

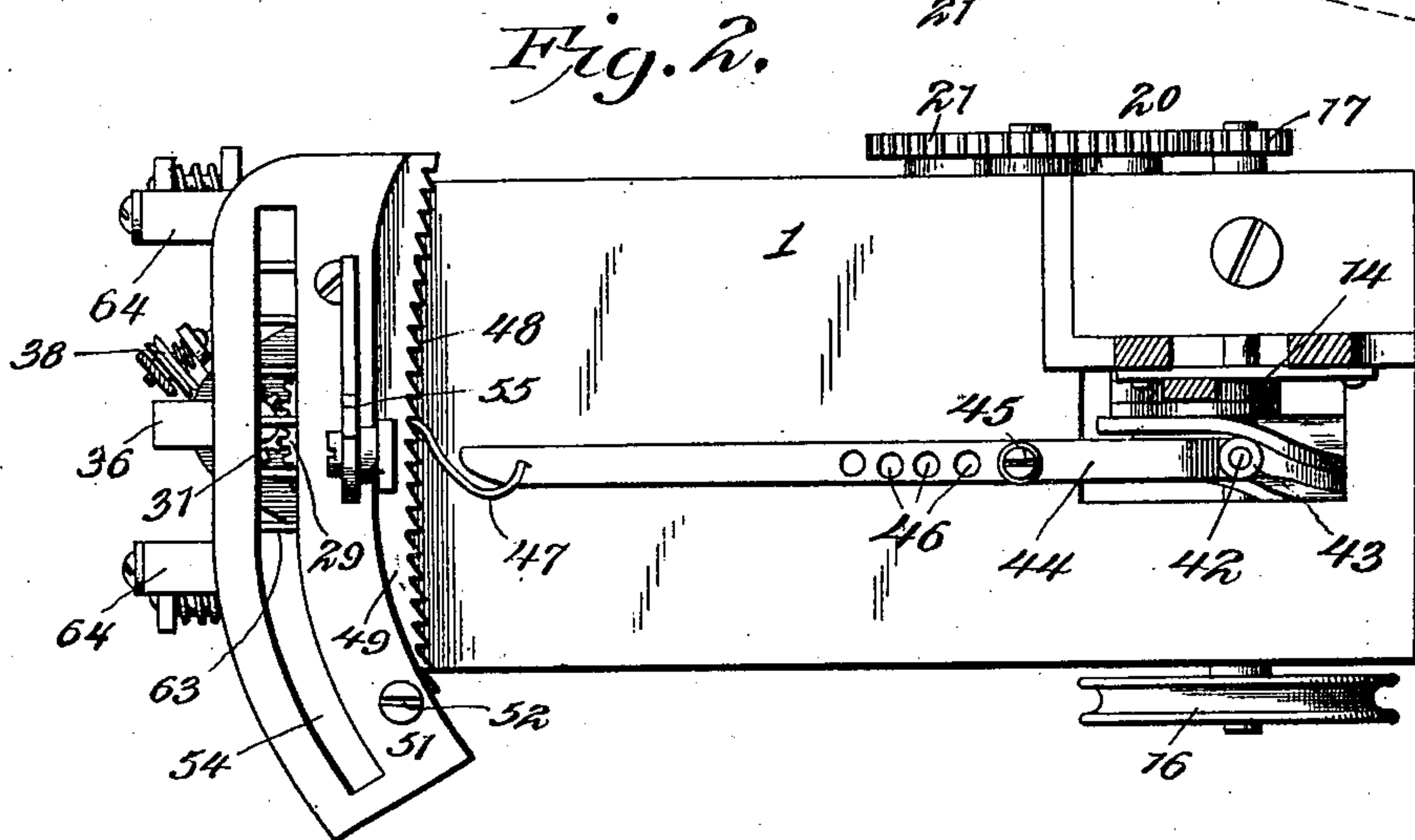
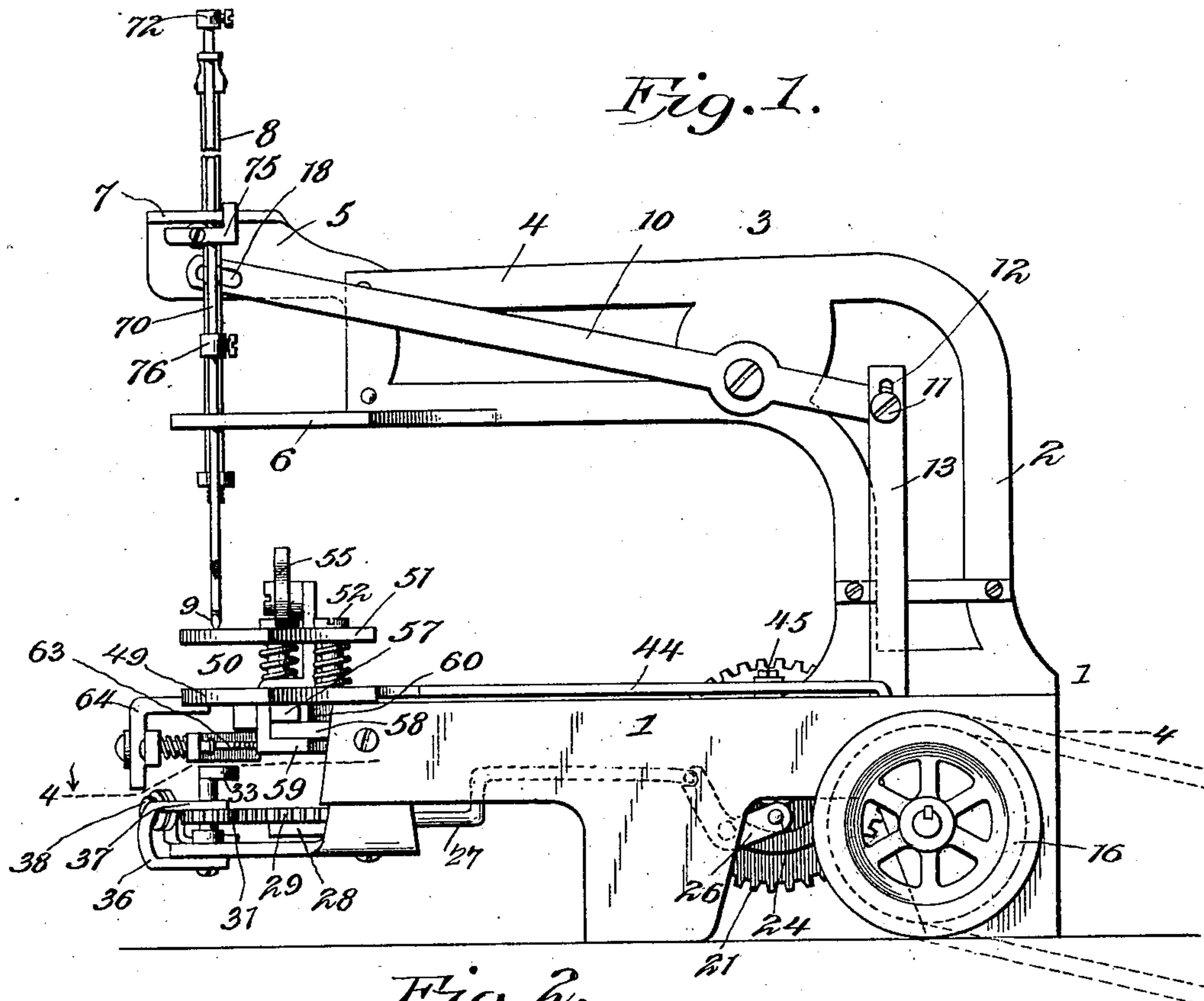
No. 692,956.

