

(Model.)

H. CHARMBURY.

3 Sheets—Sheet 1.

BUTTON HOLE SEWING MACHINE.

No. 255,143.

Fig. 1. Patented Mar. 21, 1882.

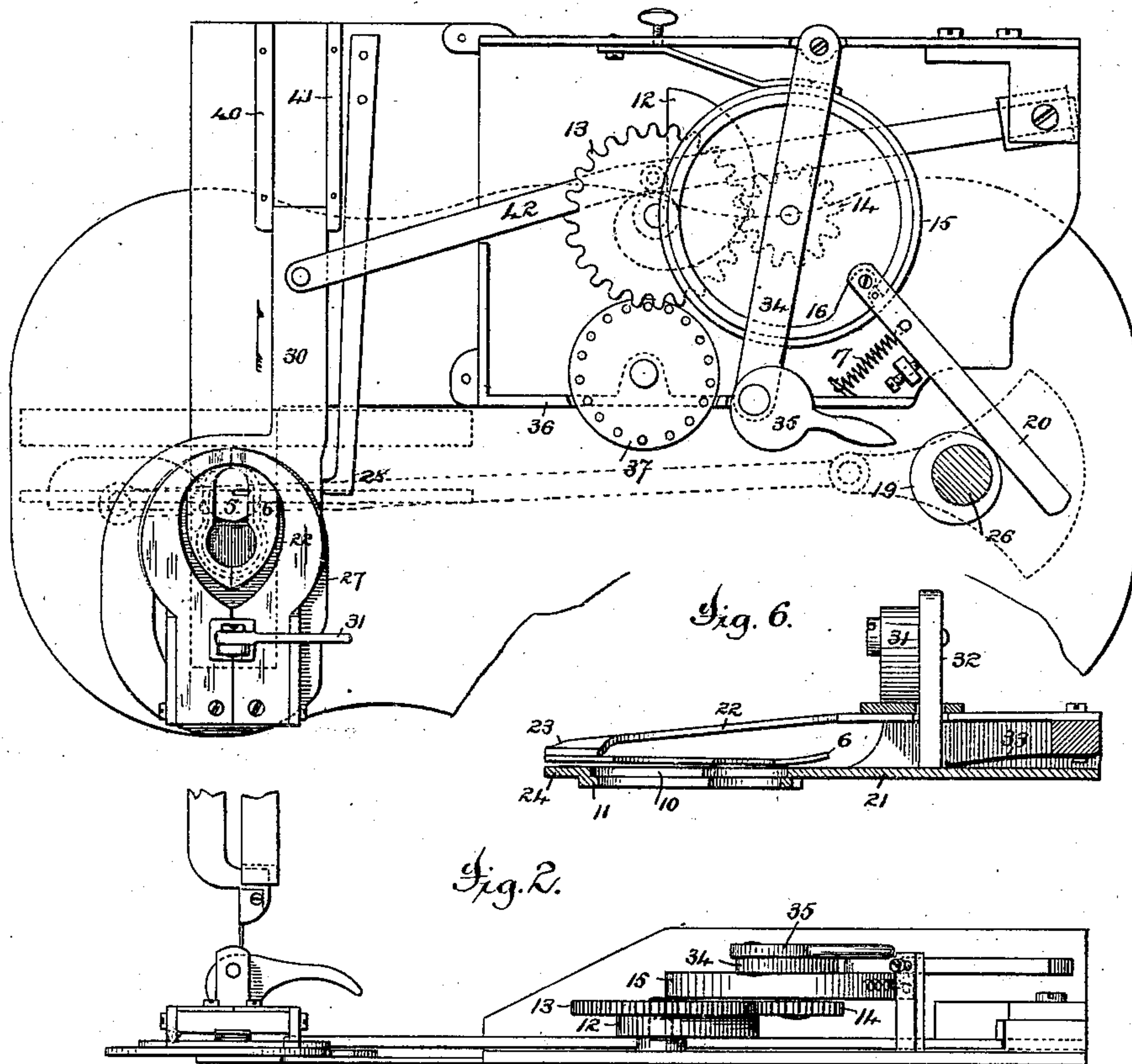


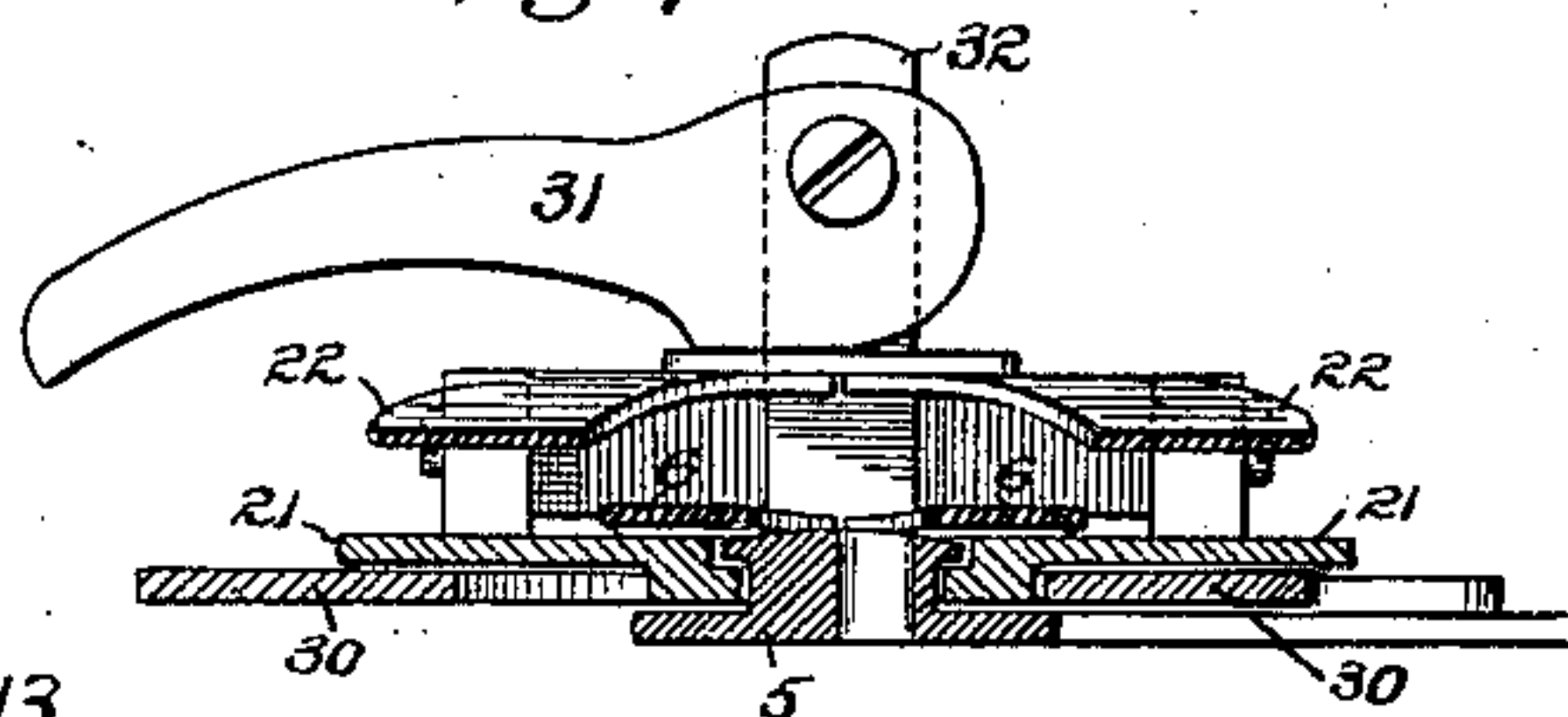
