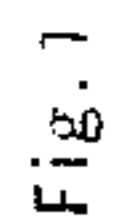


D. W. G. HUMPHREY.

SEWING MACHINE PRINCIPALLY INTENDED FOR WORKING BUTTONHOLES.

No. 49,627.

Patented Aug. 29, 1865.



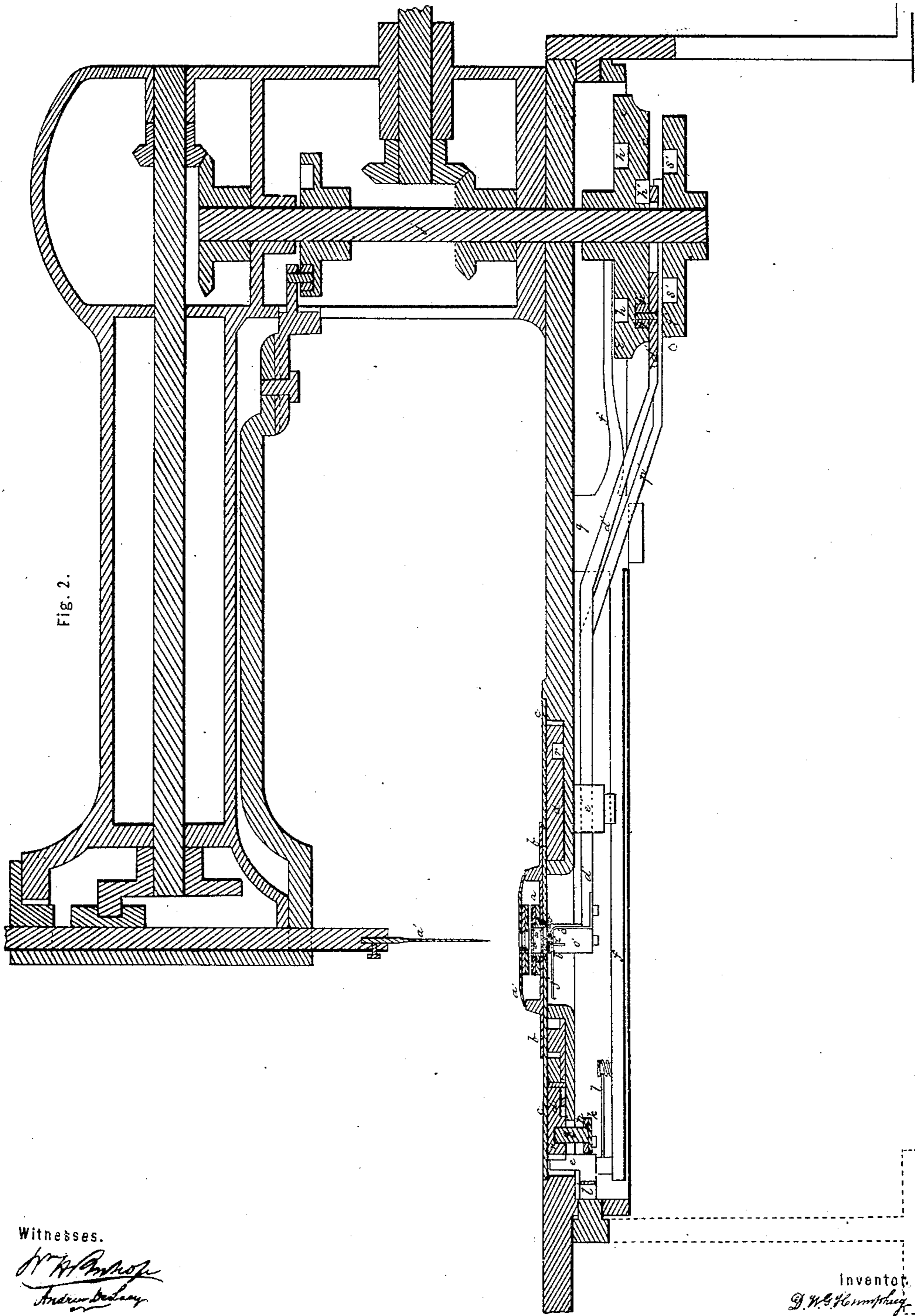
Witnesses.

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Fig. 4.