Patented Feb. 11, 1902.

D. A. WILLIAMSON.
SHOE LACING MACHINE.
(Application filed Apr. 30, 1900.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses

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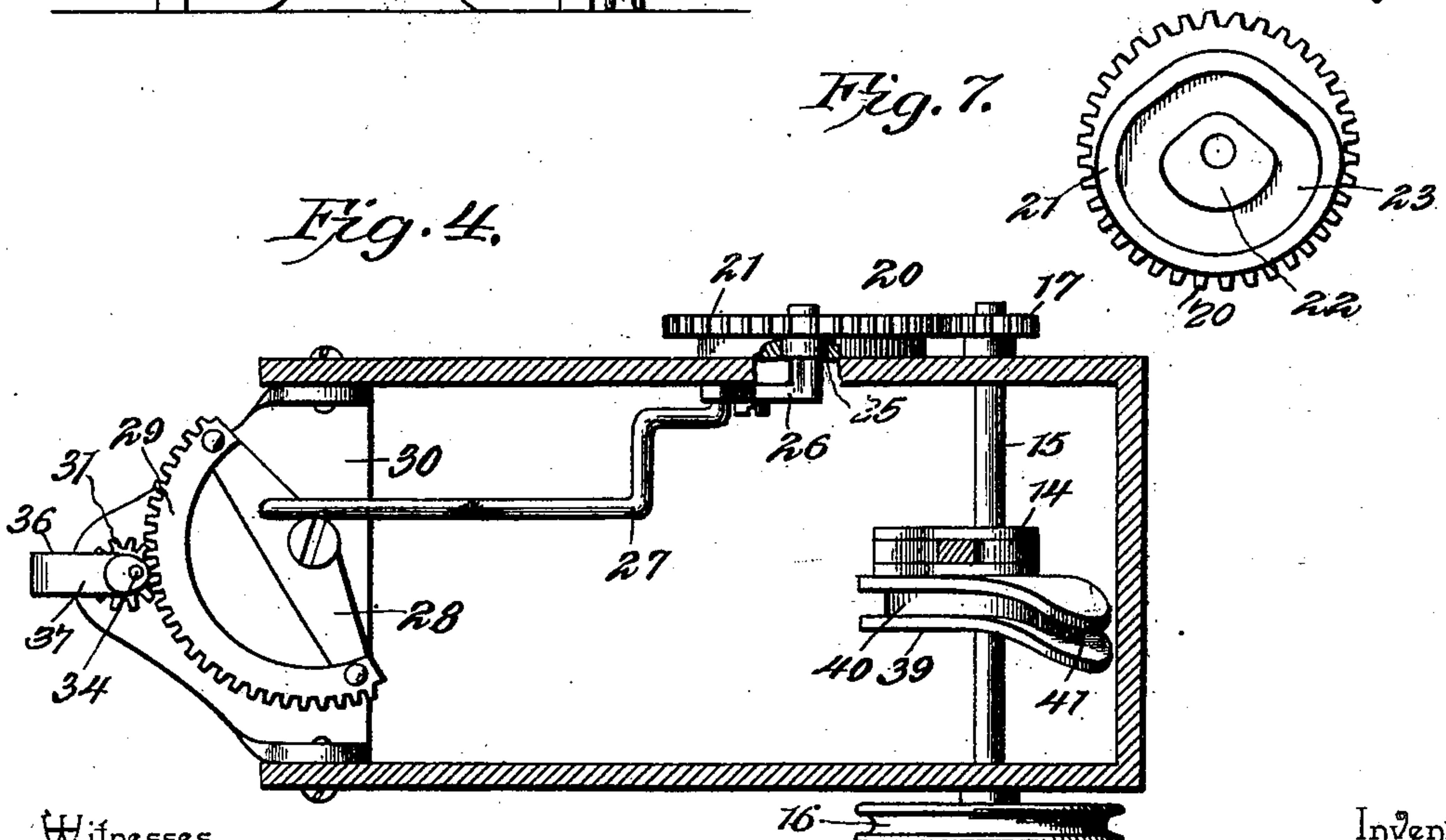
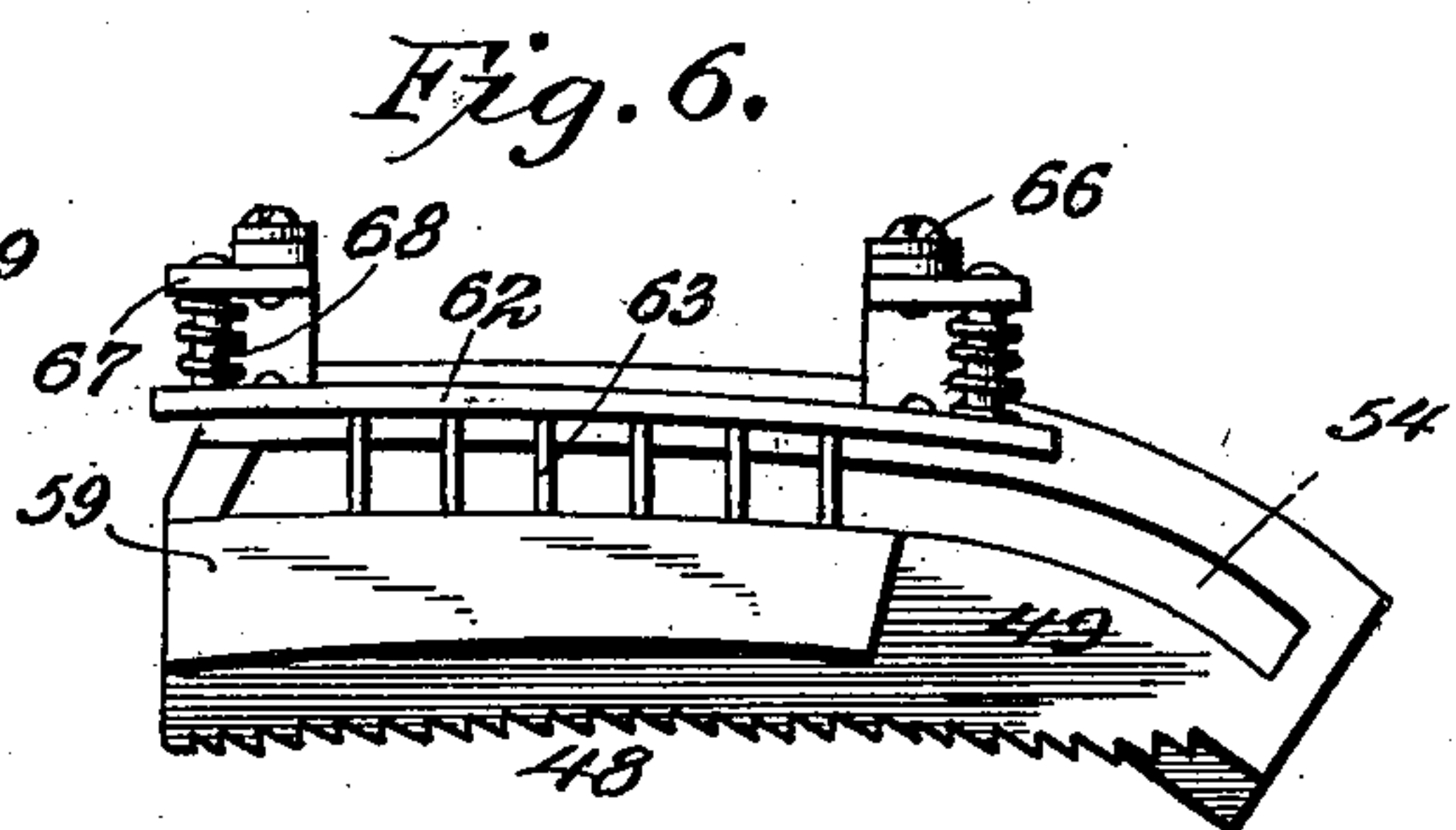
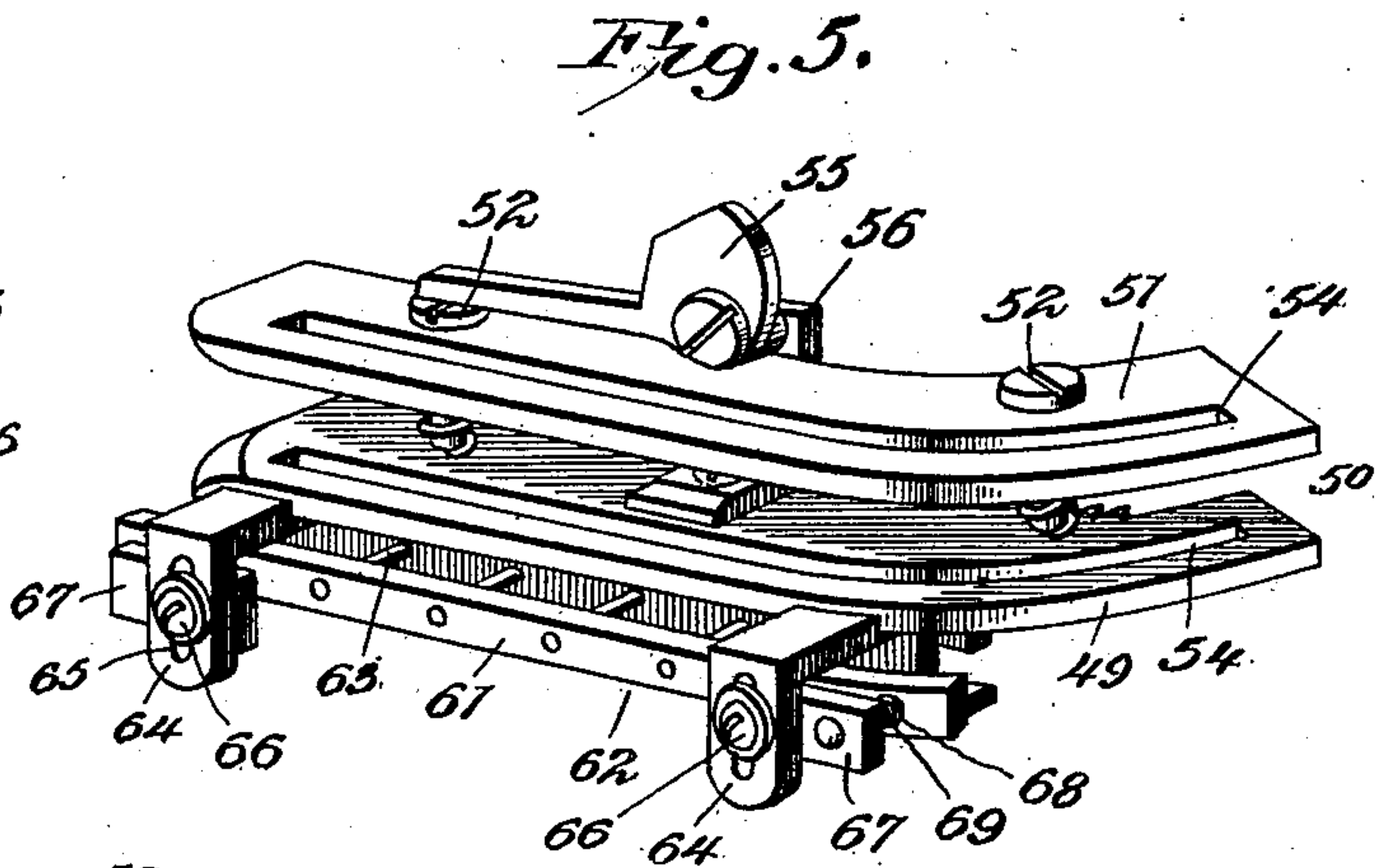