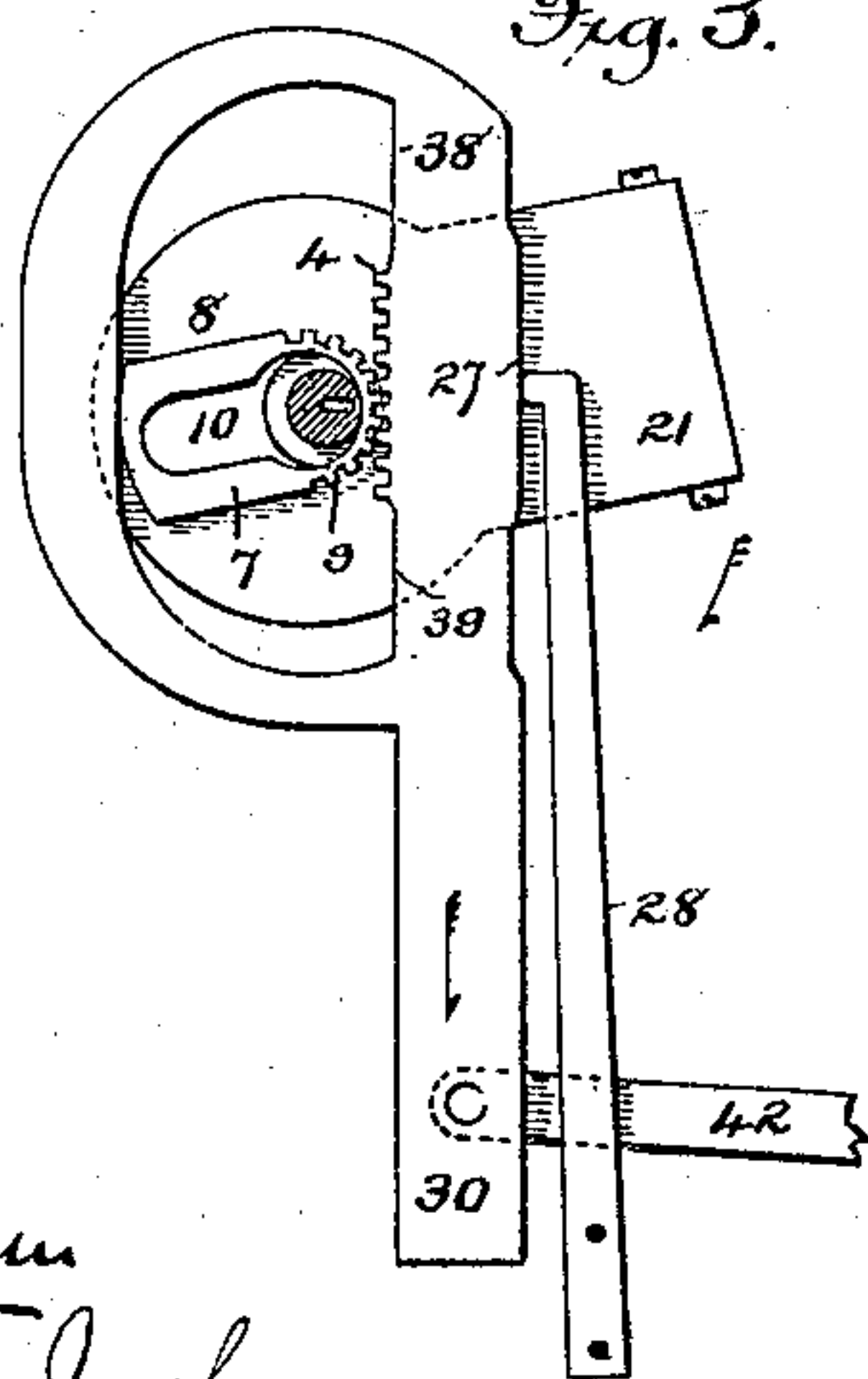
Fig. 2.

Fig. 6.

Fig. 3.

Fig. 7.

Fig. 13.



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Fig. 12.

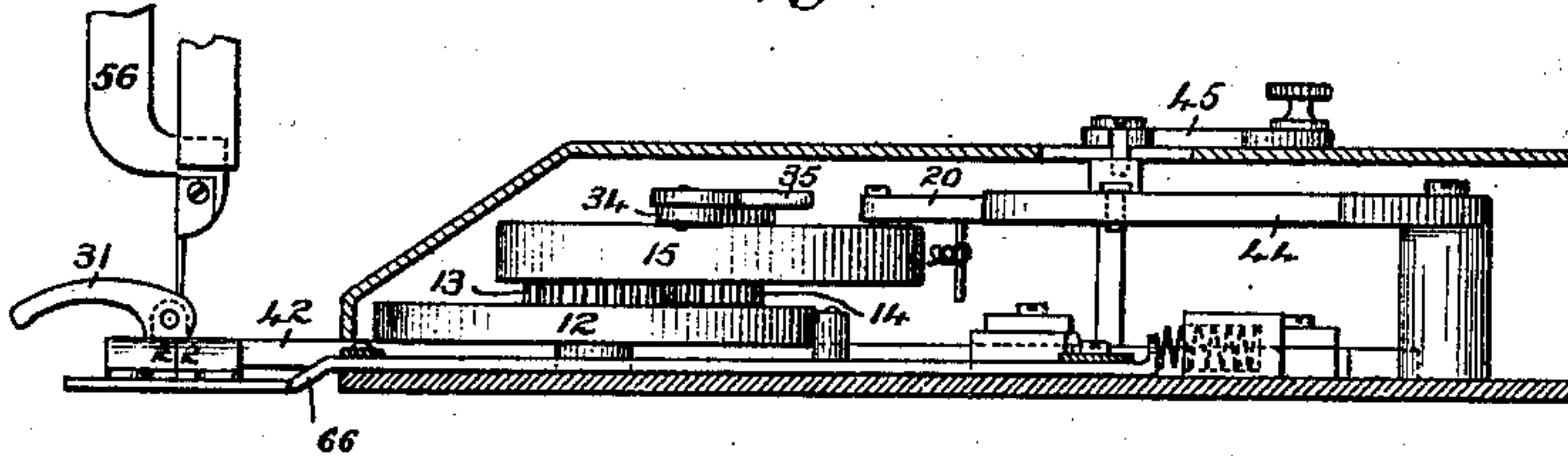


Fig. 11.