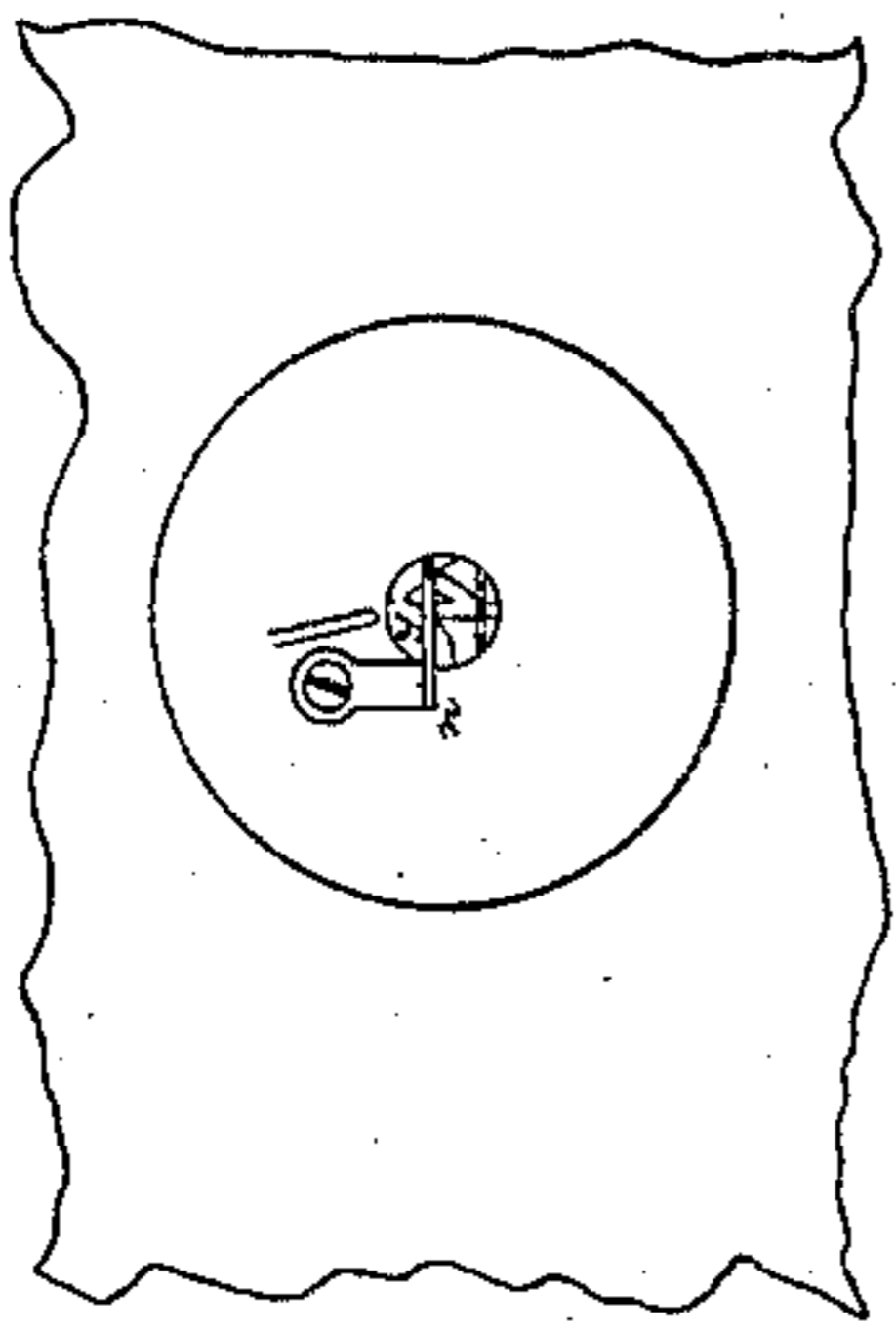


Fig. 3.