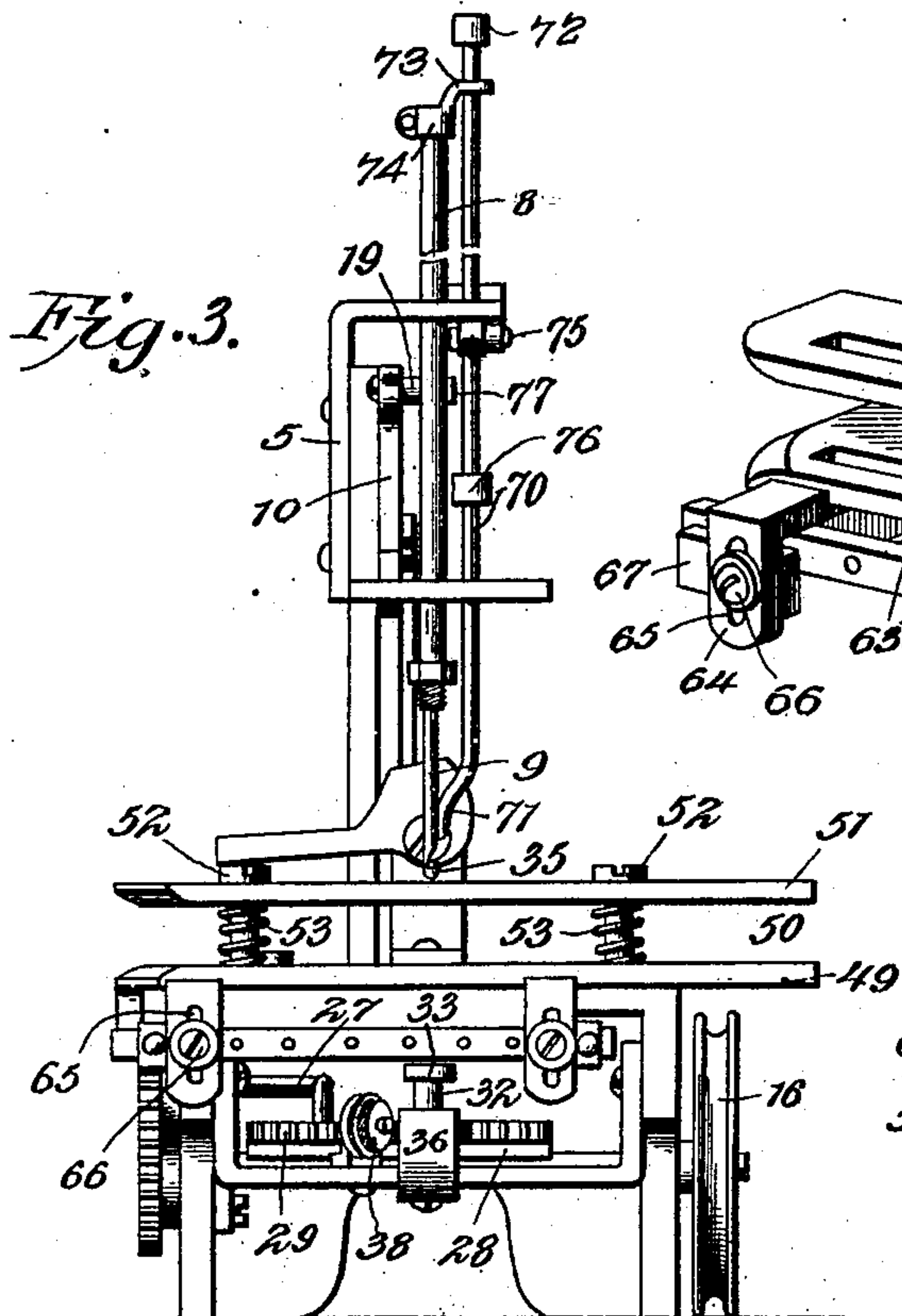
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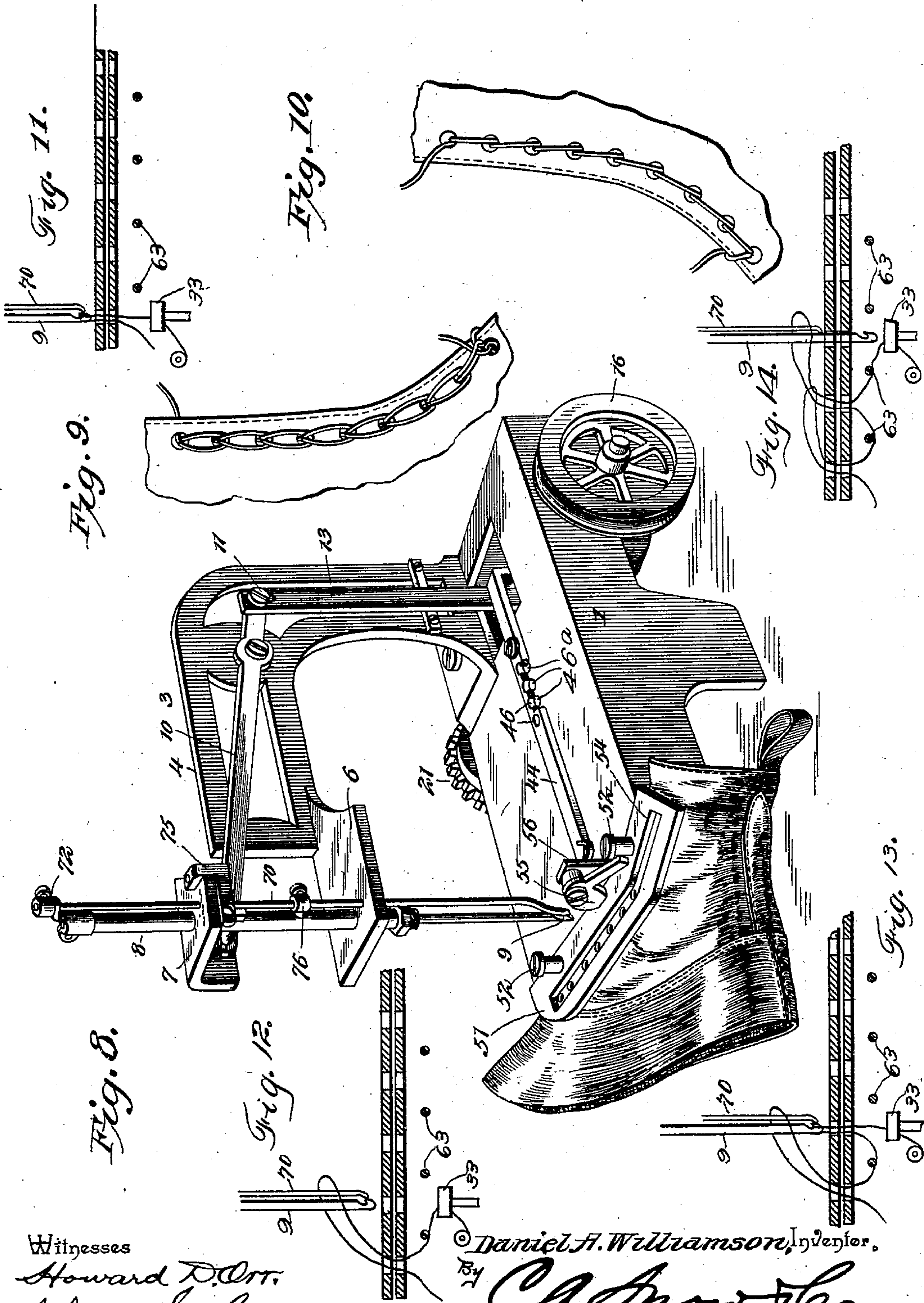
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