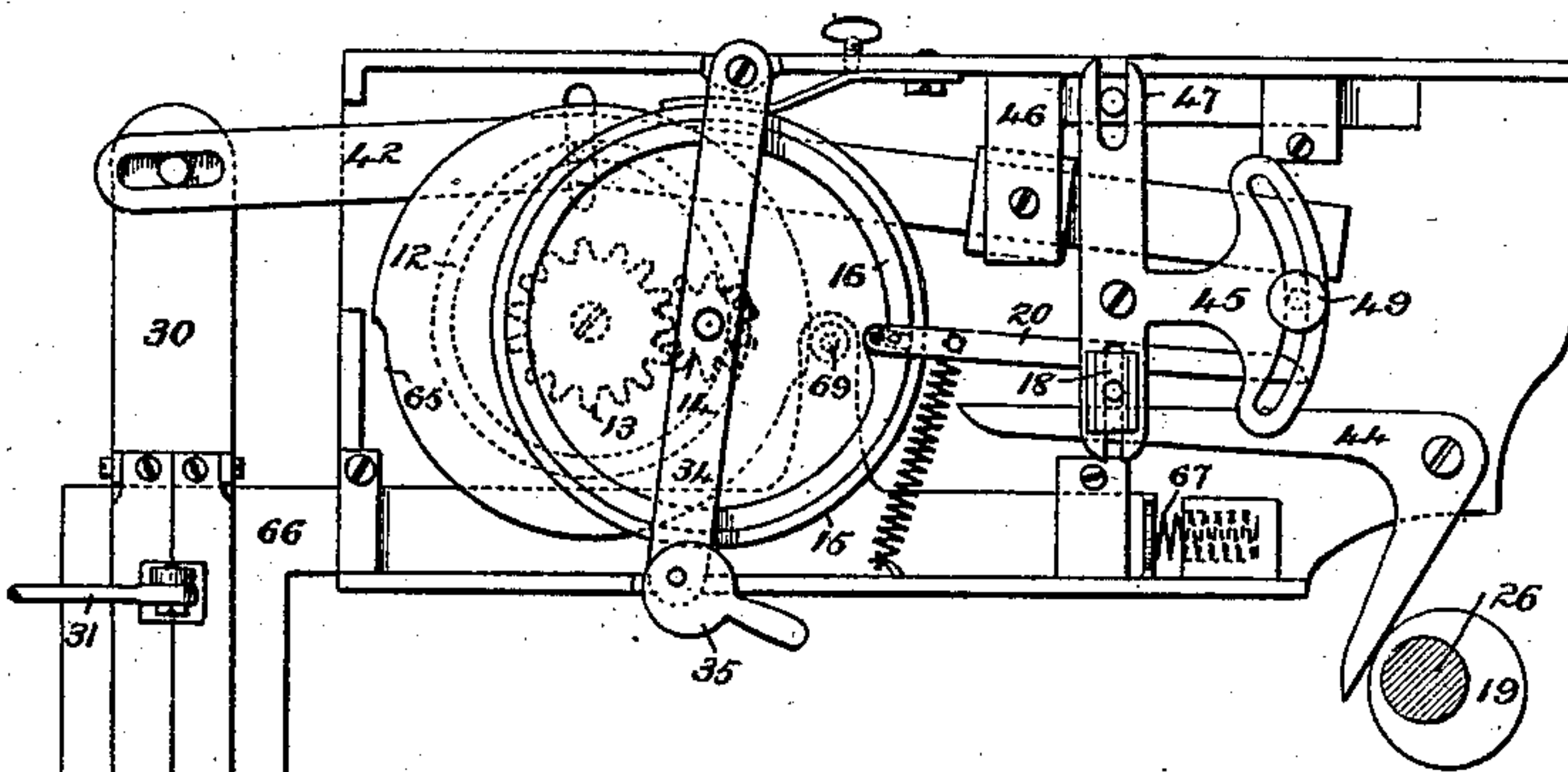


Fig. 4.

