to be over-stitched is carried by a clamp, which moves the material under the needle in such manner as to present the entire edge of the slit to the needle. Herein the upper thread is carried by a needle held in a needle-bar, which is made to reciprocate in a pivoted head which is vibrated at suitable intervals to enable the needle to descend first through the material at the desired distance back from its edge, and then over the edges; the under thread being carried by a looper having co-operating with it a spreader.

My invention in button-hole-stitching machines consists in a bed-plate having a recessed hub and a feed-wheel provided at its upper side with a groove and at its under side with three grooves and a switch, combined with means to automatically rotate the said feed-wheel at one speed while the straight sides of the button-hole are being stitched, and at two different speeds while the ends of the button-hole are being stitched, the movement of the said feed while the small end of the button-hole is being stitched being faster than when either the straight sides or the large end of the button-hole are being stitched, as will be described; also, in a button-hole-stitching machine, a bed-plate having a recessed hub and a feed-wheel provided with a groove and two dogs carried by the said feed-wheel, and a clamp to hold the material to be stitched, the said clamp having a stud to enter the said groove, combined with two plates having between them a space of substantially semicircular form, but of different radii, whereby the clamp is enabled to have a full rotation by the action of the feed-wheel, substantially as will be described.

Other features of my invention relate to

means for operating the needle-bar, and the combination, with a needle-bar and needle having a movement at right angles to the length of the bed-plate, of a horizontally sliding and rotating clamp, such as will be described; also, to certain improvements in means for operating the looper and the spreader.

Figure 1, in side elevation partially broken out, represents a machine embodying my invention; Fig. 1^a, an end view of the head of the machine and needle-bar; Fig. 1^b, a detail showing the forked end of the needle-head-moving lever and its actuating-cam; Fig. 1^c, a detail, to be referred to. Fig. 2 is an under side view of Fig. 1. Fig. 3 is a section of Fig. 2 in the irregular line *x x*, the bed being, however, in working position; Fig. 4, a detail showing the spreader-moving cam; Fig. 5, a sectional detail showing the looper-moving cam; Fig. 6, a top or plan view of a piece of material provided with button-holes shaped and stitched in accordance with my invention; Fig. 7, a top view of the bed of the machine, the movable clamp being removed; Fig. 8, a top view of the parts shown in Fig. 7, with the inner and outer guide-plate removed. Figs. 9, 9^a, 9^b are sectional details of devices instrumental in moving the feed-wheel; Fig. 10, an underside view of the feed-wheel; Fig. 11, a plan view of the cloth-carrying clamp; Fig. 12, a partial section of the same in the dotted line *x' x'*; Fig. 13, a detail of the upper arm of the clamp; Fig. 14, a detail showing the under arm of the clamp; Fig. 15, a detail of the clamp-base with the covering-plate of the clamp detached therefrom. Fig. 16 shows a cross-section of a part of the top arm of the clamp, the said section being taken through the projection 27 thereon. Fig. 16^a is a detail showing the inner end of the projection 27 and part of the arm *h*, to which it is attached; Fig. 17, an under side view of the serrated jaws of the upper arms, *h*, the said jaws being omitted from the said arms. Fig. 18 shows the hub about which rotates the feed-wheel as developed as a plane surface to show the recess therein; Fig. 19, a detail of the throat-plate; Fig. 20, a view of the regulating-lever detached. Fig. 21 shows in two views the arm located under the pawl-carrier, to be described. Fig. 22 shows in three different positions the pawl-carrier with the screws therein and its attached spring. Fig. 23 shows

two different views of the pawl detached from the pawl-carrier. Fig. 24 is a detail showing part of the bed-plate, part of the feed-wheel, the pawl for moving it, the pawl-carrier, and lever 20, together with the screws or stops, to be referred to; and Fig. 25, on a smaller scale, represents another view of the top of the feed-wheel, its dogs, and the recessed hub.