DANIEL AARON WILLIAMSON, OF TYRONE, PENNSYLVANIA.

SHOE-LACING MACHINE.

SPECIFICATION forming part of Letters Patent No. 692,956, dated February 11, 1902.

Application filed April 30, 1900. Serial No. 15,019. (No model.)

To all whom it may concern:

Be it known that I, DANIEL AARON WILLIAMSON, a citizen of the United States, residing at Tyrone, in the county of Blair and State of Pennsylvania, have invented a new and useful Lacing-Machine, of which the following is a specification.

This invention relates to a shoe-upper-lacing machine; and the object of the same is to provide simple and effective mechanism for regularly threading a shoe-lace through the eyelets of an upper in a uniform and regular manner previous to lasting the said upper and to overcome the disadvantages arising from hand-lacing and preserve the uniformity of different sizes of shoes after completion and permit the same to be closely laced when worn and have a regular dimension at the location of the instep without defacing the edges of the upper adjacent the eyelets or tearing out the latter during the lasting strain.

The invention consists in the construction, arrangement, and general and detail combination of parts which will be more fully hereinafter described and claimed.

In the drawings, Figure 1 is a side elevation of an upper-lacing machine embodying the features of the invention. Fig. 2 is a top plan view of the improved machine with the arm broken away. Fig. 3 is a front end elevation of the same. Fig. 4 is a horizontal section taken in the plane of the line 4 4, Fig. 1. Fig. 5 is a detail perspective view of the upper-holding clamp and a part carried thereby. Fig. 6 is a bottom plan view of the loop-frame which is carried by the clamp. Fig. 7 is a detail elevation of one of the actuating cams and gears. Fig. 8 is a perspective view of the improved lacing-machine, showing the shoe-upper in applied position thereon. Fig. 9 is a plan view of a portion of the shoe-upper, showing the lacing as it appears on one side after insertion. Fig. 10 is a similar view of a portion of the shoe-upper looking toward the opposite side of the same. Figs. 11, 12, 13, and 14 are diagrammatic views illustrating the manner of inserting the lace in the upper.

Similar numerals of reference are employed to indicate corresponding parts in the several views.

The numeral 1 designates a bed, which is

of such dimension and contour as to partially house and afford convenient means for mounting the several mechanisms supported thereby, and from the rear thereof the vertical member 2 of an arm 3 rises to a desired height and continues into the horizontal member 4 of said arm, from which project upper and lower bearing extensions 5 and 6, the extension 5 being constructed with an angular bearing-plate 7 and the extension 6 itself being disposed horizontally under the plate 7 and both suitably apertured for the vertical reciprocation therethrough of a needle-bar 8, having a threading-needle 9 clamped in the lower extremity thereof. To one side of the arm 3 an oscillating lever 10 is pivotally connected, the fulcrum being located nearer the rear end, and thus increasing the throw of the portion of the lever in advance of said fulcrum or toward the front end of the machine, as will be readily understood, and to the rear end of said lever, beyond the fulcrum, a connecting-stud 11 is secured and engaged by the upper slotted end 12 of a vertical pitman 13, having an eccentric connection 14 at its lower extremity, with the drive-shaft 15 extending transversely through the bed, and having thereon also at one end a grooved driving-pulley 16 to receive a belt from a suitable source of power and at the other end a pinion 17 for a purpose which will be presently explained, the pulley 16 and pinion 17 being located on the exterior of the opposite sides of the bed 1. The front end of the lever 10 is also formed with a slot 18 for loose engagement with a pin 19, projecting from the needle-bar 8, and by means of the said slot 18 in the lever 10 and the slot 12 in the pitman 13 the parts for driving the said needle-bar move easily and without binding or without too much lost motion to thereby properly reciprocate the said needle-bar and effectually carry out the lacing of the upper, which will be more fully hereinafter specified.

