

(No Model.)

4 Sheets—Sheet 1.

W. S. MILLS.
BUTTON HOLE SEWING MACHINE.

No. 362,771.

Patented May 10, 1887.

Fig 1

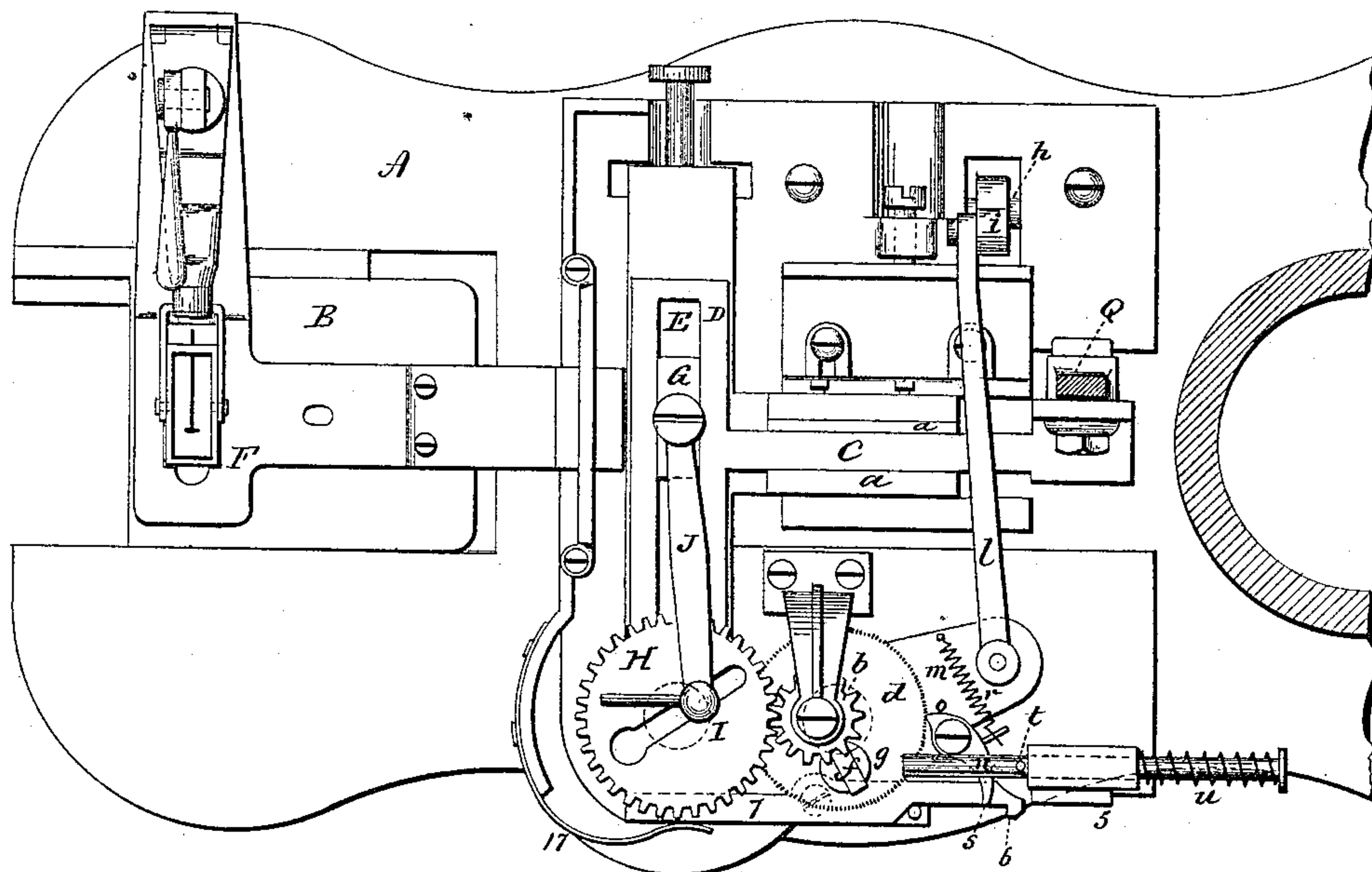
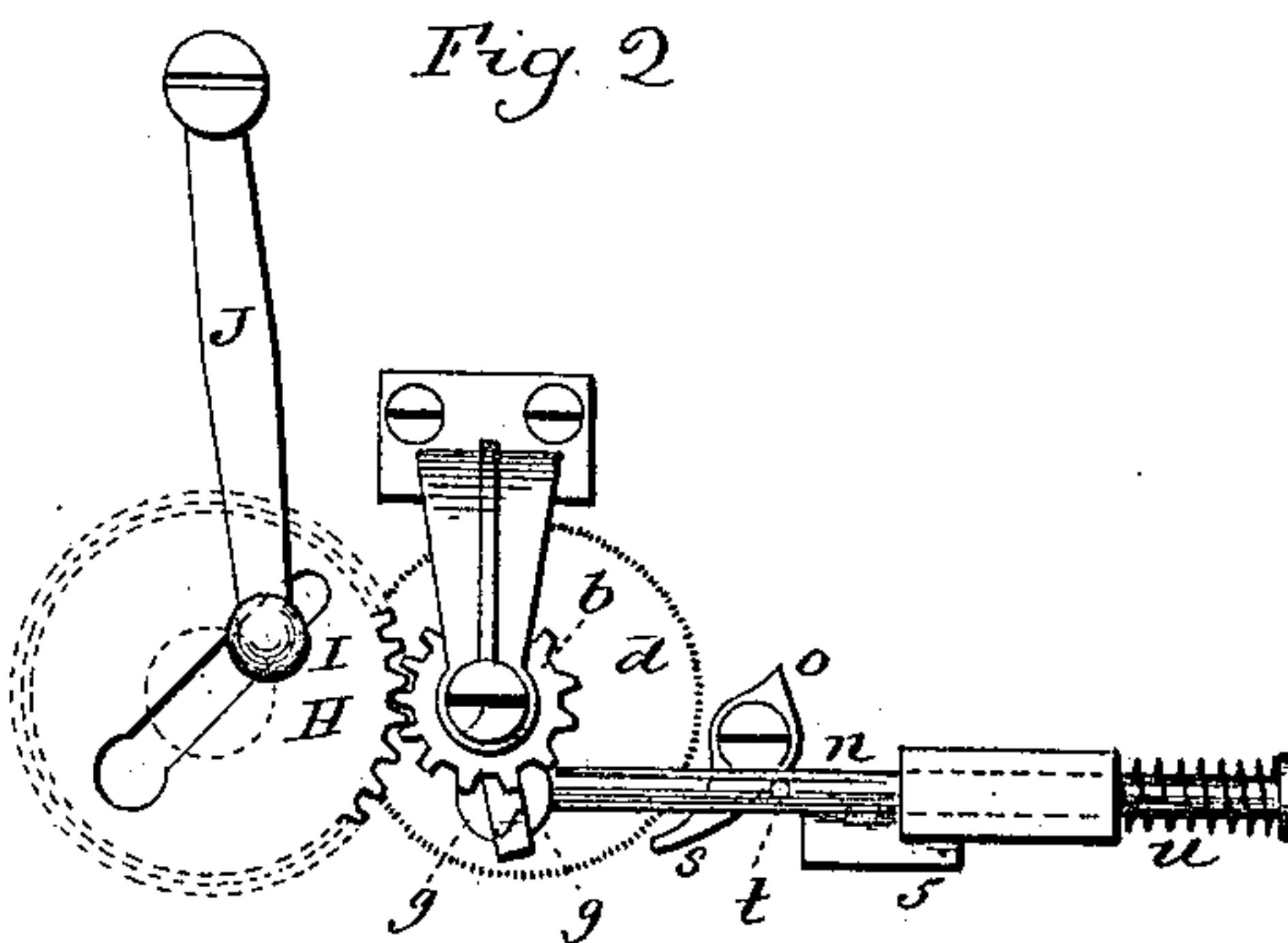