The bed A has attached to it an overhanging arm, A', having bearings for the vertical shaft A² and the needle-bar-actuating shaft A³. The shaft A², as herein shown, has upon its rear end a friction-gear, A⁴, driven by a friction-pulley, A⁵, the said pulley being mounted upon a movable stud, as described in United States patent granted to me August 10, 1886, to which reference may be had, whereby the rotation of the shaft A² may be automatically stopped at the completion of each button-hole. The shaft A³ has upon it a bevel-gear, a, which engages a bevel-gear, a', on and rotates the shaft A², being provided at its lower end with the spreader-operating cam a² and the looper-operating cam a³. The shaft A³, at its front end, is provided with a disk, a', having at its face a crank-pin, on which is placed a link, a⁶, the lower end of which is fitted to a stud, a⁷, secured to the needle-bar a⁸, provided at its lower end with an eye-pointed needle, a⁹. The needle-bar a⁸ is fitted to slide up and down in guides b b, projecting from the front side of the head b', pivoted at b² to an ear, b³, on the arm A'.

The head b' is provided with a slot, b¹, in which is adjustably placed the screw-stud b⁵, to which is attached the link b⁶, in turn adjustably attached by the bolt or stud b⁷ to an ear, 20, at the forward end of the vibrating lever b⁸, pivoted at b², and forked at its rear end, as shown in Fig. 1^b, to embrace the cam c, fast to the gear a'. The stud b⁷ is made adjustable in the slot c' of the ear 20 by the bolt b⁷, to insure the proper central position of the needle in the needle-throat c³, the adjustment of the stud b⁷ in the slot b¹ causing more or less lateral throw of the needle away from the center of the throat, according to the material to be stitched and the distance back from the edge of the slit that the material is to be covered by the stitch. The head of the stud b⁷ is made oval (see detail, Fig. 1^c) to receive the end of the link b⁶, attached to the stud b⁵, to permit the necessary oscillation of the said link as is requisite to move the head b' from the lever b⁸ without cramping of the parts. Herein the head is so pivoted as to vibrate at right angles to the bed-plate A rather than in the direction of the length of the said bed-plate, whereby when a clamp of the kind herein to be described is made to hold or move the cloth or other material the said clamp may be stopped at the front of the machine or between the needle-bar and the operator rather than at the rear of the needle-bar, as heretofore common. Stopping the clamp, as herein provided for, and as will be described, enables it to be left in the position it must occupy at the com-

mencement of the next button-hole to be made, and thereby the operator is saved the trouble of withdrawing the usual clamp-pin and pulling the clamp around for half a turn to the front of the bed-plate or to the front side of the needle-bar of the machine.

The disk at the end of the shaft A³ has attached to it a cam-hub, d, the groove of which receives a roller-stud, d', of the take-up lever d², pivoted at d¹, for the needle-thread.

The bed-plate A is cut through, as shown at Fig. 3, to leave a central hub, d', about which is made an annular recess of sufficient depth to receive the feed-wheel d³, the upper side of which is shown in Fig. 8 and the under side in Fig. 10. The hub d' has two recesses, 5 6, one being near the top of the said hub and the other near the bottom thereof, as shown in Fig. 18, wherein the hub is laid out as a plane surface. This feed-wheel, at its upper side, has what is called a "heart-shaped cam-groove," 2, (see Fig. 8,) which receives in it a pin or stud, e, attached to the base e' of the clamps C, the said stud (shown in the said figure in section as cut off from the clamp) having a roller thereon, the rotation of the feed-wheel by the pawl e² engaging the ratchet-teeth at the periphery of the feed-wheel causing the said groove to move the clamp longitudinally as when stitching along the sides of the button-hole, the stud e at such times resting in one or the other of the straight parts of the groove between the plates m and m', the said straight parts by their shoulders temporarily arresting the rotation of the clamp while the heart-cam moves the clamp longitudinally, and when the longitudinal movement has been completed the stud enters one of the circular parts of the groove between the said plates, and thereafter the clamp is rotated substantially half a turn, a semi-rotation of the clamp after each side of the button-hole has been stitched being effected by means of dogs or followers 3 4, carried by the feed-wheel d³, the dog 3 engaging the stud e as the large end of the button-hole is presented to the needle, and holding onto the said stud and causing the clamp to be rotated in unison with the feed-wheel until the large eye of the button hole is completed, when the said dog, in its rotation with the feed-wheel and in contact with the outer side of the hub d', arrives opposite and enters the recess 6, cut in the said hub, (see Figs. 8, 18, and 25,) the said recess (see Fig. 18) being made in the said hub at a short distance below its top. The dog 3 enters the said recess 6 and releases the stud e as soon as the said stud reaches a position in the straight part of the slot between the plates m m, at the opposite side of the needle-hole, the large eye by that time having been stitched, and the said stud having been released from the dog 3 the cam-groove 2 again, by its action on the stud e, causes the clamp to be moved longitudinally to present the second side of the button-hole to the needle, the said cam continuing to move the clamp for its full throw,