The pinion 17 meshes with a spur-gear 20, integrally formed with a cam-rim 21 on its inner side, as clearly shown in Fig. 7, and between which and the correspondingly-shaped web 22 a cam-groove 23 is regularly defined in eccentric relation to the inner side of said spur-gear. The cam-groove 23 is engaged by a pin 24, having a roller 25 thereon for anti-

frictional purposes, the said pin being secured to a bell-crank lever 26, fulcrumed on the adjacent side of the frame, and to the opposite arm of said bell-crank lever an angularly-bent connecting-rod 27 is secured and eccentrically attached at its opposite extremity to the cross-arm 28 of a segmental oscillating gear 29, pivoted on a horizontal seat 30 at the front end of the machine. The said segmental gear 29 is in continual mesh with a pinion 31, fixed in a horizontal position on a whirl-post 32, having a whirl-head 33 on the upper extremity thereof, with an opening 34 therein, through which the shoe lace or thread is fed, and operates in such manner as to place the thread or lace in the hook 35 at the lower extremity of the needle 9. The pinion 31 and whirl-post 32 have engagement with a front yoke 36, which is secured to the central reduced portion of the seat 30, adjacent the location of the said whirl-post and pinion, and has its upper horizontal member 37 forming a bearing for the said post. The lace or thread, which is fed from a suitable reel or spool located in proper relation to the machine, is passed through the outer looped end of the yoke 36 and then around a tension 38, similar in all respects to an ordinary sewing-machine tension, and from the said tension the thread or lace is led through the opening 34 in the whirl-head 33. It will be obvious that the function of the tension 38 is to take up the slack of the thread or lace, and it will also be seen that the employment of the segmental gear 29 and the cam mechanism for operating the same will cause the whirl-post and whirl-head to be properly rotated and in timed relation to the reciprocation of the needle to form the loop and produce a chain-stitch.

On the drive-shaft 15 a cam 39 is also mounted and has a peripheral cam-groove 40 with a lateral deflection 41 and is engaged by a pin 42, carrying a roller 43 and connected to the rear end of a feed-arm 44, fulcrumed on the top of the bed 1, as at 45, and having a plurality of apertures 46 therein for the purpose of adjustment and to regulate the stroke of the same. The outer end of the feed-arm 44 carries a yielding feeding-finger 47, which takes into and operates in conjunction with a ratchet face or edge 48, formed in the rear edge of a lower member 49 of a clamp 50, which also comprises an upper freely-adjustable member 51, which is movable on vertical posts 52, rising from the rear portion of the lower member 49 and surrounded by coiled springs 53, bearing against the under side of the said upper member 51 to thereby normally hold the latter in elevated position. Both members 49 and 51 are provided with a slot 54, and the slots in the two members are in vertical alinement and are of the same contour as the line defined by the eyelets in a shoe-upper. The needle 9 vertically reciprocates through the slots 54 of the clamp members, and when the shoe-upper is applied to

the machine it is folded so that the eyelets in opposite edge portions thereof are in alinement and then placed over the lower member 49 with the said eyelets accurately coinciding with the slot 54 in said members, and while in this position the shoe-upper is clamped against accidental movement by moving the upper member downwardly thereagainst and locking it against movement or tendency to return to its normal elevated position by a cam-lever 55, eccentrically fulcrumed on an upright 56, rising from the rear portions of the lower clamp member 59. The clamp 50 is removably held on the outer end of the bed 1 under the needle and needle-bar through the medium of a transversely-extending supporting-bar 57, centrally connected to a flat arm 58, attached to the adjacent portion of the bed, and normally bearing on the said supporting-bar is the lower member 49 of said clamp, which also has sliding movement on the bar during the feeding operation through the medium of the feed-finger 47, carried by the feed-arm 44, successively engaging the teeth of the ratchet 48. The supporting-bar 57 and a portion of the arm 58 enter a retaining-guide 59 on the under side of the rear portion of the member 49 of the clamp, as shown by Figs. 1 and 6, the dimension and curvature of the said guide being such as to cause the supporting-bar 57 to hold the entire clamp in proper position and permit it to be shifted in a transverse direction in the arc of a circle over the end of the bed. The rear upper depending flange 60 of the retaining-guide contacts with the adjacent edge portion of the outer end of the bed, which is regularly curved to cause an accurate feed or to hold the slots 54 in the members 49 and 50 of the clamps in true alinement at all times with the needle 9. The clamp also carries with it a looping-frame 61, which comprises a pin-bar 62, having a plurality of pins 63, extending in a rearward direction and in a plane at right angles to the said bar, which is under the lower clamp member 49. This pin-bar is supported by bracket-arms 64, depending from the lower clamp member 49 and each having a vertical slot 65 therein, in which a screw 66 is adjustably mounted and secured at its inner extremity to an outwardly-extending arm 67, each of the screws 66 being attached to a similar arm 67 and the latter having combined guide and bearing pins 68 projecting inwardly therefrom and on which the pin-bar 62 is freely movable and held inward to bring the ends of the pins 63 normally in contact with the outer face of the guide 59 by springs 69, surrounding said pins 68 and bearing at opposite extremities against the pin-bar and the contiguous faces of the arm 67.