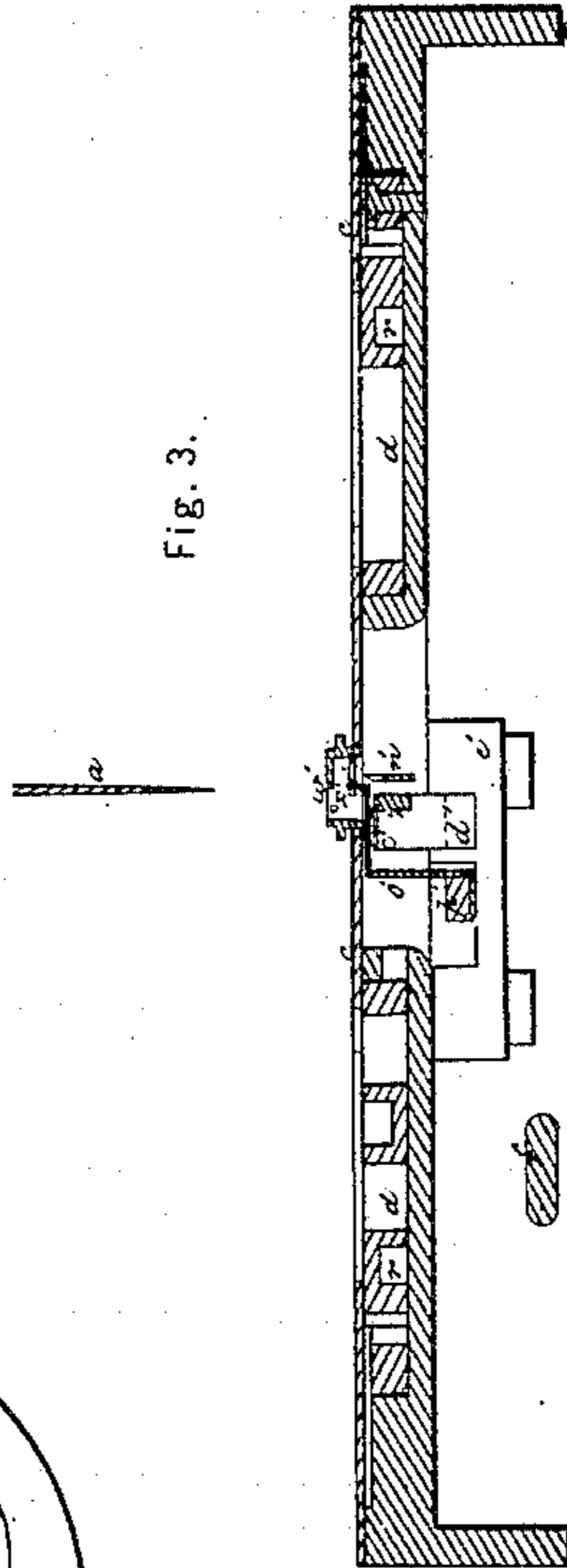


Fig. 8.

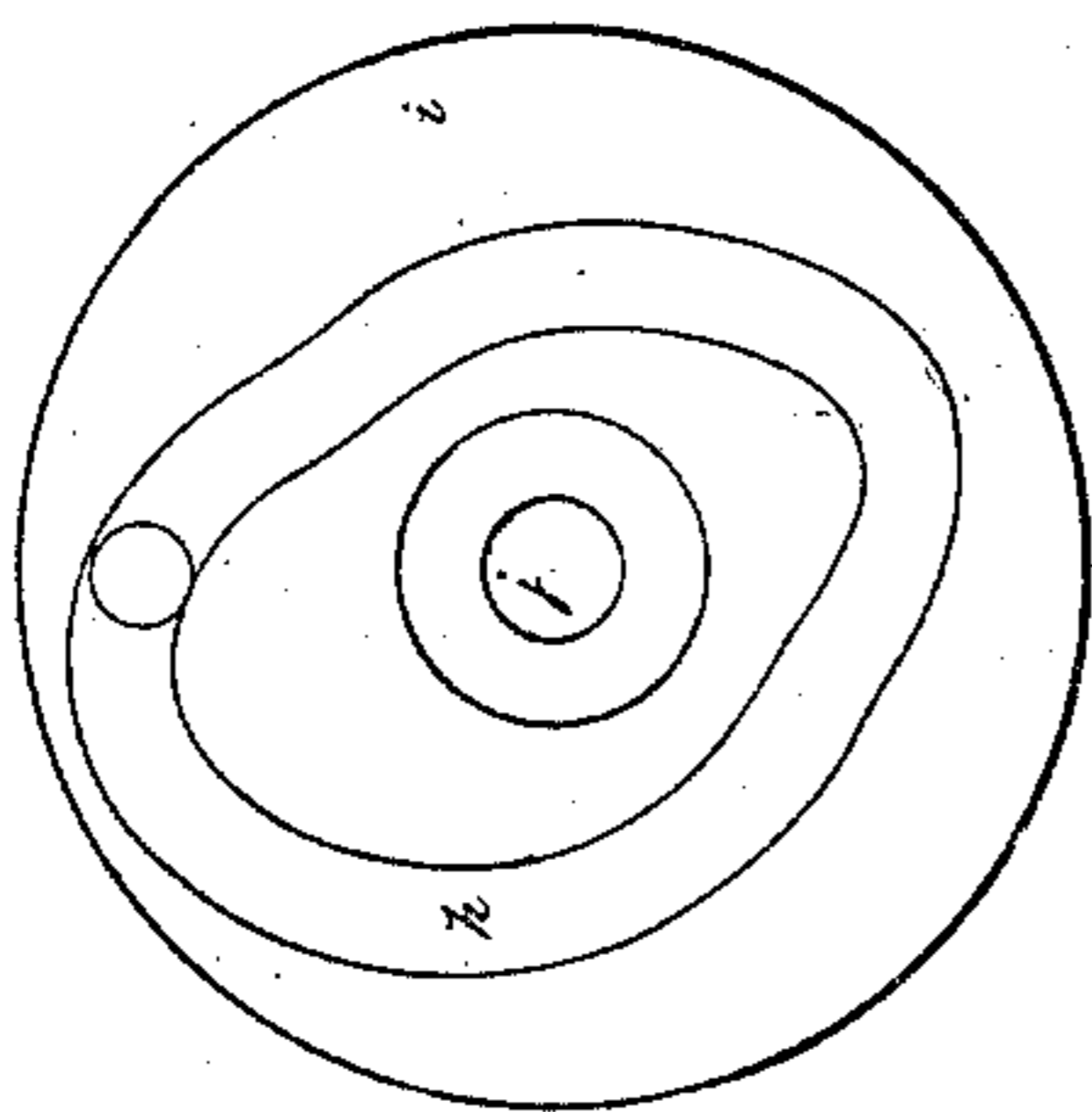


Fig. 6.