Fig 2



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Fig. 3

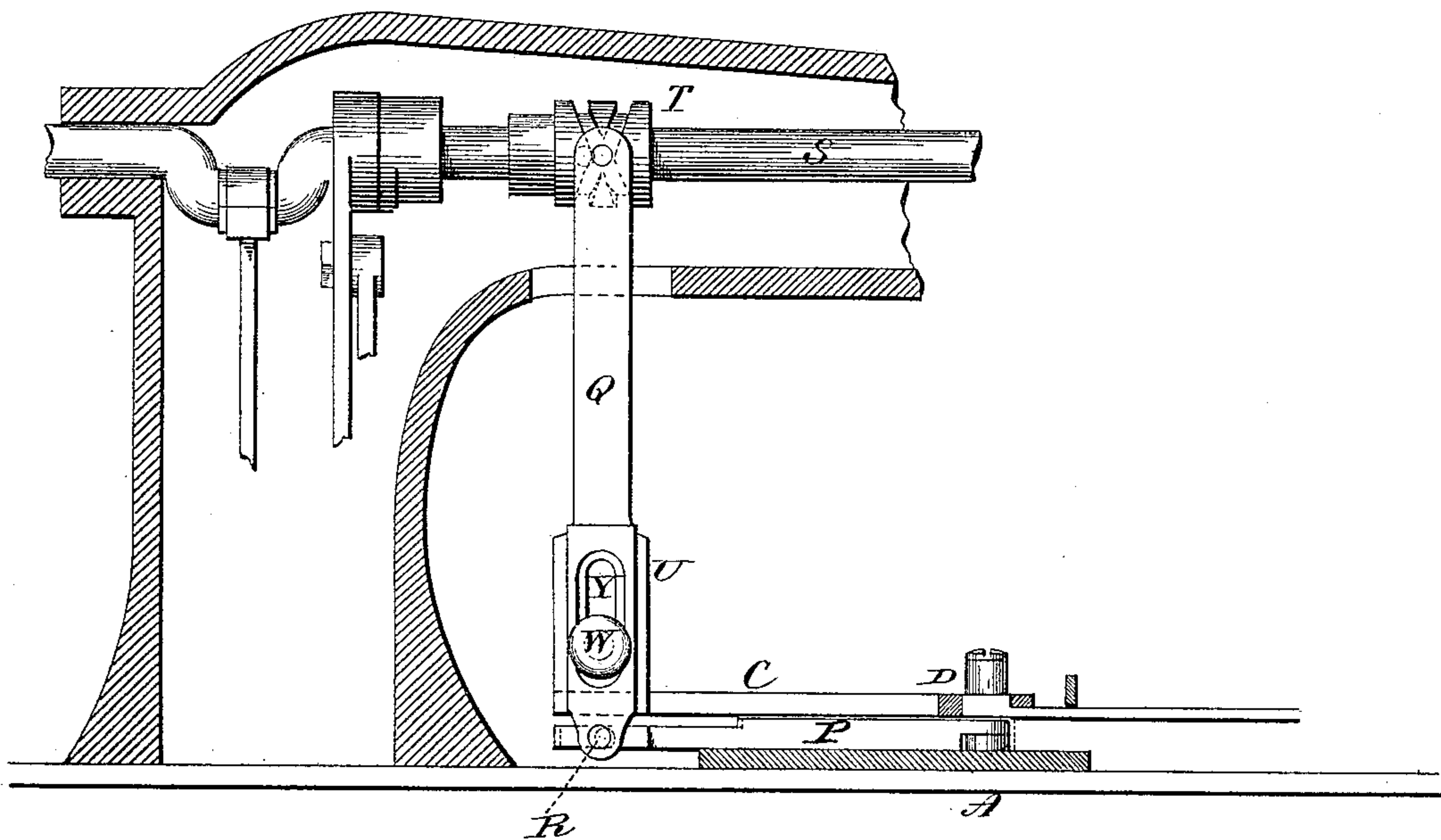
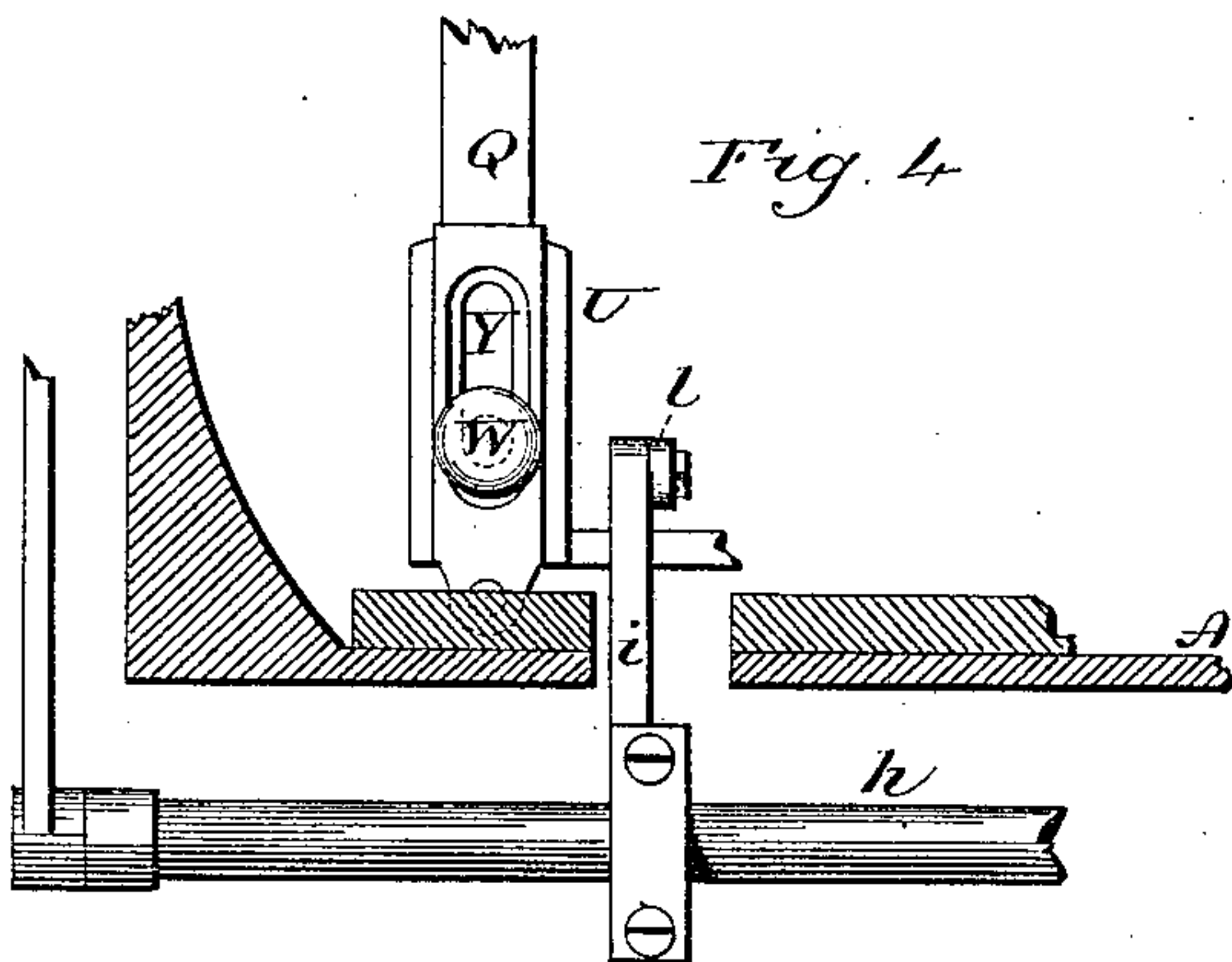


Fig. 4



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Fig. 5.