To change the stroke of the end of the arm 44, carrying the finger 47, and consequently change the extent of the feed of the upper holding device, the screw 45 is released and reset in other of the openings 46, the latter registering with similar openings 46^a in the

bed, as shown in Fig. 8, the arm in the adjustment shown being arranged for its greatest stroke.

The lace or thread from the opening 34 in the whirl-head 33 is brought upwardly and looped over the pins 63, and in commencing the operation of feeding and looping the thread or lace through the eyelets of the shoe-upper the clamp 50 and all the parts carried thereby, including the loop-frame 61, are simultaneously moved to the right in looking at the end of the machine, as shown by Fig. 3, by releasing the feed-finger 47 from the ratchet 48 and again setting the said feed-finger in proper position in the said ratchet. This adjustment of the clamp-frame is continued far enough to the right to bring the first pin in close relation to the needle 9 when the latter descends directly over the whirl-head 33.

In the bearing extensions 5 and 6 a cast-off 70 is also movably mounted and consists of a vertical rod having a lower inwardly-bent extremity 71, normally in contact with the needle 9, the said cast-off being provided at its upper end with a stop-collar 72, adapted to be engaged by a finger 73, slidable in a vertical direction on the same above the upper bearing extension 5 and preferably integrally formed with a clamping socket or cap 74, fitted on the upper end of the needle-bar. To the under side of the bearing extension 5 a bearing-clamp 75 is located, and therethrough the said cast-off has movement, the clamp serving to hold the cast-off in true position relatively to the needle-bar and prevent too-loose movement, so as to cause the said cast-off to effectually operate in the desired manner or to carry out its intended function of casting off the loops of the thread or lace from the needle-hook 35. Below the clamp 75 a stop-collar 76 is adjustably mounted on the cast-off and is engaged by a projection 77, secured to the pin 19, forming the connection between the lever 10 and the needle-bar 8.

In the operation of the machine the shoe-upper is clamped under the needle-bar in the manner hereinbefore explained and with the line of eyelets coinciding with the slots 54 in the clamping members 49 and 51, the clamp 50 having been first moved to the right in looking at the machine as shown by Fig. 3 and until the pins 63 of the loop-frame 61 are disposed in starting relation to the shoe-upper above. The operation of the drive-shaft 15 through the pulley 16 will cause the eccentric 14 to vertically reciprocate the pitman 13, and thereby oscillate the lever 10, which first moves the needle-bar 8 in a downward direction, and after the needle-bar has moved downwardly a predetermined distance the cast-off 70 moves in the same direction until the lower extremity comes in contact with the eyelet disposed in the path of the needle 9, and from this time the cast-off remains inactive and while the needle continues downwardly into the whirl-head 33,

which has been operated by the segmental gear 29 and connecting-rod 27 and the means for actuating the latter to form a loop, which is caught by the hook 35 of the needle 9 and drawn upwardly through the eyelets of the shoe-upper in alinement until the lower extremity of the cast-off is reached, when the operation hereinafter more fully explained will ensue, and the thread or lace in loop form will be disengaged from the hook 35, and at this time the feed-arm 44 is horizontally oscillated by the deflection 41 of the cam 40 to thereby cause the feed-finger 47 to move the clamp 50 and all parts carried thereby one step toward the left or such a distance as to bring the next unoccupied pair of eyelets in the shoe-upper in the path of the needle, when the same operation ensues and continues until all the eyelets have been threaded or laced or as many of the same as it is desired to connect. It will be seen that the thread or lace, which is of a temporary character for the purpose of lasting, does not pass over the edges of the lacing-flies, and the strain during the lasting operation is exerted in a direction transversely of the flies, and thereby permits the shoe-upper of the completed shoe which has been so treated during the lasting operation to be laced closely or so that the edges of the lacing-flies may be drawn together and also have the upper fit well over the instep and in accordance with the form of the last. Heretofore the means employed for holding the upper of a lace-shoe during the lasting operation permitted the lacing-flies to pull away from each other and made it difficult to closely lace the completed shoe or have it fit with comfort and regularity over the instep. The stroke of the cast-off will be regulated by adjusting the collars 72 and 76 to accommodate different thicknesses of material for the length of stitch, and by adjusting the pin-bar 62 through the medium of the screw 66 in the slot 65 the loop of the thread or lace may be lengthened or shortened, so as to accommodate uppers having eyelets placed close to the edge of the flies, as it is apparent that the closer the eyelets are to the fly edges the shorter the loops must be. When the last stitch or loop is drawn upwardly through the terminal eyelet of the series operated on, it is caught by the hand of the operator and a suitable length of the thread or lacing drawn upwardly and secured to one of the adjacent previously-formed loops, so that it may be conveniently reached after lasting for the purpose of removing this temporary thread or lacing. In the operation of inserting the lacing through the eyelets of the upper the needle makes a descent through the first pair of alined eyelets and into the center of the whirl, with the hook of the said needle just below the upper surface of said whirl, the cast-off during such descent of the needle remaining in close contact relation with the upper eyelet of the pair being at the time operated upon. The whirl then moves from left to right and