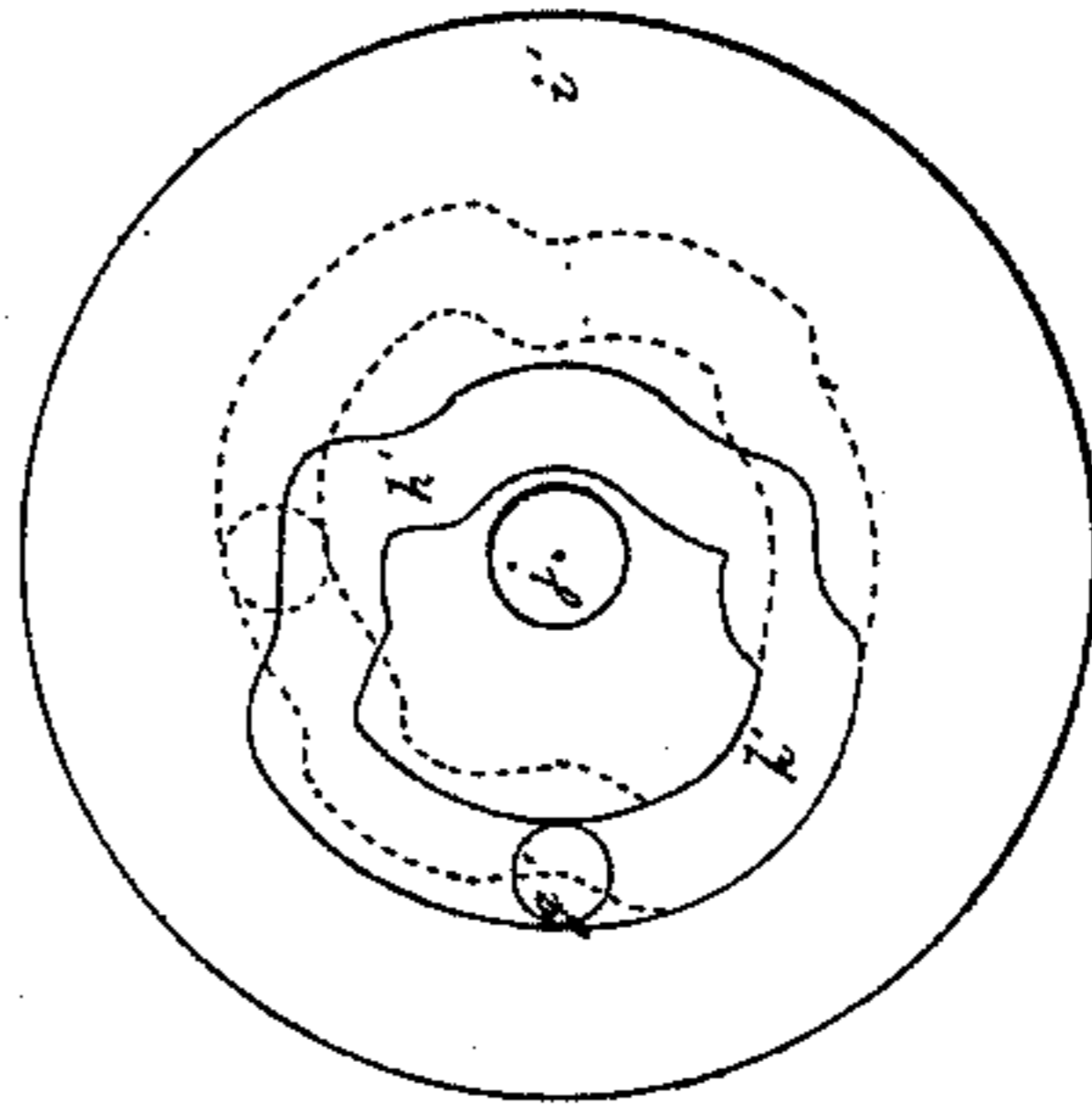


Fig. 7.