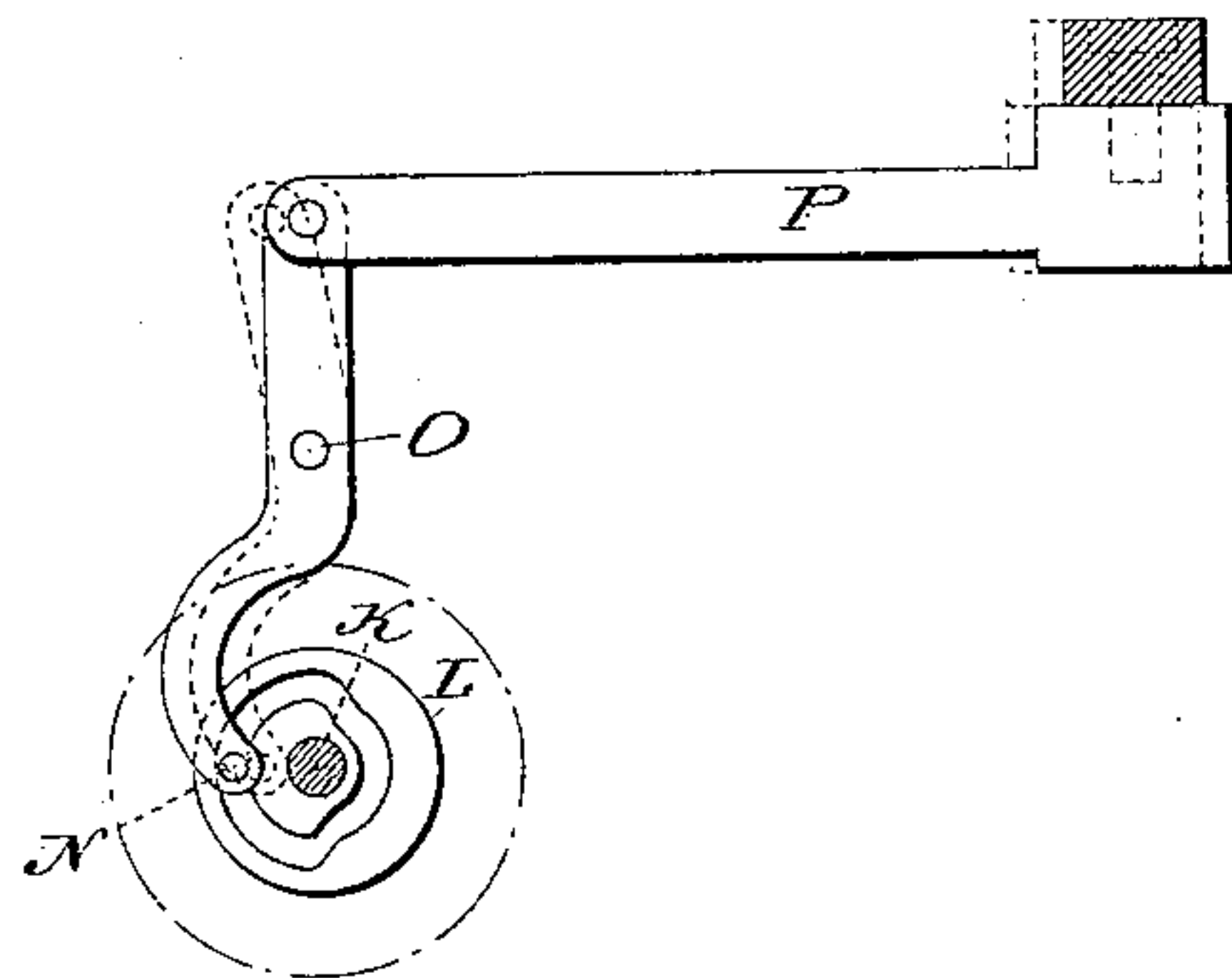
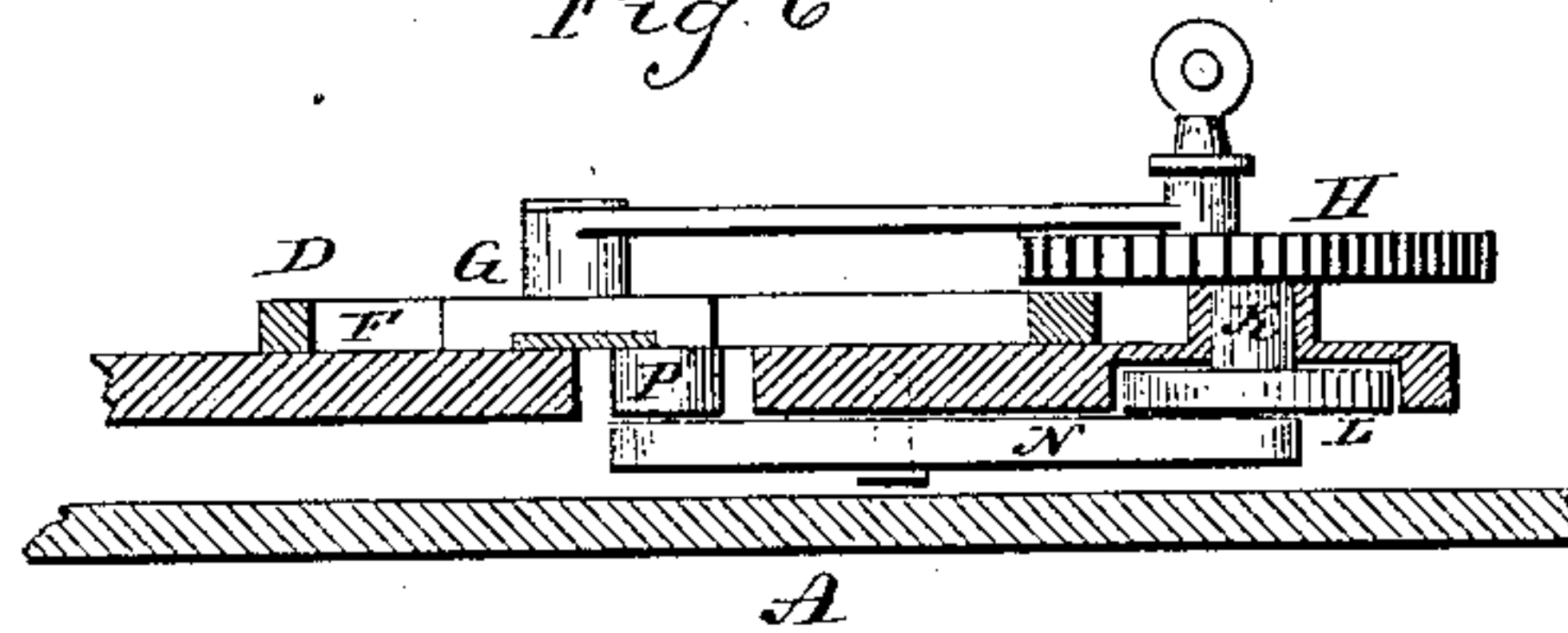


Fig. 6.