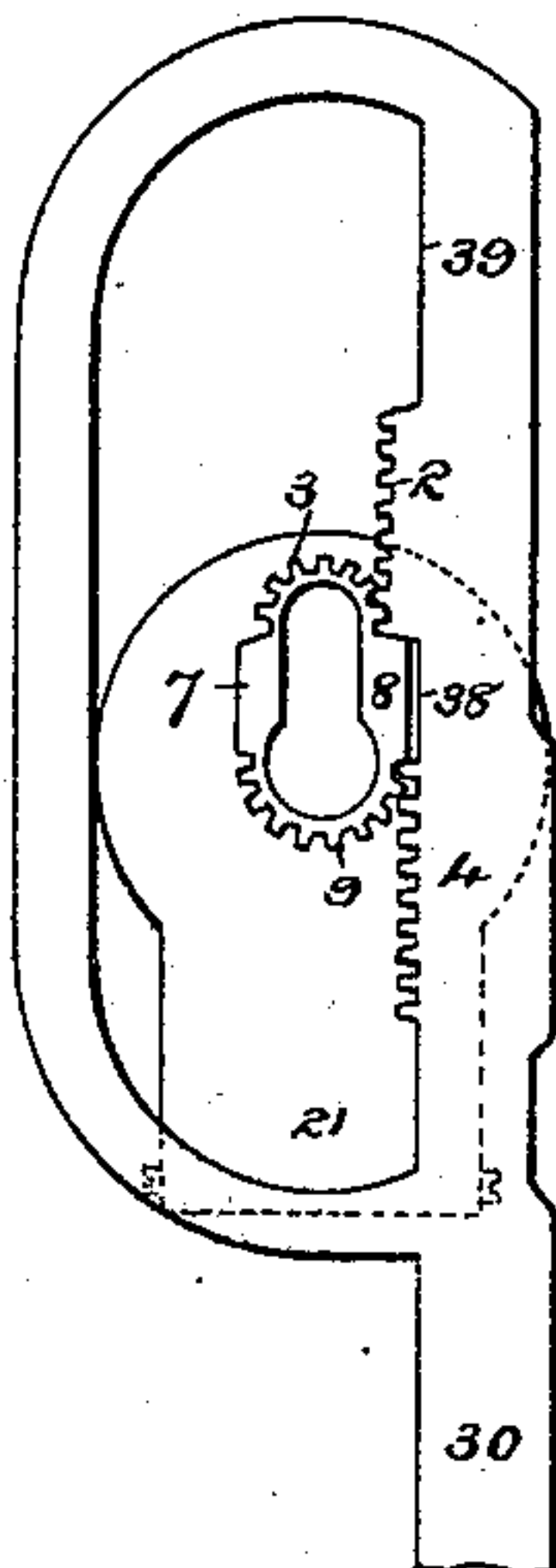
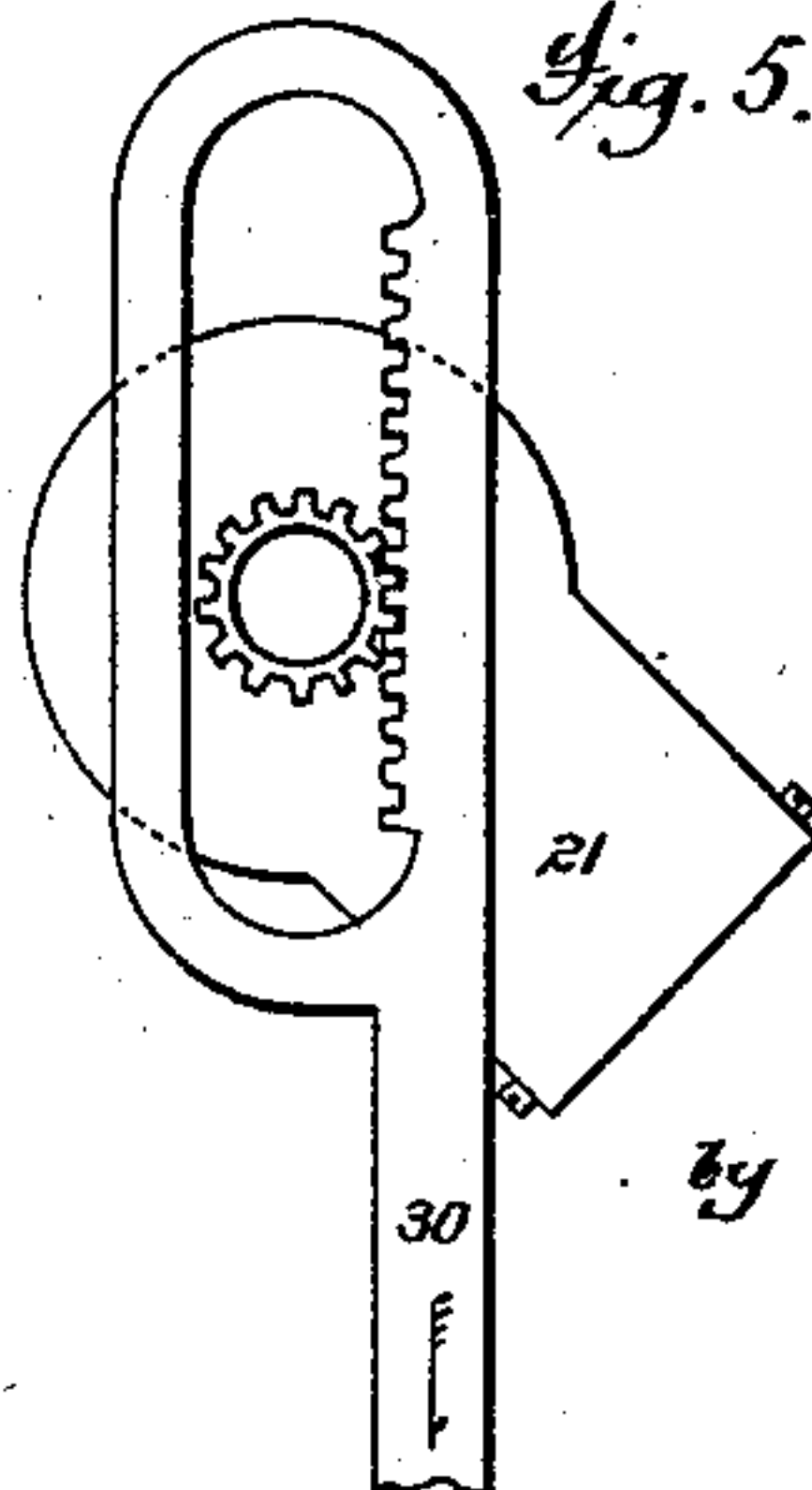


Fig. 5.