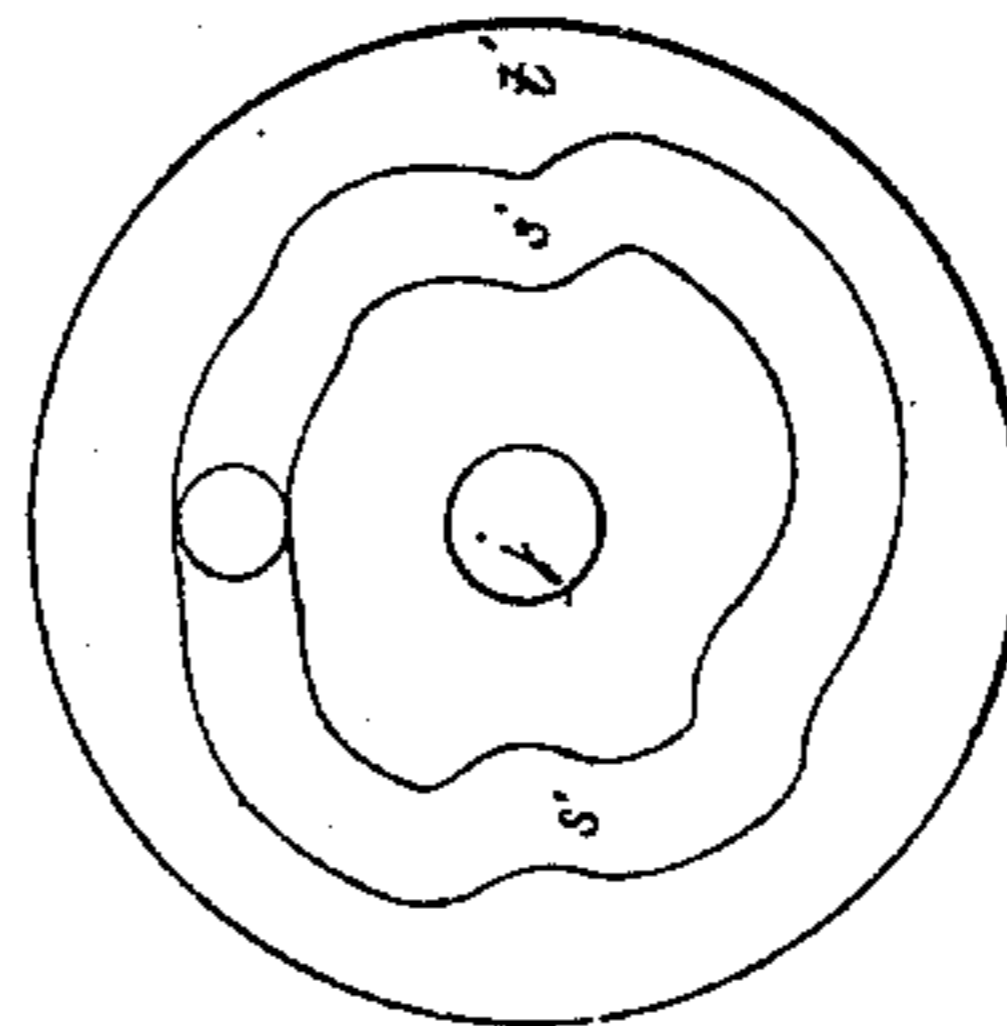
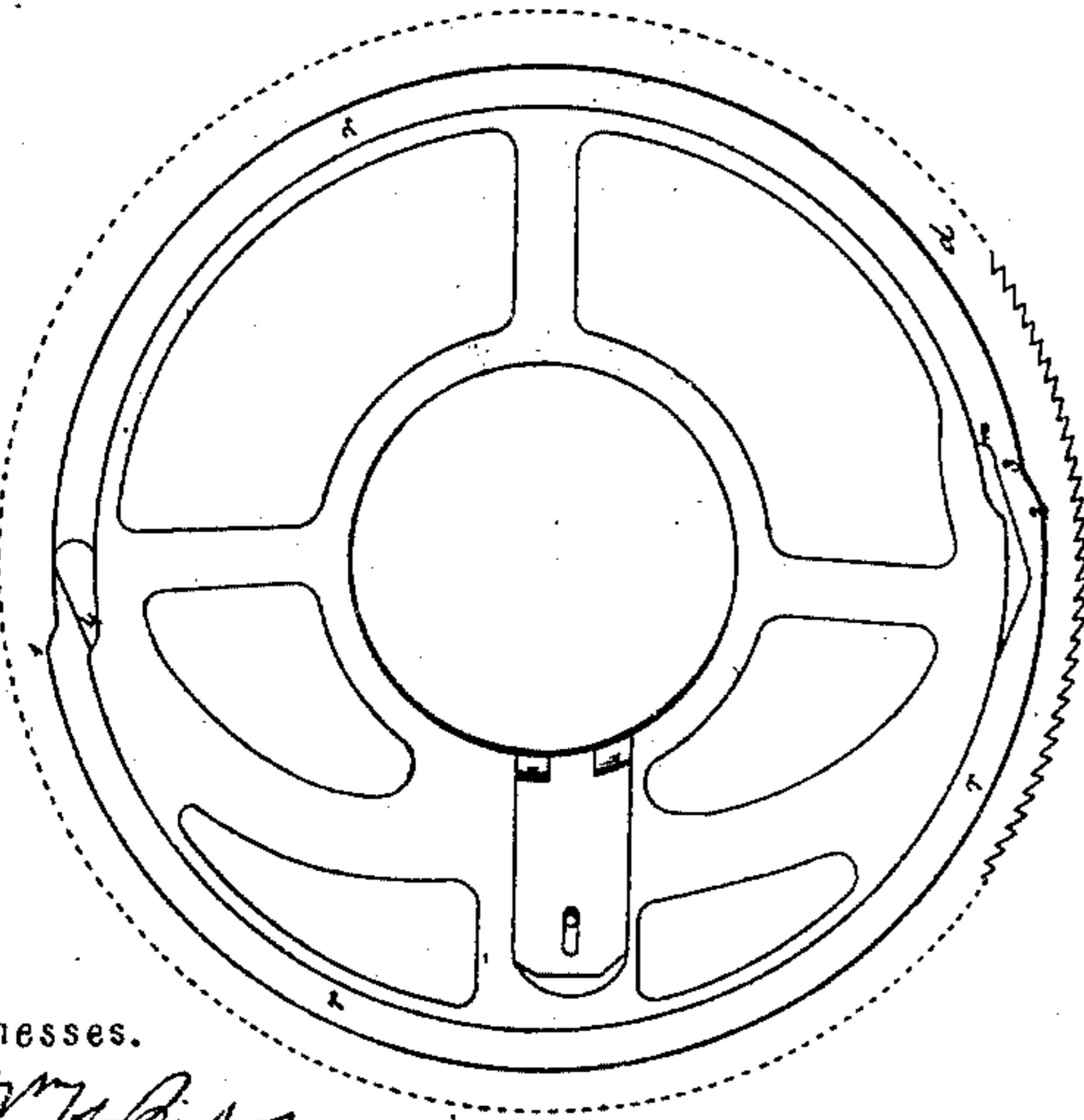


Fig. 5.