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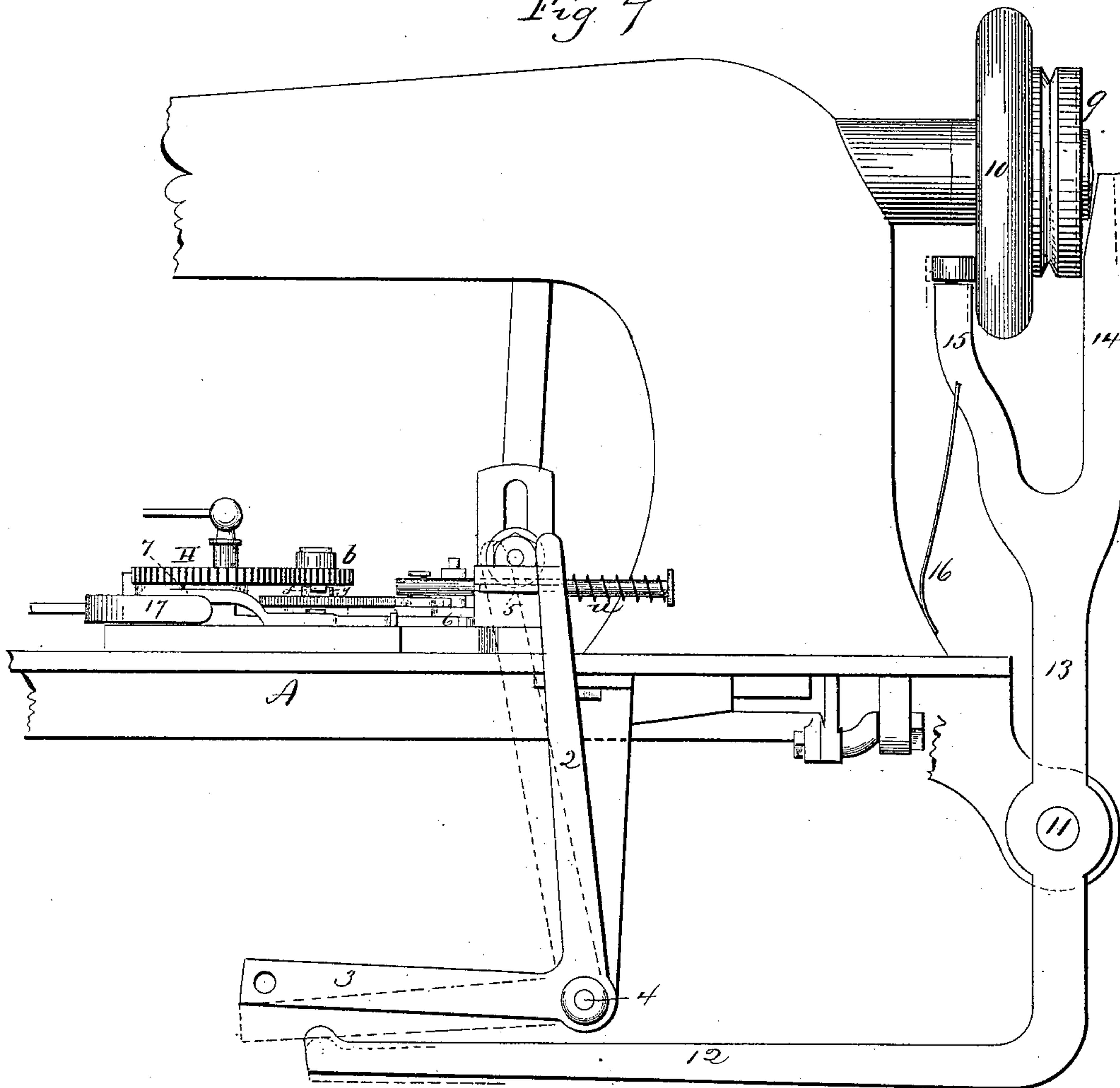
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Fig 7



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UNITED STATES PATENT OFFICE.

WILLIAM S. MILLS, OF NAUGATUCK, CONNECTICUT.

BUTTON-HOLE SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 362,771, dated May 10, 1887.

Application filed December 6, 1886. Serial No. 229,785. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. MILLS, of Naugatuck, in the county of New Haven and State of Connecticut, have invented a new Improvement in Button-Hole Sewing-Machines; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in--

Figure 1, a top view of the bed of the sewing-machine, showing the button-hole attachment thereon, the arm of the machine removed; Fig. 2, a detached view of the feed-wheel H, the ratchet *d*, and their connections, illustrating the operation of the set-back; Fig. 3, a longitudinal sectional view showing the connection between the lever Q, the slide C, and the fulcrum-bar P below it; Fig. 4, a sectional view showing the feed rock-shaft of the machine and the arm from which the feed-pawl lever is actuated; Fig. 5, a detached view showing the cam on the feed-wheel, the fulcrum-bar of lever Q, with the intermediate lever; Fig. 6, a sectional side view of the parts shown in Fig. 5; Fig. 7, a front side view showing the arrangement and operation of the lever 2 3 to actuate the set-back and the stop-motion.