the full throw of the said cam completing the full longitudinal movement of the clamp. This having been done, it remains to finish the small end of the button-hole and leave it round instead of square and with its edge overstitched, which is one of the chief objects of my present invention. To do this the dog or follower 4, carried by the feed-wheel and resting at that time with its inner edge against the periphery of the hub d' , meets the stud e , and the toe or projection of the said dog 4, extending into or across the heart-cam groove 2 and acting against the said stud, carries the clamp with it, giving it substantially a quarter-rotation to bring the center part of the small end of the hole under the needle and with the large part of the hole directly in front of the operator, at which time the jaws of the clamp are operated by the operator to release the work, and the material is then moved along in the clamp to the next hole and re-clamped. The work having been clamped, the stitching is commenced at the center of the small end of the button-hole, and the semicircular movement of the clamp by the dog 4 against the stud e is continued by again starting the feed-wheel, and as soon as the said clamp has received a quarter-turn, so as to bring the material under the needle at the straight side of the hole near the small end and the clamp is to be moved longitudinally, the dog 4 arrives in position opposite the recess 5, out into the top of the hub d' . As soon as the rear side of the dog 4 arrives in position opposite the recess 5 the stud e , by its pressure against the rounded part of the toe of the dog 4, pushes the said dog into the said recess 5, as in Fig. 25, far enough to release the said stud, the said dog traveling in the said recess 5 as the feed-wheel is rotated, it being again pushed out, however, by contact with the periphery of the hub d' , as at 124, (see Fig. 8,) before the dog 4 is again to engage the stud e .

The feed-wheel d'' has to be rotated twice during the stitching of each button-hole. This feed-wheel at its under side has two nearly-semicircular grooves, f f' , in arcs of different circles, (see Fig. 10,) the groove f being the larger. These two grooves are joined by an intermediate cross-groove, f'' , there being two switches, f^3 f^4 , at the junction of the said cross-groove with the grooves f and f' . These grooves are shaped, as shown in Fig. 10, to automatically effect variations in the speed of rotation of the feed-wheel, and consequently the extent of movement of the clamp between each ascent and descent of the needle, as it will be obvious, is necessary to enable the stitches at both the large and small ends of the button-hole to be spaced to correspond with the stitches at the sides of the button-hole, the speed of movement of the feed-wheel and clamp being slowest while the sides of the button-hole are being stitched, a little faster while the large end is being stitched, and yet faster while the small end is being stitched. As, for instance, in the machines herein illustrated the pawl e'

moves the feed-wheel over a distance equal to five teeth at each stroke while the side of the button-hole is being stitched; and over a space equal to seven teeth while the large end of the button-hole is being stitched, and over a space equal to ten teeth while the small end is being stitched; but it will be understood that this difference in the feed-movement may be changed at any part, if desired, and be differently proportioned.