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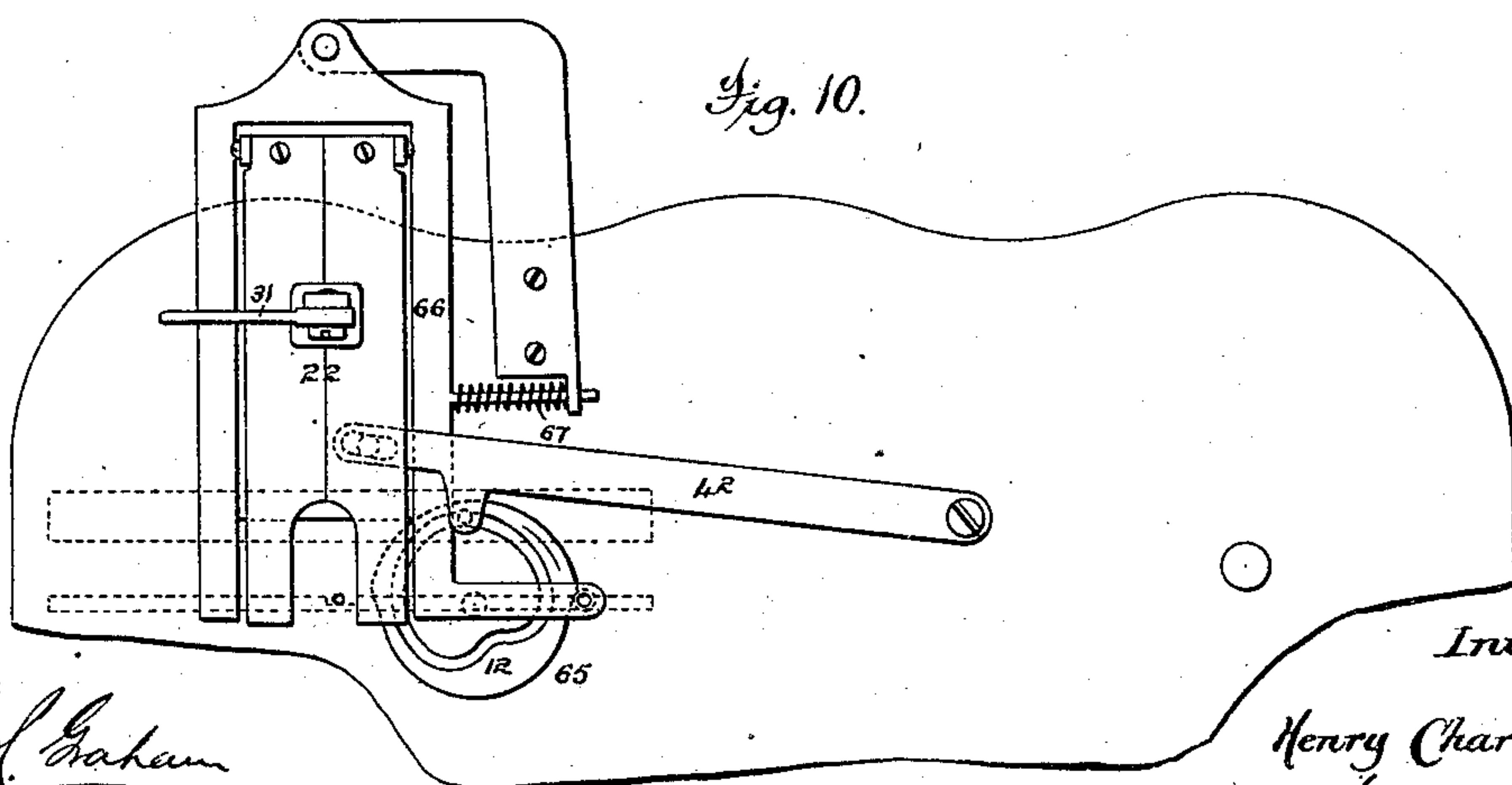
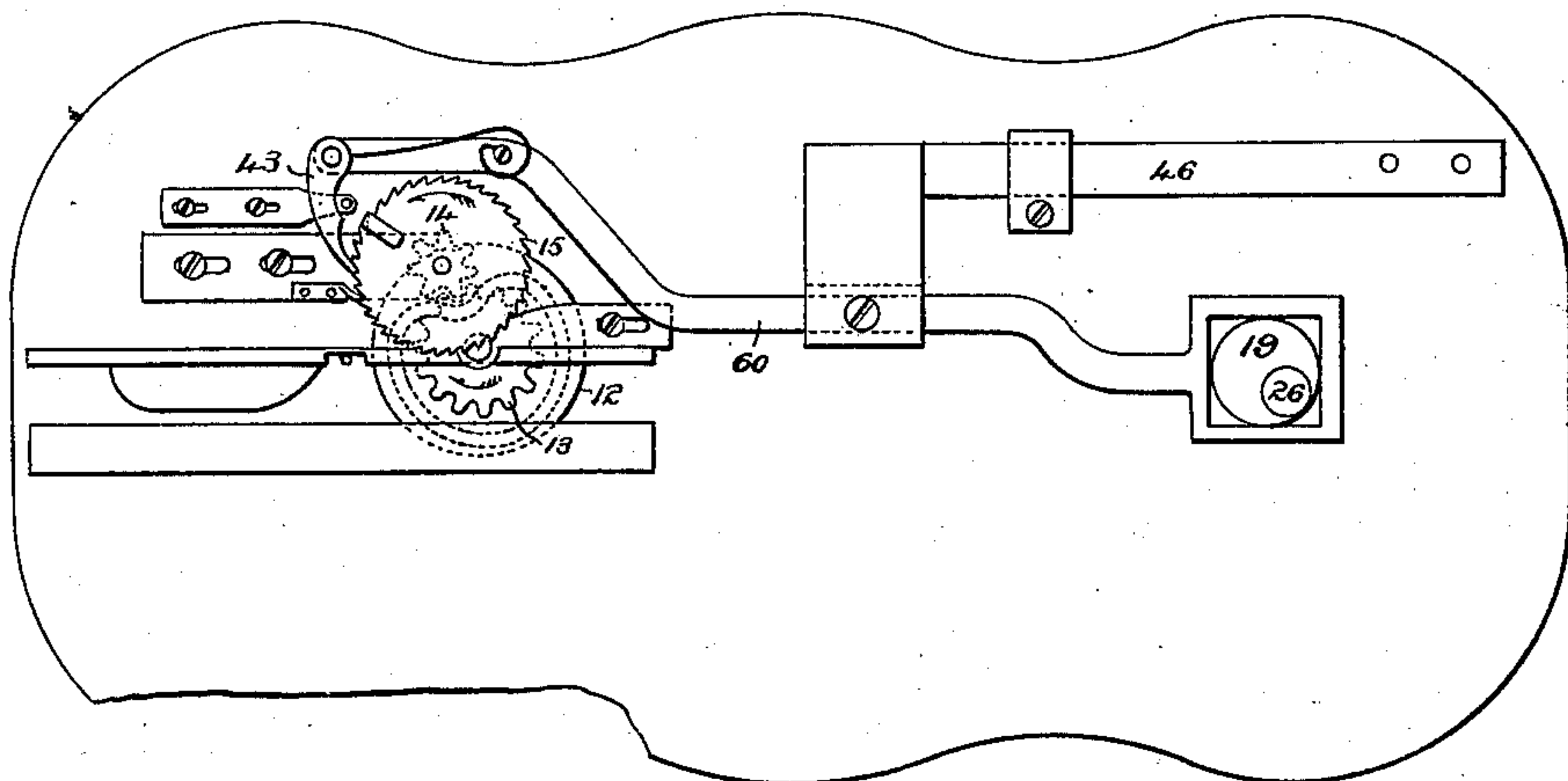
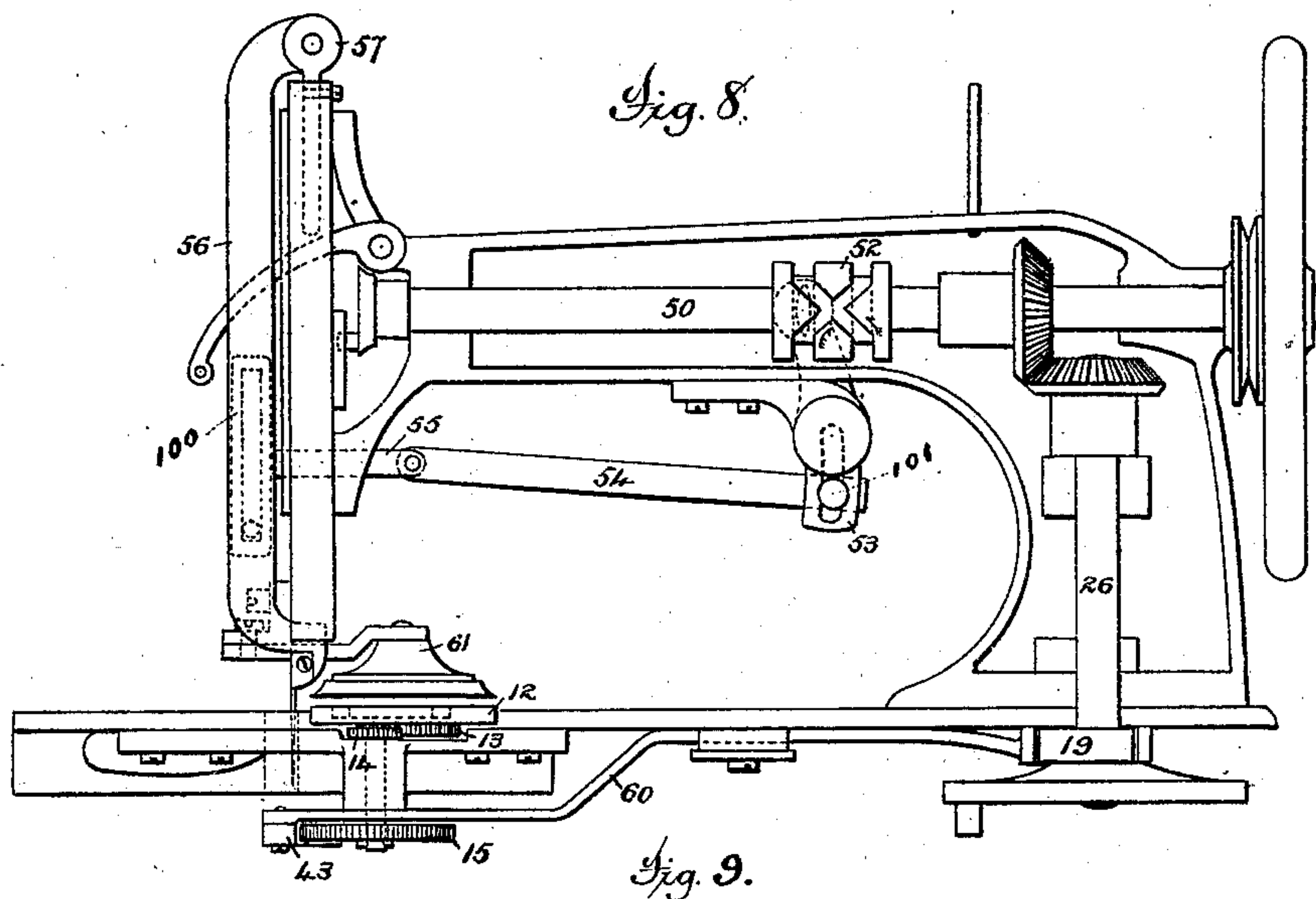
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BUTTON HOLE SEWING MACHINE.