This invention relates to an improvement in an attachment for sewing-machines, whereby an ordinary sewing-machine is adapted to stitch a button-hole, and in which attachment the button-hole is clasped in a holder, to which holder a feeding motion is imparted from stitch to stitch, and at the same time a reciprocating movement across the path of the needle is imparted to the holder, so that one descent of the needle passes through the fabric adjacent to the edge of the button-hole, and at the next descent the needle is caused to pass through the slit for the button-hole, and continuing, alternate stitches being taken through the fabric, then over the edge of the fabric, and is an improvement upon the attachment described in Letters Patent of the United States No. 203,287, dated May 7, 1878, and Patent No. 252,052, January 10, 1882.

To the cloth-holder an intermittent or step-by-step movement is imparted in the direction of the path of the needle to form the line of

stitches on one side of the button-hole. Then the cloth-holder is moved across the path of the needle to produce the stitches upon the opposite side.

In the patent before referred to, the mechanism for imparting the step-by-step or feed movement to the cloth-holder, together with the mechanism for imparting the transverse reciprocating movement to the cloth-holder, were so combined that the whole partook of such transverse reciprocating movement; hence a very considerable weight was necessarily moved in such reciprocating movement, and this movement being rapid, it produced a great jar upon the machine and consequent wear of parts.

The object of the first part of my invention is to separate the parts, and so that this rapid reciprocating movement will be imparted only to the slide carrying the cloth-holder, and that the parts which move the cloth-holder to the opposite sides of the needle will receive a movement at the time required—that is, at each end of the button-hole.

The second part of my invention has for its object to move the cloth-holder directly from the feed rock-shaft of the machine, and so that the ordinary feed adjustment will apply for the feed of the cloth-holder.

The third part of my invention has for its object to produce a lap in the stitching of the button-hole—that is to say, so that the button-hole will begin at a point back of the point where it will be finished, and so that the last stitches in completing the button-hole will be taken over the first stitches in the commencement of the same.

The machine to which I illustrate the attachment as applied is what is known as the "Singer;" but I show only so much of the machine as is necessary for the illustration of the invention, the machine being too well known to require detailed description; and the mechanism of the attachment, broadly considered, is substantially the same as that illustrated and described in the patent before referred to, and only requires brief description.

A represents the bed of the sewing-machine; B, the cloth-plate thereon.

C is a slide arranged in longitudinal guides *a a* at right angles to the path of the needle,

and is constructed at its forward end with a cross-head, D, in which is a slot, E, parallel with the path of the needle.

F is the clamp adapted to clamp the cloth around the button-hole to be stitched, in the usual manner. This clamping device does not require to be described, as it constitutes no part of my invention.

In the slot E of the cross-head is a slide, G, movable in said slot parallel with the path of the needle, and to this slide G the cloth clamp or holder is attached. The slide G is moved through the slot E, step by step, as each stitch is taken, and correspondingly moves the work. The slide G moves in one direction for one side of the button-hole and then returns for the other side. This step-by-step movement is imparted to the slide G through a gear-wheel, H, in which is an adjustable stud, I, eccentrically arranged, and with which a rod, J, connects the slide G, and so that as the gear-wheel H revolves it will impart a reciprocating movement to the slide G through the slot E.

On the shaft K of the gear-wheel H (see Figs. 5 and 6) is a grooved cam, L, which revolves with the gear-wheel H, hence receives one full revolution in the formation of a single button-hole. In the plane of this cam is a lever, M, on the end of which is a stud, N, working in the groove on the cam, as seen in Fig. 5. This lever is hung upon a fulcrum, O, the other end of the lever being hung to a bar, P, beneath the slide C, the said bar being movable under the action of the cam parallel with the slide C. The groove in the cam L is of the shape as seen in Fig. 5, to hold the lever at rest during nearly one-half the revolution of the cam, then will draw that end of the lever inward, as seen in broken lines, Fig. 5, where it will remain stationary during nearly one-half the revolution, and then that arm of the lever will be thrown outward. The two times of rest of the cam correspond to the time in which the button-hole is being stitched on its two sides, and the passage of the cam from the two rests corresponds to the time of turning the ends of the button-hole. The bar P extends backward beneath the slide C, and to it the lower end of the lever Q is hung upon a fulcrum, R. (See Fig. 3.) This lever extends upward to the shaft S in the arm of the sewing-machine and into engagement with a cam, T, thereon, the cam being adapted to give to the lever Q a vibratory movement in a plane at right angles to the path of the needle. On the slide C is an upwardly-projecting arm, U, in a plane parallel with the lever Q, and to this arm a pivot, W, is fixed, extending through a slot, Y, in the lever, as seen in Fig. 3, and so that at each revolution of the shaft S a full vibratory movement is imparted to the lever Q, and that lever, turning upon the fulcrum R, imparts to the slide C its reciprocating movement at right angles to the path of the needle, and so that the clamp will be moved sufficiently to permit the needle to alternately pass through the button-hole and then through the fabric

near the edge of the button-hole, and this reciprocating movement of the slide C will continue through one full side of the button-hole, and when the end of the button-hole is reached the cam L comes into action through the lever O upon the bar P, and moves that bar accordingly, taking with it the lower end or fulcrum R of the lever, as indicated in broken lines, Fig. 3. This movement occurs while the stitching is being made around the end of the button-hole, and so that as the bar P comes to a rest the needle will have passed to the opposite side of the button-hole, and the work will then continue along that side of the button-hole to the opposite end, when the cam L will again come into action and return the bar P as the stitching is produced around that end of the button-hole. The action of the lever Q upon the slide C is not affected by this change in the position of the fulcrum R, upon which the lever Q is hung, as the slide C and the bar P move in parallel planes. Thus it will be seen that the transverse reciprocating movement of the work holder or clamp is communicated through the slide C only, and without taking with it any other part of the feeding mechanism. By this part of my invention I not only avoid the unnecessary movement of parts of the machine, but I simplify the mechanism by which the movable parts are actuated.