The switch f^3 has a heel, 8, which, as shown in Fig. 10, extends into either the groove f' or f . The pawl e' is pivoted at 10 on the pawl-carrier 12, in turn pivoted to a stud, 13, fixed to the bed-plate A. Directly under the said pawl-carrier 12, and having the said stud 13 for its fulcrum, is the short arm 14, (see Figs. 9, 9', and 21,) it having at its end a stud, 15, which is extended down through the curved slot 16, (see Fig. 2,) where the said stud by a suitable screw, or, in other usual manner, has joined to it the end of the connecting rod g , fitted over the crank-pin g' on the disk or plate g'' , at the extreme lower end of the shaft A'. The crank-pin moves the connecting-rod g and normally gives to the arm 14 a uniform throw, which in extent is sufficient to effect through the arm 12 and pawl e' the maximum movement of the feed-wheel as when the small end of the button-hole is being stitched.

The arm 14 is provided with a projection, 17, herein shown as the head of a screw, which projects above and constitutes a shoulder to strike against the rear side of and move the pawl-carrier 12 positively forward. The forward stroke of the said pawl is always to the same point; but its backward stroke is variable by means of adjusting-screws 18 19, which, by their positions in the pawl-carrier, may be made to strike sooner or later against the outer side of the regulating-lever 20, (see Figs. 3, 8, 20, and 24,) having a roller-stud, 21, which enters the grooves in the under side of the feed-wheel d'' .

The stud 13 has coiled loosely about it a spring, 22, (see Figs. 9, 21, 22, and 24,) both ends of which are extended outwardly through a slot in the hub of the arm 12, one end of the spring being bent to enter a hole in the stud 23, fixed to the arm 14, the other end of the said spring being bent to form a projection which enters a hole in the arm 12, the said spring normally acting to keep the rear side of the said arm 12 against the stop 17. When the roller-stud 21 is in the groove f , the lever 20 is so moved that its end arrests the backward throw of the pawl-carrier 12 by striking against the screw 18, so that it does not partake of the full backward stroke of the arm 14, the feed-wheel at such time moving the clamp to stitch the side of the button-hole. When the stud 21 is in the groove f' , the lever 20 will have its outer end so placed as to enable it to arrest the backward throw of the pawl-carrier 12 a little later than before, the screw 19 at this time striking the end of the said lever 20, the latter screw striking the said

lever rather than the screw 18, because of the greater arc of movement of the pawl-carrier, and at this time the pawl acts to move the feed-wheel over a greater distance to enable the large-end of the button-hole to be stitched. When the roll 21 is in the cross-groove f^2 , the lever 20 is so turned as to place its outer end in such position that the pawl-carrier 12 partakes of the full movement of the arm 14 and the feed-wheel is given its maximum stroke, as when the small end of the button-hole is being stitched. When the button-hole is to be commenced, the roll 21 will rest midway the ends of the cross-groove f^2 . The feed-wheel will be started, the roll 21 will pass from the said cross groove into the groove f , and follow along the same into the groove f' past the point of the switch f^3 , and, hitting the heel 8 thereof, will turn the said switch from its full into its dotted line position, Fig. 10, and, passing along in the said groove, the said roll will strike, move, and pass the switch f^4 , thus closing the cross-groove f^2 , and the roll 21 will pass from the groove f' into the groove f , this being the second entrance of the said roll into the said groove, the first entrance being as the first side of the button-hole was being stitched, this second entrance being made just as the second side of the said button-hole is to be stitched. The roll 21 as it passes from the groove f the second time does not enter the groove f' , nor can it, for the switch f^3 closes the said groove, and consequently the said stud is forced to enter the cross-groove f^2 to its point of starting. As the roll 21 passes the heel 8 of the switch f^3 , it acts thereon and turns the said switch back into its full-line position.

The full parts of the external diameter of the stationary hub d' act to hold the dogs 3 and 4, connected to and rotating with the feed-wheel, out into the groove 2 to engage the stud e , the dogs releasing the said stud when opposite, respectively, the recesses 6 5.