carries the lacing or thread around the front of the needle and disposes said lacing or thread in the hook of the latter, and the needle now ascends with the lace or thread therein, and when the hook thereof reaches the plane of the upper eyelet, as shown by Fig. 11, the cast-off covers the said hook and firmly holds the lace or thread in the latter to thus form a loop. The parts are so arranged that when the clamp 50 is shifted to start the lacing operation the first pin 63 will be in such position that the first updrawn lace or thread loop will be brought to bear against the rear portion thereof, as shown by Fig. 12. After reaching the highest point of its movement the needle again immediately descends, the clamp having been in the meantime shifted to bring the space between the first and second pins 63 under the needle, as shown by Fig. 13, to pass through the next eyelets, and after reaching the latter the cast-off again remains on the uppermost eyelet, while the needle continues to descend, as before, to the whirl and again have the lace or thread thrown around the hook thereof to form a second loop. As the needle moves upwardly from the top surface of the shoe-upper the loop of lace or thread is between the needle and cast-off and under updrawing tension to form a loop, this joint upward movement of the needle and cast-off continuing for a comparatively short distance above the plane of the upper, when the needle-hook becomes cleared from the cast-off and immediately descends through the loop, followed after an interval by the cast-off, that descends to the plane of the upper and holds the loop until the needle again ascends with a new-caught portion of the thread, which is drawn through the previously-formed loop to lock the latter, the cast-off operating as before. The next upward movement of the needle draws the loop of the lace or thread upwardly between the first two pins and through the second pair of eyelets and the first-formed loop, which has been held in place by the cast-off during the second descending movement of the needle, through the second set of eyelets and down to the whirl, as shown by Fig. 13, to thereby interlock the loops. The cast-off again engages the needle-hook, and the needle and cast-off rise above the clamp with the second loop, as in the first instance, the clamp again being shifted as before to place a succeeding set of eyelets under the plane of movement of the needle to cause the second loop to be drawn against the second pin 63 and bring the space between the second and third pins under the needle. This operation is regularly successive until all the eyelets of the upper have been engaged in a similar manner, and it will be seen that as the loops are formed and drawn above the plane of the upper the clamp is shifted to carry the loop from one set of eyelets to the next set of the latter. After the eyelets are all engaged the pin-bar 62 is drawn outwardly

to clear the pins 63 from the loops and the upper is removed from the clamp in a prepared condition for application to a last. Previous to the removal of the upper from the clamp 50 the pin-bar 62 is drawn outwardly by hand to disengage the pins 63 from the loops or to afford means for clearance of the loops.

The advantage of the improved machine is that it overcomes the irregularities and unsatisfactory results arising from hand-lacing and provides means for having every upper uniform and regular. It frequently occurs in uppers laced by hand that the strain incident to the lasting operation will cause the lacing-flies to open, owing to slack lacing, and the next upper of the pair would be laced too close, with the result that the completed shoe embodying the lasted upper that was laced too slack when put on the foot could not be made to snugly fit by the ordinary lacing means employed in applying a shoe to a foot and the other tightly-laced upper for lasting could be drawn snugly to fit the foot, and thus a very serious objection in a pair of shoes would naturally result.

In Figs. 9 and 10 the threaded or looped lace is shown as it appears from opposite sides of the upper and illustrates the secure method of holding the upper without liability of tearing out the eyelets or breaking through the edges of the upper during the lasting strain.

Having thus described the invention, what is claimed as new is—

1. In a lacing-machine of the class set forth, the combination of a bed, a clamping device for a shoe-upper, means for imparting a step-by-step movement to said clamping device over one end of the bed, and mechanism carried by the bed for looping a thread or lace and drawing the same through the eyelets of the upper, the said clamping device having means for holding portions of the loops of the thread or lace away from the upper.

2. In a lacing-machine of the character set forth, the combination of a support, a shoe-upper-holding device having loop-holders in connection therewith and movable on one end of the support, and mechanism on the said support for automatically drawing a thread or lace through the eyelets of the upper.

3. In a lacing-machine of the character set forth, the combination of a support, a shoe-upper-holding device having loop-holders in connection therewith and movable on the said support, means for moving the said holding device and means operating in timed relation to the movement of the holding device for the shoe-upper for drawing a thread or lace through the eyelets of the upper and securing the opposite parts of the latter preparatory to lasting.

4. In a lacing-machine of the character set forth, the combination of a support, a slotted clamp having loop-holders in connection therewith and movable over the support by a

step-by-step feed and arranged to receive and tightly bind a shoe-upper, a needle-bar carrying a hooked needle having reciprocation through the slotted portion of the clamp and the upper held thereby, a looping device below the clamp, and means for operating the said parts.

5. In a lacing-machine of the character set forth, the combination of a support, a slotted clamp having loop-holders in connection therewith and movable over the support by a step-by-step feed and arranged to receive and tightly bind a shoe-upper, a needle-bar carrying a hooked needle having reciprocation through the slotted portion of the clamp and the upper held thereby, a looping device below the clamp, a cast-off device working in conjunction with the needle-bar and needle, and means for operating the said parts.

6. In a lacing-machine of the character set forth, the combination of a support, a shoe-upper-holding device having loop-holders in connection therewith and movable on the said support, a vertically-reciprocating needle-bar carrying a hooked needle movable through the said clamp and the shoe-upper carried thereby to draw a thread or lace through the eyelets of the upper, means for looping the thread or lace and located below the clamp, a cast-off in intimate relation to the needle-bar and needle and having a timed actuation by the movement of the needle-bar, means for controlling the movement of the cast-off and regulating its time of actuation, and means for operating the several mechanisms.

7. In a lacing-machine of the character set forth, the combination of a support, a clamp having loop-holders in connection therewith and movable over the support and arranged to receive the upper of a shoe, a loop-frame adjustably carried by and movable with the clamp, mechanism for forming and drawing a looped thread or lace through the clamp and

loop-frame, and means for operating the several devices.

8. In a lacing-machine of the character set forth, the combination with mechanism for looping a lace or thread, of a regularly-fed holding device for a shoe-upper disposed in operable relation to the said mechanism to permit the looped thread or lace to be drawn through the eyelets of the upper, means for feeding the said holding device, and a looping-frame carried by the said holding device and movable and adjustable independently of the latter and also manually movable in a plane at right angles to the feeding direction of the latter to release the loops therefrom.

9. In a lacing-machine of the character set forth the combination with mechanism for looping a lace or thread, of a shoe-upper-holding device disposed in operable relation to said mechanism to hold the eyelets in the shoe-upper in alinement therewith, an adjustable loop-frame carried by the said holding device, and mechanism for operating the several parts.

10. A lacing-machine of the class set forth, comprising a device for supporting and holding a shoe-upper to dispose the eyelets thereof in alined pairs, a loop-forming mechanism having a single needle to successively pass through the eyelets of the upper and lock the series of loops loosely in said eyelets, means for imparting a step-by-step movement to said device for supporting and holding the upper, and means for operating the loop-forming mechanism in timed relation to the movement of the said device.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

DANIEL AARON WILLIAMSON.

Witnesses:

H. C. SMITH,

GEO. S. FLENNER.