The feeding mechanism consists of a pinion, b, which works into the gear-wheel H; and is one-half the diameter of the wheel H, and upon an axis eccentric to the axis of the pinion b, as indicated in broken lines, Fig. 1, is a toothed ratchet, d, into which the feed-pawl e works. From the hub of the pinion b an arm, f, extends radially outward through a slotted stud, g, eccentric on the wheel d. This arrangement of gear, pinion, and ratchet-wheel are the same as in the patent before referred to. The ratchet-wheel therefore makes one full revolution for each side of the button-hole to be stitched.

In the patent before referred to, the step-by-step rotation was imparted to the ratchet-wheel mechanism forming a part of the attachment and independent of the sewing-machine proper.

Below the bed of the sewing-machine is the usual feed rock-shaft, h. (See Fig. 4.) Fixed to this shaft is an arm, i, which extends up through the bed of the machine, as seen in Fig. 1, and from its upper end a rod, l, connects that rock-shaft with a lever, m, hung upon the axis of the ratchet-wheel d, the said lever carrying the pawl o, and as seen in Fig. 1, so that the regular and usual oscillation of the rock-shaft h imparts a vibratory motion to the lever m, causing the pawl o to engage the teeth of the ratchet in one direction and escape therefrom in the opposite direction, the same as does the pawl in the mechanism of the patent before referred to; but by attaching the lever m directly to the rock-shaft of the sewing-machine not only is the mechanism of the attachment relieved from this

operation, but the same adjusting device by which the throw of the rock-shaft is varied for the ordinary feeding of the sewing-machine is applied to the adjustment of the feed for the button-hole attachment.

As it is desirable that the work shall finish always at the same point in the button-hole, and that at the same point at which it starts, it follows that there is no overlapping of the stitching of the button-hole, but that the work stops where it begins, and thus frequently leaves a weak place in the stitching. To overcome this difficulty I begin the stitching at a point back of the place where the finishing is to be made, and whereby a certain number of the stitches last taken will overlap the stitches first taken. To do this, when the machine is stopped at the required point, and after the work is properly placed for the new button-hole, I turn the feed backward to a certain extent before starting the machine, and this I do by means of a slide, *n*, arranged in the plane of the stud *g* in the ratchet-wheel *d*, but outside the axial plane of the ratchet-wheel, and, as seen in Figs. 1 and 2, this slide works over the pawl *e*. The pawl is provided with the usual spring, *r*, which tends to hold its nose into engagement with the ratchet-wheel. The pawl is also constructed with a tail, *s*, which extends outward beneath the slide *n*, and on the slide is a stud or shoulder, *t*, which stands in the plane of the tail *s*. The slide extends toward the stud *g*, and is provided with a spring, *u*, the tendency of which is to hold the slide back and out of the path of the stud *g*, and so as to leave the pawl free for the spring action, as seen in Fig. 1; but by forcing the slide toward the stud *g*, as seen in Fig. 2, the shoulder *t* thereon strikes the tail of the pawl, turns it away from the wheel, leaving the wheel free, and then on the continued movement of the slide its end strikes the stud *g*, as seen in Fig. 2, and so as to turn the stud with the arm *f* backward to the extent of the last part of the movement of the slide *n*, and as from the position seen in Fig. 1 to that seen in Fig. 2. Such backward movement of the arm *f* correspondingly turns the pinion *b* backward, and it in its turn gives to the wheel *H* a backward movement, which also moves the work-holder to the same extent. This extent may be, say, five stitches. The work of stitching will now commence five stitches back from where it would have begun had not this set-back been made, and the work will continue around the button-hole to the point of finishing, and in so doing the said five stitches set back will be overlapped by the last five stitches made in finishing the button-hole.

The set-back is produced by the foot of the operator through a bell-crank lever, 2 3, hung upon a fulcrum, 4, below the bed, the arm 2 extending up and so as to work against a shoulder, 5, projecting from the slide *n*. When the arm 3 is pulled down by the action of a foot-pedal, (not shown,) the arm 2 presses forward against the shoulder 5 and forces the

slide forward, as seen in broken lines, Fig. 7, and so soon as under this movement the set-back has been made the arm 2 strikes the inclined nose of the latch 6, and, passing onto that nose, escapes from the shoulder 5. Then the spring *u* reacts and withdraws the slide *n*, permitting the pawl *e* to again engage the ratchet-wheel and the work to proceed as before. The arm 2 passes onto the nose of the latch 6, and is there held until, as the button-hole is being completed, a downwardly-projecting stud, 7, on the wheel *H* strikes the tail 8 of the latch and throws it out of engagement with the arm 2, leaving that arm free.

The lever 2 3 is in connection with the clutch or power, so that as the arm 2 is drawn into the latch the power is applied to start the machine, as usual in this class of machine, that stop mechanism being so well known as to require but a brief description.