If desired, I may employ the adjustable screw n , Figs. 8 and 24, to determine the maximum backward throw of the pawl-carrier 12, and to prevent overthrow or movement of the feed-wheel d' , I have added the adjustable screw n' , which acts upon the pawl c' at the end of its forward stroke. The base e' of the clamp has secured to its upper side the bracket h , upon the outer end of which is hinged the U-shaped block h' , to which, by screw h^2 , is attached the upper U-shaped arm, h^3 , (see Fig. 13,) of the cloth-holding clamp. The lower forked arm, h^4 , (see Fig. 14,) is attached to the block h by the screw h^5 . The upper side of the lower arm is serrated to engage the cloth or other material, and to assist in spreading open the button-hole slit and keep the material from slipping, and one of these arms, as well as the jaw about to be described, is provided with a groove, 24, (see Fig. 14,) to receive and permit the free movement of the under thread therein as a second button-hole is commenced, (one button-hole having been

finished and the material unclamped, moved by hand for the proper distance, and again reclamped in position to begin another button-hole,) this groove permitting the slack threads connected with the material at the button-hole just finished to be drawn freely across the clamp and through the said groove as the stitch at the small end of the button-hole is commenced; such drawing upon the said threads finishing the stitch at the small end of the last button-hole made.

The upper and lower arms each have projections 27 28, which are acted upon by a cam, 29, mounted loosely on a screw-threaded post, 30, erected upon the base e' , the said cam having a lever, 32, by which to move it. The lever 32 has two cam-pins, 33, to strike the block 27 and depress the upper arm, h^3 , upon the cloth laid between it and the under arm, h^4 . The first movement of the lever causes the cam 29 to follow down on the screw-stud, and the pins 33, acting on the blocks 27, press the upper arm against the cloth, and this done the further movement of the lever and cam spreads the two parts of the under and upper arms to open the button-hole. The upper arm, h^3 , is grooved, as at 31, to receive the pivots of the upper jaws, o r , (see Fig. 11,) the said upper jaws at their under sides being serrated, as are the upper sides of the lower jaws, h^4 , and so also the right-hand half of the upper jaw (see Fig. 17) is provided with a channel or groove corresponding with the groove 24 in the said under jaw.

The feed-wheel, the dogs carried by it, and the pawl c' are covered and protected by two plates, m m' , the former being attached to the bed-plate by screws m^2 , and the latter to the hub d' by screw m^3 , said plates m m' being shaped the one, m , internally, and the one, m' , externally, substantially as shown in Fig. 7, to leave a guiding-groove, m^4 , in which moves or travels the stud e , extended downward therein from the base e' of the clamp. This groove m^4 is composed of two substantially semicircular parts having different radii from the center of the needle-throat c' .

The plate m' , at its under side, has attached to it a clamp-pressing spring, m^5 , which, at its free end, has a roller-stud, m^6 , that is extended up through a small slot, m^7 , in the plate m' , the said roller-stud acting upon the outer edge of the clamp-base e , resting on the said plate and keeping the wall of the elongated central slot, m^8 , of the said base e pressed snugly against the outer side of the needle-throat, thus keeping the material at the stitching-point uniformly in position with relation to the needle-throat and the descending needle.

The base-plate n' of the needle-throat c' , attached to the under side of the plate m' by the screws n^2 , is slotted centrally, as shown at n^4 , Fig. 19, to receive in it the loop-spreader o , shaped to resemble a fork, or made U shape, as shown at Figs. 2 and 3, the said spreader being attached to the end of the spreader-carrying slide-rod o' by the screw o^4 .

Placing the spreader in a groove in the base of the needle-throat piece enables me to employ a shorter and therefore much stronger needle than heretofore.

5 The rod o' is fitted to slide in a bearing, o^3 , and at its rear end is forked, as best shown in Fig. 4, to embrace the shaft A^2 , the said rod having a roller-stud, o^1 , which enters the groove in the cam or disk a^2 , attached to the said shaft A^2 . The slide-rod o' , as herein shown, 10 has a central opening, o^5 , through which is extended a lug, o^6 , fast to the under side of the bed-plate A , the said lug receiving in it the fulcrum-stud o^7 , on which is mounted the elbow-shaped looper-lever p , to the longer arm of which is attached the looper p' . The shorter arm of the said lever p has connected to it the link p^2 , the rear end of which (see Figs. 3 and 5) is shaped to embrace the shaft A^2 and pre- 20 sent two parallel acting faces, 28 29, against which strikes the cam a^2 , attached to the said shaft A^2 .