No. 255,143.

Patented Mar. 21, 1882.



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UNITED STATES PATENT OFFICE.

HENRY CHARMBURY, OF NEWARK, NEW JERSEY.

BUTTON-HOLE SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 255,143, dated March 21, 1882.

Application filed March 22, 1881. (Model.)

To all whom it may concern:

Be it known that I, HENRY CHARMBURY, a subject of the Queen of Great Britain, residing in the city of Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Automatic Button-Hole Sewing-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

In said drawings, Figure 1 is a plan view of the mechanisms; Fig. 2, a side elevation of the same; Fig. 3, a plan view of the under side of the cloth-clamp and its driving-bar. Figs. 4 and 5 represent modifications of the cloth-clamp driving-bar. Fig. 6 represents a longitudinal central sectional elevation taken through the cloth-clamp. Fig. 7 represents a transverse sectional elevation of the cloth-clamp, its driving-bar, and the guiding-stud. Fig. 8 represents a side elevation of a common form of sewing-machine with my improved apparatus applied thereto. Fig. 9 represents a plan view of the bottom thereof. Fig. 10 represents a plan view of a modified structure of the cloth-clamp and its driving mechanism. Fig. 11 represents a plan view of my improved apparatus provided with devices for securing a nice adjustment of the feed to vary both the length of the stitch and the length of the button-hole. Fig. 12 is an elevation of the same with one side of the frame removed, and Fig. 13 illustrates a button-hole.

The invention accomplished by these improvements consists in mechanisms constructed so as to be moved by some part of a sewing-machine, whereby the stitch-forming devices are actuated, which mechanisms embrace a cloth-clamp and means for imparting to it a step-by-step movement, so as to carry the cloth along proper distances to form each stitch, and at the same time guide it, so that such stitches may produce a button-hole having either parallel sides, a circular form, or parallel sides united by a circular end or ends, with which mechanisms is combined a means for vibrating the needle, so that said button-holes may be formed by stitches, the threads of which extend a distance outward from the edge of

the button-hole, which means for vibrating the needle may be adjusted so that straight edges or a line of sewing parallel with the edge of the button-hole may be made, if desired, all of which will be more perfectly understood by the following detailed description of the embodiment of said invention, as illustrated by the accompanying drawings.

It being understood that this apparatus is adapted for attachment to or combination with any sewing-machine that has a moving part that will vibrate a lever, as 20, Fig. 1—such a part, for instance, as the vertical shaft 26, Fig. 8—and that the purpose of this apparatus is to cause a cloth-clamp such as that constituted by the jaws 23 24, Fig. 6, to move and carry the cloth or material in a proper direction to cause the line of stitches to border an opening as a button-hole, I will now describe the mechanisms (shown in Figs. 1 to 7) for effecting such result.

The cloth-feeding clamp consists of a rigid bottom plate, 21, and a flexible top plate, 22. This top plate is made of spring metal perforated with an opening to admit the passage of the needle through it, and at the same time form spring-arms separated at their forward ends, where they form a jaw, 23, that coacts with a similar jaw, 24, at the end of the plate 21, to nip the material at one end of the space at which the stitches are formed. Said top plate has projecting inwardly from it a spring-tongue, 6, likewise formed of two spring-arms, that provide an opening to admit of the passage of the needle through it, which presses the material onto the face of the bottom plate, 21, and forms a means for clamping the material at the other end of the stitch-forming space.