Witnesses.

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D. W. G. HUMPHREY, OF CHELSEA, MASSACHUSETTS.

IMPROVEMENT IN BUTTON-HOLE SEWING-MACHINES.

Specification forming part of Letters Patent No. **49,627**, dated August 29, 1865.

To all whom it may concern:

Be it known that I, D. W. G. HUMPHREY, of Chelsea, in the State of Massachusetts, have invented certain new and useful Improvements in Sewing-Machines principally intended for working Button-Holes; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a view of the under side of the machine. Fig. 2 is a longitudinal vertical section in the plane of the axis of the cam-shaft; Fig. 3, a cross vertical section in the plane of the needle; Fig. 4, a bottom view of that part of the table where the stitching operation is performed, with the stitching mechanism removed; Fig. 5, a separate view of the under face of the feeding-ring; Fig. 6, a separate view of the cam-groove for operating the loop-carrier; Fig. 7, a separate view of the cam for operating the loop-openers, and Fig. 8 a separate view of the cam which operates the ratchet-lever.

The same letters indicate like parts in all the figures.

My said invention is of improvements on a machine described in and secured by Letters Patent granted to me, and bearing date the 7th day of October, 1862; and the first part of my present invention relates to an improvement on the method of regulating the spacing of the stitches by the motion imparted to the movable clamp which holds the cloth for working button-holes, by means of which improvement the mechanism is materially simplified and rendered more perfect in its action; and the second part of my said invention relates to the stitching mechanism, by which it is much simplified and its operations rendered more sure and less liable to derangement.

The accompanying drawings represent, in general, a machine for working button-holes, many parts of which need not to be described, as no claim of invention is made or intended to be made thereto in this application.

In the said drawings, *a* represents the clamp which holds the cloth in which a button-hole is to be worked, which clamp is secured to a plate, *b*, fitted to turn and move as required on the table *c*.

Below the plate *b* there is a circular feeding

ring or plate, *d*, fitted to turn in a cavity in the table, and the upper surface of this ring has a cam-groove to impart the required motions to the clamp, as fully described in the patent above recited, and granted to me on the 7th day of October, 1862, and this ring has ratchet-teeth on its periphery to receive the action of a spring ratchet hand or pawl, *e*, which is hinged to one end of a lever, *f*, that vibrates on a fulcrum-pin, *g*, its other end, being adapted to a cam-groove, *h*, in the face of a cam-wheel, *i*, on the main cam-shaft *j*. The form of this cam-groove is represented in the separate section, Fig. 8, and the form is such that the lever *f* is vibrated back and forth twice in every revolution of the cam-shaft, and the throw of one of the said vibrations is greater than the other, and this is for a purpose important to be understood.

In working button-holes on the plan of the said former invention I prefer that the feed motion, when working the eyelet of the button-hole, shall take place once for each operation of the needle, and to have the feed motion greater just preceding that motion of the needle in which it passes through the cloth than preceding that motion in which it passes within the eyelet. For this reason the throw of the ratchet-lever should be alternately short and long. But in working the straight part of the button-hole it is preferable to have the feed motion take place only once for every two operations of the needle. The range of feed motion given to the feed-ring while working the eyelet of the button-hole is required to be much greater than when working the straight parts of the button-hole, for in the former a considerable portion of the motion given to the ring is required to turn the clamp.

To avoid the necessity of using complicated machinery to vary the periods and ranges of motion of the ratchet-lever, I have combined therewith and with the feed-ring what I denominate a "feed-gage," which is placed below the table and below the feeding-ring, and against the edge of which the ratchet hand or pawl *e* is borne by its spring *l*. The feed-gage is composed, for the convenience of adjustment, of two cam-plates attached to a lever. One of these cam-plates, *k*, is such that during the short throw of the ratchet-lever, when stitching along the straight parts of the button-hole,