The cams a^2 and a^3 and the disk g^2 , carrying the crank-pin g' , may and preferably will be 25 made in one piece, and it is herein supposed to be so made, the said part being attached to the said shaft by the set-screw 30. (See Fig. 5.)

The rear forked end of the link p^2 is made to embrace a hub, 31, between the cam a^2 and the 30 disk g^2 , the said hub being employed to enable the insertion in it of the crank-pin g' , thus affording a solid or firm base for it. The disk g^2 keeps the end of the link p^2 up in place on the cam a^3 . The looper and spreader de- 35 scribed co-operate with the eye-pointed needle and manipulate the upper and under threads as and to form an overseam-stitch, all as described in my patent of the United States No. 337,273.

40 The switch f^4 may be omitted; but I prefer to retain it.

From the foregoing description it will be understood that the stitching for each button-hole is commenced at the center of the small 45 end of the eye and while that end is farthest from the operator, which is the only position in which the operator inserts or removes the work.

The clamp is first moved for substantially a 50 quarter-turn to overstretch one-half of the small eye, then moved longitudinally and over-stretched for a distance equal to the length of one side of the button-hole, then rotated a semi-rotation to overstretch the large end of 55 the hole, then again moved in a straight line to enable the second straight side of the button-hole to be overstretched, and is finally given a quarter-turn to enable the last half of the small end of the eye to be overstretched to the 60 point of commencement, when the machine is stopped with the small end of the button-hole farthest from the operator, leaving the clamp in position to be opened and the material to be removed without further rotation of the clamp 65 by hand or by mechanism, which movement is commonly made in other button-hole-stitching machines employing clamps having both

longitudinal and rotative movements at intervals, or machines wherein the small end of the button-hole is barred by long stitches made 70 therein at right angles to the length of the slit constituting the button-hole.

I claim—

1. The combination, substantially as described, in a button-hole-stitching machine, of 75 the bed-plate having the hub provided with recesses 5 6, the cloth-clamp provided with the stud c , the cover-plates $m m'$, the feed-wheel provided at its upper side with the cam-groove 2 and dogs, and at its lower side 80 with grooves $f f' f^2$, the lever 20, having a roll, 21, the pawl, the pawl-carrier, the arm 14 and means to turn it, and the adjusting-screws 18 19, to co-operate with the said lever 20, whereby the extent of movement of the clamp may 85 be varied during the stitching of the button-hole.

2. In a button-hole-stitching machine, the clamp provided with the stud c , the plates $m m'$, the bed-plate having the notched hub, and 90 the feed-wheel having the dogs and groove 2 at its upper side and at its under side the grooves $f f' f^2$, and the switch f^3 , combined with means to automatically rotate the said feed-wheel at one speed while the straight 95 sides of the button-hole are being stitched, and at two different speeds while the ends of the button-hole are being stitched, the movement of the said feed while the small end of the 100 button-hole is being stitched being faster than when either the straight sides or the large end of the button-hole are being stitched, substantially as described.

3. In a button-hole-stitching machine, the bed-plate having the hub recessed, as at 5 and 105 6, provided at its upper side with the groove 2 and dogs 3 and 4, and at its under side with the grooves $f f' f^2$, and the switch f^3 , combined with means to automatically rotate the said feed-wheel at one speed while the straight 110 sides of the button-hole are being stitched, and at two different speeds while the ends of the button-hole are being stitched, and with a clamp to hold the material, the said clamp having a 115 pin to enter the said groove 2, and with stitch-forming mechanism to stitch the button-hole and leave the clamp in position with the large eye in the material directly in front of the operator, substantially as described.