The pulley 9 is loose upon the shaft and works in frictional contact with the wheel 10 on the driving-shaft or a surface in connection therewith. A lever is hung upon a fulcrum, 11, one arm, 12, of which extends beneath the arm 3 of the lever 2 3. The other arm, 13, extends upward and is divided—one branch, 14, outside the pulley 9 and so as to bear thereon, the other branch, 15, upon the inside of the fly-wheel 10. The distance between the two branches 14 15 is a little more than the thickness of the wheel and pulley, so that if the branch 14 be brought to bear against the face of the pulley it will press that pulley into frictional contact with the fly-wheel with sufficient force to communicate power thereto. Then the machine will run; but when pressure on the branch 14 is removed from the pulley 9 the power is disconnected, and at the same time the branch 15 is brought to bear upon the wheel 10 as a brake to produce instantaneous stopping. It will therefore be seen that as the arm 3 is drawn downward it will press the arm 12 downward and apply the power; but when the arm 2 is released, as before described, then both levers are free to be thrown backward, disconnect the power, and apply the brake. This backward movement of the levers may be produced by a spring, 16, or otherwise. I show this disconnecting mechanism as being one well known; but I do not wish to be understood as confined to that particular disconnecting or stopping mechanism.

The power is held in engagement by the latch 6 until such time as the latch 6 is turned to release the lever 2 3. Then the machine will stop, and the stopping will always occur at the same point in the button-hole, and the set-back will be to the same extent, that extent depending upon the distance which the slide *N*, turns the pinion *b* backward, and that extent may be varied to suit circumstances.

A spring, 17, bears against the tail of the latch to hold it in the path of the stud 7, and also of the arm 2 as it passes onto the latch.

The lever 2 3 may be employed to simply

throw the slide forward to produce the set-back; in that case an incline corresponding to the nose of the latch 6 will throw the arm 2 out of engagement with the slide and permit the slide to retreat so soon as it shall have reached its forward or full set-back position.

What I claim as an improvement on the invention of said Patent No. 203,287 and Patent No. 252,052, January 10, 1882, is—

1. The combination, in a sewing-machine substantially such as described, of the slide C, carrying the slotted cross-head D, the slide G in the slot of said cross-head and carrying the work-holder, the gear-wheel H in crank connection with said slide G, mechanism, substantially such as described, to impart step-by-step rotation to said wheel H, a cam, L, on the axis of said wheel H, a lever, Q, cam T on the driving-shaft of the machine, with which one end of said lever Q engages, the said lever hung to said slide C, the other end extending downward and hung upon a fulcrum, with a lever between said fulcrum and the said cam L, substantially as described, and whereby at predetermined times a movement is imparted to said fulcrum in a path parallel with said slide C and at right angles to the path of the needle.

2. The combination, in a sewing-machine substantially such as described, of a slide, G, arranged in guides parallel with the path of the needle and carrying the work-holder, a gear, H, in crank connection with said slide G, a pawl and ratchet with intermediate gear working into said gear-wheel H, a pawl arranged to work in the teeth of said ratchet, and a direct connection between said pawl and the feed rock-shaft of the machine, substantially as described, and whereby the oscillating movement of said rock-shaft imparts the back and forward movement to said pawl in connection with said ratchet.

3. The combination, in a sewing-machine substantially such as described, of the slide G, arranged in guides parallel with the path of the needle and carrying the work-holder, a gear, H, in crank connection with said slide G, a pinion, b, working into said gear H, a ratchet, d, in connection with said pinion, and a pawl adapted for back and forward movement in connection with said ratchet, and whereby a step-by-step rotation is imparted to said wheel H, with a slide working in a plane parallel with said ratchet-wheel and adapted at a predetermined time to engage said ratchet-wheel in a direction opposed to the action of the pawl, the said slide provided with a shoulder arranged to disengage said pawl before

said slide engages said ratchet-wheel, substantially as and for the purpose described.

4. In a sewing-machine substantially such as described, the combination of the slide G, arranged in guides parallel with the path of the needle and carrying the work-holder, a gear-wheel, H, in crank connection with said slide G, a ratchet-wheel in gear connection with said wheel H, a vibrating pawl adapted to engage said ratchet-wheel and impart a step-by-step rotation thereto, the said ratchet-wheel provided with a projection upon its side, a slide in the plane of said projection and adapted to engage said projection at a predetermined time, the said slide also constructed with a shoulder arranged to throw said pawl out of engagement with said ratchet-wheel, a lever, 2 3, one arm of which is arranged to engage said slide and impart a movement thereto toward said ratchet-wheel, and an incline, 6, in the path of the advancing arm 2 of said lever, substantially as described, and whereby the said lever 2 3 will be thrown out of engagement with the slide when the said slide has reached its extreme forward position.

5. In a sewing-machine substantially such as described, the combination of the slide G, arranged in guides parallel with the path of the needle and carrying the work-holder, the gear H in crank connection with said slide G, the ratchet d, intermediate gearing connecting said ratchet with said wheel H, a vibrating pawl arranged to engage said ratchet-wheel and impart to it a step-by-step rotation, a stud, g, on said ratchet-wheel, a slide, n, in the plane of said stud, a lever, 2 3, one arm of which is arranged to engage the said slide and impart a movement thereto toward said ratchet-wheel, a spring-latch, 6, arranged to throw said arm out of engagement with said slide and to engage said arm in its extreme forward position, a stud on the wheel H, the tail of the latch 6 extending into the path of said stud, and so that at a predetermined time in the revolution of the wheel H the said latch will disengage said lever, and a stop mechanism, substantially such as described, between said lever 2 3 and the power, substantially as specified, and whereby as the said lever 2 3 is advanced into engagement with said latch it will apply the power and when released from said latch it will disengage the power.

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