the ratchet hand or pawl is not permitted to reach the ratchet-teeth, and hence no feed motion takes place; but the long throw of the ratchet-lever carries the ratchet hand or pawl beyond the sloped part *m* of the cam-plate *k*, and this permits the ratchet-hand to take into the ratchet-teeth and to turn the feed-ring the required distance to give the feed motion; and as the range of feed motion is required to be varied for different qualities of work, this cam-plate *k* is made adjustable by slots *n n*, fitted to slide on a steady-pin and on the shank of the screw by which it is secured. There is another cam-plate, *o*, similar to the one above described and secured in like manner, for the purpose of adjusting the range of the feed motion around the eyelet, and both of these cam-plates are secured to the face of a lever, *p*, which vibrates on a stud-pin below the table. On its upper face and near the outer end it is provided with a round pin, *q*, which extends up through an aperture in the table of sufficient capacity to allow the requisite play, and the upper end of this is fitted to a cam-groove, *r*, in the under face of the feed-ring *d*. This cam-groove is represented in the separate Fig. 5. The groove is concentric from 1 to 2, and also from 3 to 4; but the latter is of less radius than the former, and from 2 to 3 and from 1 to 4 the two parts of the groove run into each other. During the rotations of the feed-ring *d*, so long as the part of the cam-groove from 1 to 2 is running on the pin *q*, the lever *p*, with its cam-plates *k* and *o*, which I have denominated the "feed-gage," is thrown out so far that the feed hand or pawl cannot reach the ratchet-teeth of the feed-ring except beyond the sloped part *m* of the cam-plate *k* to give the required feed motion to space the stitches along the straight parts of the button-hole; but when the stitching reaches the eyelet of the button-hole and the feed-ring is about to begin to turn the clamp the part of the cam-groove *r* from 2 to 3 shifts the feeding-gage by drawing it inward, so that the ratchet-hand will then be controlled by the cam-plate *o*, which allows it to act on the ratchet-teeth of the feed-ring at every throw of the lever, giving alternately a long and a short feed motion.

It will be obvious from the foregoing that the object of constructing the feeding-gage with separate and adjustable cam-plates is to afford a convenient means of adjusting the feeding motions to different qualities of work.

In working at very high velocities the ratchet hand or pawl *e*, in passing along the cam-face of the feed-gage, would be liable to fail to engage the ratchet-teeth precisely where it should unless its spring were made with considerable tension, which would cause considerable rubbing friction and cause the machine to run hard. To avoid this, and at the same time to avoid the possibility of the feed-ring being forced around by inertia beyond the range of motion of the feeding-hand, I employ a separate and independent spring, *v*, which

is attached to the table, and against which the feed-hand strikes just as its edge approaches the feed-ring, so that the tension of this spring shall then act on it to insure its engaging the ratchet-teeth at the right time and place, and so that it shall so hold the feed-ring when it reaches the extent of its forward motion that the said ring shall be prevented from moving beyond the required distance by inertia.

In the stitching operation described in my said patent of October 7, 1862, the puncturing-needle descends through the cloth, forming a loop of its own thread below the cloth. An instrument called the "loop-carrier" then passes between the needle and its thread, and thereby catches and holds the loop of the needle-thread while the needle rises out of the cloth and vibrates laterally preparatory to its next descent through the slit of the intended button-hole—that is, by what may be termed the "edge" of the button-hole. The loop of the needle-thread thus held by the loop-carrier is then to be spread so that the needle in its next descent shall pass into and carry its thread into and below the previously-formed loop of its own thread, and when this has been accomplished the instrument which opened the loop lets it go, and before the needle rises a needle-like instrument carrying a second or under thread enters between the needle and its thread to pass this under thread into the second loop of the needle-thread before the needle rises, and as the needle rises preparatory to again puncturing the cloth the loop of the under thread is spread, that the needle in its next descent may enter and carry its thread into the loop of this under thread to repeat the series of operations.

The instrumentalities described in my said patent of October 7, 1862, for performing the series of operations above described are complicated and liable to derangement, and by my present improvements I have not only reduced the number of instruments, but I have materially reduced the motions and the mechanism by which the motions are produced, while at the same time the operations are rendered more sure.

The puncturing-needle *a'* is operated up and down and laterally to pass alternately through the cloth and through the slit of the button-hole by means such as are described in my said patent of October 7, 1862.

Below the table there is an instrument, *b'*, termed the "loop-carrier," which is pointed and of a wedge-like form, and for convenience formed by cutting out the edge of a thin plate of metal, *c'*. This plate of metal is secured to one end of a rod, *d'*, adapted to slide longitudinally in suitable ways, *e'*, and its other end is forked and embraces the cam-shaft, on which it slides as a guide, and it is provided with a roller or pin, *g'*, fitted to a cam-groove, *h'*, in the face of a cam-wheel, *i'*, (represented separately in Fig. 6,) and the form of this cam-groove is such as to move the loop-carrier back and forth with

an intermittent motion at the required periods of time, as will be presently described. On the same plate of metal c' is formed a needle-like instrument, j' , which carries the under thread. Like the loop-carrier, it is preferably made by cutting out the edge of the plate c' , and with its point facing the point of the loop-carrier. This instrument has an eye near the point, through which the thread from a spool, l'' , passes. The surface of this instrument from the eye to the back end is grooved to receive the thread and prevent it from interfering with the other parts of the machine. The said thread is taken from the spool l'' , provided with suitable means for giving tension, and it passes through a spring-guide, m' , and then to the needle like instrument. As the operations and motions of this instrument and the loop-carrier are alternate and in opposite directions, they are united on the same rod or bar and receive motion from the same cam.