4. In a button-hole-stitching machine, the 120 feed-wheel, the pawl-carrier 12, the pawl thereon, and the arm 14, having the projection 17, combined with means to operate the said arm, the said projection acting against and causing the said pawl-carrier to move in 125 unison with it in one direction, and with the adjusting-screw n , to limit the maximum backward throw of the pawl-carrier, substantially as described.

5. The combination, with stitch-forming 130 mechanism, substantially as described, the bed-plate having a recessed hub, the clamp to hold, spread, and carry the material, and the feed-wheel grooved at one side at 2 and at its

other side at $f f' f^2$, and dogs carried by the said feed-wheel to rotate the said clamp at intervals, of means to automatically rotate the said feed-wheel twice during the working of each button-hole, whereby the button-hole is overstitched entirely about its edge, including not only its two straight sides, but the large and small eyes constituting the ends of the said button-hole.

6. In a button-hole-stitching machine, the base e' , the screw-threaded post fastened to it, and the arms h^3 and h^4 , provided with blocks 27, combined with the hollow cam screw-threaded and placed on the said post, and with the lever attached thereto and having the cam studs or projections 33 33, to operate substantially as described.

7. In a button-hole-stitching machine, the arms $h^3 h^4$ of the clamp, provided with a groove, 24, to permit the rendering between the said arms of the thread extended to a button-hole when a second button-hole is to be commenced, substantially as described.

8. In a button-hole-stitching machine, the needle-bar-carrying head b' , pivoted to the overhanging arm at b^1 , and means to reciprocate the needle-bar, combined with the link b^6 , the horizontally-vibrating lever b^3 , and means to move the said lever, whereby the needle-bar-carrying head is moved transversely to the length of the plate, substantially as described.

9. In a button-hole-stitching machine, a needle-bar provided with an eye-pointed needle, means to operate the needle-bar, a head to guide the needle-bar, the said head being pivoted to the overhanging arm b^2 , to vibrate at right angles to the length of the bed-plate, the link b^6 , connected to the said hub, the horizontally-vibrating lever b^3 , and means to move it, combined with a cloth holding and moving clamp and with a feed-wheel, and with means, substantially as described, to operate the same at different speeds and to completely rotate the said clamp, each semi-rotation thereof being at different speeds to enable both ends of the button-hole to be finished with round ends, substantially as described.

10. In a button-hole-stitching machine, a

needle-bar, an eye-pointed needle therein and means to operate it, and the looper, the elbow-lever carrying it, the link p^2 , and the spreader, and the slide-rod o' , to which it is attached, combined with means, substantially as described, to operate the said looper and spreader, substantially as set forth.

11. In a button-hole-stitching machine, the needle-bar, the eye-pointed needle therein, and means to move the needle-bar laterally with relation to the length of the bed-plate, as described, and the looper and spreader, substantially as described, arranged below the bed-plate and clamp, the bed-plate, the recessed hub d' , and the feed-wheel provided with the groove 2, the dogs 3 and 4, and with grooves $f f' f^2$ at its lower side, and means to operate the said feed-wheel intermittently, combined with the clamp to hold the material, the said clamp having a stud to enter the said groove, and with the two plates $m m'$, connected to the said bed-plate and to the said hub to leave a space, m^5 , between them, in which the stud e may travel while the clamp is being moved both longitudinally and in the arc of a circle, as set forth.

12. The overhanging arm, the head pivoted thereto on a part parallel to the length of the said arm, and having bearings for the needle-bar and slotted at b^1 , and the needle-bar and means to reciprocate it, combined with the link b^6 , adjustably connected to the said head, the lever b^3 , means to vibrate it and the pin b^7 , to connect the said link and lever, substantially as described.

13. In a button-hole-stitching machine, the upright shaft A^2 , its attached cams, the link p^2 , the elbow-lever and its attached looper, and the fulcrum-stud o' , combined with the spreader and its slide-bar o' , provided with an opening and surrounding the said fulcrum stud, substantially as described.

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

JOHN W. LUFKIN.

Witnesses:

G. W. GREGORY,
F. CUTTER.