The plate 22 is provided with a cam-arm, 31, which is pivoted to a post, 32, rising from the plate 21, which cam-arm 31 presses the said plate 22, and with it the tongue 6, downward against the pressure of a spring, 33, to clamp the work, which latter, it will be observed, is thus held at opposite points, or at each end of the stitch-forming space, the clamp thus acting not only to perfectly hold the cloth in its stretched condition, but from its peculiar structure—that is, by the provision of the yielding

tongue 6, and by making this tongue and the upper plate, 22, in two parts, as shown—each end and side of the clamp will yield independently of the other, and thus the clamp will operate to hold the cloth firmly upon all sides of the button-hole, even though a seam or other inequality in the thickness of the cloth happens to be so close to the button-hole as to be under the clamp. The bottom plate, 21, of this cloth-clamp is perforated with an opening, 10, to adapt the same to receive a guiding-stud, 5, which is provided with a flange that overhangs the ledge 11 of said plate 21, which opening 10 is of such dimensions as to permit the transit of the cloth-clamp to an extent suited to the length of the line of stitch that is to form the button-hole. The movements of this cloth-clamp are imparted by means of a driving-bar, 30, the shank of which runs between guides 40 41. Movement is imparted to it by means of a lever, 42, that is actuated by a cam, 12, which cam is fast upon a toothed wheel, 13, with which meshes a pinion, 14, that is fast upon a clutch-wheel, 15, to which latter a step-like rotative movement is imparted by means of a spring-clamp, 16, that bears upon the inner periphery of the wheel 15, and to which slight feeding movements are imparted by means of the lever 20, which is pivoted to one end of the clamp 16, provided with a reacting spring, 17, and vibrated by means of a cam, 19, carried by the shaft 26.

The clutch-wheel 15 is pivoted to a swinging bar, 34, one end of which is controlled by a cam, 35, the periphery of which bears in a seat in the side plate, 36. By a proper movement of this cam 35 the wheel 15, with the pinion 14, may be swung laterally to disconnect said pinion from the toothed wheel 13, and thus permit the latter, with the cam, 12, it carries, to be moved by means of a sprocket or other geared wheel, 37, whereby said cam 12 may be so moved as to permit the free sliding movement of the driving-bar 30 in either direction to be accomplished by hand when it is desired to move the clamp backward to take up a lost stitch or to begin the operation of forming a button-hole.

As it is necessary in forming button-holes to stitch opposite sides thereof, it is obvious that the cloth must be first fed in one direction and then be reversed or be fed in the opposite direction. It is also desirable in making button-holes for some purposes to enlarge one end or provide it with an eye, and my improvement is therefore designed, among other varieties, to make that form of button-hole having an enlargement at one of its ends, and the structure of the apparatus now being specially described is adapted for that purpose.

With the parts in the position shown in Fig. 1, which is that occupied at the beginning of the operation of forming the button-hole, at which time the driving-bar 30 is moved so that the smallest curved end of the opening 10 in the bottom plate, 21, bears against the guid-

ing-stud 5, the driving-bar 30 will, as it is moved in the direction of the arrow, Fig. 1, by the action of the cam 12, carry with it the cloth-clamp, and thus move the cloth over the point of descent of the sewing-needle through the perforation in the guiding-stud 5, which clamp will be guided in such movement imparted through the driving-bar 30 by means of its ledge 11 and the flange on the stud 5, during which movement the straight edge 39 of the bar and the guiding-face 7 of a projection depending from the under side of the bottom plate, 21, or the straight edge 38 of the bar and the straight edge 8 of the projection, will be in supporting contact.

If the opening 10 through the plate 21 has straight walls, and the straight edge 39 of the bar 30 is continued far enough, it will be apparent that the cloth will be fed forward in a right line; but where the walls of said opening are curved outwardly, as in Fig. 1, and the driving-bar 30 is provided with a properly-shaped cam-edge, 27, that bears against the guide 28, it will be apparent that as the driving-bar moves forward said cam 27 will cause it to make a lateral movement that will force the curved walls of its opening 10 to travel against the stud 5, and the cloth-clamp to be thereby moved to carry the material laterally as well as onward beneath the needle.

If the guiding-face 7 and its opposite or companion guiding-face, 8, of the projection depending from the bottom plate, 21, are united by a segment, as 9, (of which segment said faces 7 and 8 may be said to be elongated teeth,) and the inner face of the driving-bar 30 is provided with a rack, 4, it will be apparent that when this driving-bar is moved laterally the teeth of the rack will engage with the teeth of the segment, and any further onward movement of the driving-bar will cause the said cloth-clamp to begin and make a rotative movement, turning the same half a circle, thus causing the stitches to follow a like curve and form the eye of the button-hole; and that when this half-revolution is made the rack will pass out of gear with the segment, and the straight edge 38 of the bar will lie against the straight guiding-face 8, the cam-edge of the driving-bar 30 permitting the proper return lateral movement of the bar, and with it the cloth-clamp, which will thus be brought into a position to complete its feeding action by a right-line movement, during which the opening 10 moves on the stud 5 until the narrow end of said opening is reached.

I will now describe the modification of an ordinary sewing-machine, whereby its reciprocating needle is given a lateral swinging movement, whereby a zigzag line of stitches is imparted to the material passed through it, in order that the co-operation of such needle movement with the cloth-feeding mechanism described may be the better understood.

Fig. 8 shows an ordinary type of sewing-machine, having a horizontal shaft, 50, with a

crank-movement for vertically reciprocating the needle, and a vertical shaft, 26, geared to the former shaft for operating the shuttle mechanism—as, for instance, in the Singer sewing-machine, like which the machine described is constructed in all of its minor parts.

To vibrate the needle I mount upon the shaft 50 a cam, 52; constructed to vibrate a rock-arm, 53, which, through a connecting-rod, 54, and the guide-arm 55, the end of which works in the slotted guide 100, rocks a needle-bar, 56, that is pivoted at its upper end to the needle-bar driver 57, so as to swing thereon, its lower end being free to play laterally in a guide-slot provided in said driver 57. The rock-arm 53 is slotted at its lower end, so that the pivot 101, by which it is connected to rod 54, may be adjusted to different positions to vary the vibrations of the needle-bar.

The needle-bar 56 has the needle mounted in its lower end, in the usual way, and will, it is obvious, as the shaft 50 revolves, receive not only a vertical reciprocatory motion from the movement of the driver 57, but a lateral vibration from the cam 52.

If, now, we consider the parts to be as in Fig. 1, and the machine to be set in motion, the cloth introduced between the jaws of the clamp, the cam 19 on the vertical shaft 26 will, by vibrating the lever 20, move the clutch-wheel 15, and through the pinion 14 and wheel 13 slowly turn the cam 12, which, bearing upon the lever 42, will, when the needle is withdrawn from the fabric, move the same a distance forward equal to the space desired between the stitches, said needle in proper concert making its vibratory movement to sew a zigzag stitch. When the enlarged part of the opening 10 is reached the cloth-guide will begin to make its lateral movement, and when the rack 4 of the bar 30 engages with the segment 9 the cloth-clamp will also make its rotative movement, and when the straight path of the opening 10 is again reached (after the fabric has been reversed) the rack 4 will disengage from the segment 9, and a right-line onward movement of the cloth-clamp will result while the straight edge 38 of the bar 30 is passing over the straight guiding-face 7, the resulting stitched button-hole thus formed being like that represented in Fig. 13.