Attached to the under side of the table there is a plate, n' , with one face parallel with the vertical plane of motion of the needle a' , and so placed that the needle shall pass very near to it, but without touching. As the thread, when carried through the cloth, is on both sides of the needle extending from its eye to the cloth, when the needle begins to rise to slacken the thread to form the loop the thread tends to bow out on both sides, and sometimes more on one side than on the other. It is desirable, however, to have it bow out on one side only, that the loop-carrier and the second thread-carrier may enter between it and the needle. I obtain this desired result by placing the plate n' in the position above described.

Between the loop-carrier and the under face of the plate on which the stitching is performed there is an instrument which I denominate the "compound loop-opener." It is made of a thin plate of metal, o' , attached to one end of a lever, p' , which vibrates on a fulcrum-pin, q' , the other end being provided with a pin or roller fitted to a cam-groove, s' , in the face of a cam-wheel, t' , on the cam-shaft. The form of this cam-groove is represented in the separate Fig. 7, and its relations to the cam-groove h' , which operates the loop-carrier, is represented by dotted lines in Fig. 6. The loop-opener operates at right angles to the motion of the loop-carrier. This loop-opener is divided into two parts or prongs, u' and v' , by a slot of sufficient width to allow the needle a' to pass between them, notwithstanding its lateral vibration. Both loop-openers are formed alike, with a slight indentation in the outer edge, forming a small dull point next the slot which separates them.

That portion of the table on which the stitching is performed has an aperture, w' , of sufficient size for the needle a' to pass through notwithstanding its lateral vibrations, and this part of the table is reduced in thickness by a cavity, x' , made in its under side, and in the lower part of this cavity there is inserted a small plate,

y' , with an inverted-V-shaped aperture, with its apex opposite to the loop-openers. The form of this opening and of the opening through which the needle works and their relations to each other are represented in Fig. 4. After the needle a' has punctured the cloth and carries its thread below, it rises for a short distance to slacken the thread, and the loop-carrier, which in the meantime has been advancing, then enters between the needle and its thread and moves along to draw out the required quantity of thread to form the loop, the loop-carrier being provided with a projecting shoulder, z' , at the rear under part, to prevent the loop from passing back. In the meantime the needle has risen out of the cloth. This motion of the loop-carrier carries the loop of the needle-thread with one side against the inner edge of the loop-opener u' and the other part of it over its point. The loop-opener then advances and carries that portion of the loop which is over its forward edge toward the apex of the V-shaped opening, while the other portion of the loop continues to be held back by the loop-carrier. By this operation the loop of the needle-thread is opened, so that the needle, which in the meantime has been vibrated laterally to pass down in the slit of the button-hole, shall pass into the loop of its own thread to carry its own thread below such loop. As soon as these operations have been performed the loop-opener and the loop-carrier retire and liberate the loop, which is drawn to the cloth by the continued downward motion of the needle. So soon as this downward motion of the needle is completed it rises for a short distance to slacken its thread, and then the under-thread carrier, j' , which has been advancing as the loop-carrier was receding, enters this second loop of the needle-thread, carrying the under thread into it, and while this loop continues around the body of the under-thread carrier the under thread is carried over the point of the other loop-opener, v' , which then advances to open the loop of the under thread, carrying one side of this loop along the side and toward the apex of the V-shaped opening to open the loop, so that the needle, when it next descends through the cloth, shall pass into this loop, while the under-thread carrier retires out of the second loop of the needle-thread, which is then drawn around the loop of the under thread, after the needle has entered the loop of the under thread, preparatory to a repetition of the series of operations.

It will be obvious to any one skilled in the construction and operation of sewing-machines that some of my said improvements may be advantageously employed without the others, although it will be found best to employ them all—as, for instance, the feeding-gage may be made without the separate and adjustable cam-plates; but the use of these adjustable plates will afford a ready and convenient mode of adjusting the feeding motion to the quality of the work desired.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The feeding-gage, in combination with the ratchet hand or pawl and the feeding-ring which operates the clamp that holds the cloth, substantially as and for the purpose specified.

2. The adjustable cam-plate which regulates the range of the feeding motion for spacing the stitching in working the eyelet, in combination with the ratchet hand or pawl and the feeding-ring which operates the clamp that carries the cloth, substantially as and for the purpose specified.

3. The adjustable cam-plate which regulates the range of feeding-motion for spacing the stitches along the straight parts of the button-hole, in combination with the ratchet hand or pawl, the feeding-ring, and the adjustable cam-plate for adjusting the range of the feeding motion in working the eyelet, substantially as and for the purpose specified.

4. The auxiliary spring which acts on the ratchet hand or pawl only at the time it is re-

quired to act on the ratchet-teeth, in combination with the said ratchet hand or pawl, the feeding-ring, and the feeding-gage, substantially as and for the purpose specified.

5. Connecting the loop-carrier and the under-thread carrier with each other, to be operated together and by the same means, substantially as and for the purpose specified.

6. Uniting two loop-openers for opening the loop of the needle-thread and the loop of the under thread, substantially as described, so that they shall be operated by the same means, as described.

7. Each of the loop-openers, in combination with each of the oblique sides of the aperture in the plate below that part of the table on which the stitching is effected, substantially as and for the purpose specified.

D. W. G. HUMPHREY.

Witnesses:

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