If, now, it is desired to provide a button-hole with an eye at each end, it is only necessary to modify the driving-bar 30, as in Fig. 4, so that it shall have a second rack, 2, that will coact with a second segment, 3, with which the cloth-clamp will then be provided. In said figure the parts are in the position they would have when one side and the eye end of the button-hole has been sewed, said position being that which the bar and cloth-clamp sustain while the face 8 and guide 38 rest together, and said parts move concertedly in a right line a distance equal to the space between the edge of the stud 5 and the opposite curved end of the opening 10. When this distance has been traversed the rack 2 will engage the seg-

ment 3, (as constructed without any lateral movement of the bar 30,) and the cloth-guide will make a second half-revolution to form the lower curved end of the button-hole.

The bar 30 may be provided with a continuous rack and the bottom plate, 21, of the cloth-guide have a projection—that is, a toothed wheel—as shown in Fig. 5, when the movement imparted to the cloth-clamp by the step-like movement of the driving-bar will be a circular one, and thus the mechanisms will produce an eyelet form of button-hole.

The movement of the cloth-guide may be made a right-line movement simply, if desired, and but a slight modification of the parts is necessary to produce this result. Thus the driving-bar 30, carrying the cloth-guide permanently fixed to it, is supported by a carrier, 66, that is adapted to slide laterally against the pressure of a spring, 67, as in Fig. 11, the cam 12 acting by its peripheral cam-surface upon an arm, 69, of this carrier 66, and its slotted cam-surface acting upon a pin projecting from the lever 42, the shape of this cam being such as to impart the necessary lateral and forward and backward movement to carry the cloth in a right-line forward to be stitched on one side of the button-hole, and then be shifted laterally and perform a like right-line movement in the opposite direction to stitch the other side of the button-hole. In these Figs. 11 and 12 is also shown means for adjusting the throw of the actuating-lever 20, which is now moved by a bell-crank, 44, and also for adjusting the fulcrum of the lever 42, whereby the throw of said lever is governed. By thus adjusting the throw of levers 20 and 42 both the length of the stitch and of the button-hole may be varied, and although these devices for this purpose are shown in connection with a modified form of clamp, it is to be understood that they are equally applicable to and will usually be used in connection with the form of clamp shown in Fig. 1.

The bell-crank 44, vibrated by the cam 19, bears against a pivot in a box, 18, that slides on one arm of an adjusting-plate, 45, against which pivot the lever 20 rests.

The fulcrum of the lever 42 is carried by an arm of a sliding block, 46, the position of which is fixed by a pivot projecting from it and entering a slot in the arm 47 of the adjusting-plate 45.

It will now be obvious that as the plate 45 is swung up in the fixed position by means of its set-screw 49 it will throw the pivot in the box 18 to a point where it will be moved to a greater or less extent by the bell-crank 44, and at the same time slide the block 46 so as to carry the fulcrum of the lever 42 to a position wherein said lever will have a lesser or greater throw, as may be desired. This last-described structure may be modified, as is shown in Fig. 10, which shows a form of the devices well adapted to be built with the sewing-machine. The cloth-clamp is in this case moved back and forth with a step-by-step motion in its

carrier 66, this motion being given by the intermittently-operated cam. The carrier 66 is pivoted at the end opposite the cam, and the lateral movement necessary to shift the clamp and material, so that the opposite edges of the button-hole can be stitched, is effected by swinging the carrier 66 upon its pivot, instead of moving it bodily sidewise.

The motion for moving the driving-bar-actuating cam 12 may be varied from that described, as is shown in Figs. 8 and 9. Here the clutch-wheel 15 is an ordinary ratchet-wheel, with which a pawl, 43, vibrated by the bar 60, that communicates motion to the shuttle, is made the means of moving it, the other parts remaining the same.

With the modification of the cam shown in Figs. 8 to 12, when the cam 12 is arranged to protrude upward through the bed-plate of the sewing-machine, its movement may be utilized for feeding the cloth in a circular path for that variety of sewing by detaching the cloth-clamp proper and applying a clamp, 61, pivoted to an arm, so as to press the cloth onto the face of the cam 12 and freely turn as said cam is rotated.

I claim—

1. The combination, with a work-clamping device constructed and mounted to slide with and rotate upon its driving-bar, of means for imparting a step-by-step movement to the latter and a rotative movement to the former, substantially as described.

2. The combination, with a work-clamping device constructed and mounted to slide with and to rotate upon its driving-bar, and means for imparting a step-like movement to the latter, of a toothed segment connected with the work-clamping device and a rack carried by the driving-bar, whereby the onward movement of the said bar will impart both an onward and a rotative movement to the said work-clamping device, all substantially as described.

3. The combination, with the work-clamping device and its toothed projection, of the driving-bar 30, carrying said clamping device, and having the rack, as 4, and a mechanism for moving said driving-bar with a step-like action, all substantially as described.

4. The combination, with the work-clamping device and its projection, having toothed segment 9, with elongated teeth or surfaces 7 8, of the driving-bar 30, having rack 4 and

surfaces 39 38, and means for moving said driving-bar with a step-like action, all substantially as described.

5. The combination, with the work-clamping device, its guide-opening 10, having an enlarged circular end, and a projection carrying a toothed segment provided with elongated teeth 7 8, of the guide-post 5, the intermittently-moved driving-bar 30, having rack 4, surfaces 39 38, and a cam-like edge, 27, acted upon by a guide, as 28, substantially as described.

6. The combination, with the intermittently-moved actuating-cam, and the lever transmitting motion from said cam to the driving-bar of the work-clamping device, and the lever for actuating said cam, of an adjusting device, as 45, whereby the throw of both levers is simultaneously adjusted, substantially as described.

7. The combination, with the work-clamping device, its driving-bar, the intermittently-moved actuating-cam, a train of gearing transmitting motion from a driving clutch-wheel to said cam, the lever 20, and the bell-crank 44, of means for varying the point at which the power of said bell-crank shall be applied to the lever 20, substantially as described.

8. The combination, with the work-feeding clamp, the cam 12, its wheel 13, pinion 14, and the clutch-wheel 15, of the swinging bar 34 and cam 35, substantially as described.

9. A work-clamp for sewing-machines, consisting of the plates 21 22 and the spring-tongue 6; having one of its ends rigidly secured to the end of the plate 22, substantially as described.

10. A work-clamp for sewing-machines, consisting of the plate 21, the divided plate 22, and the divided spring-tongue 6, having one of its ends rigidly secured to the end of plate 22, substantially as described.

11. The combination of the cam, as 52, the swinging needle-bar 56, having the slotted guide 100, the rock-arm 53, and adjustable connections, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HENRY CHARMBURY.

Witnesses:

T. H. PALMER,
GEO. H. GRAHAM.