

March 20, 1928.

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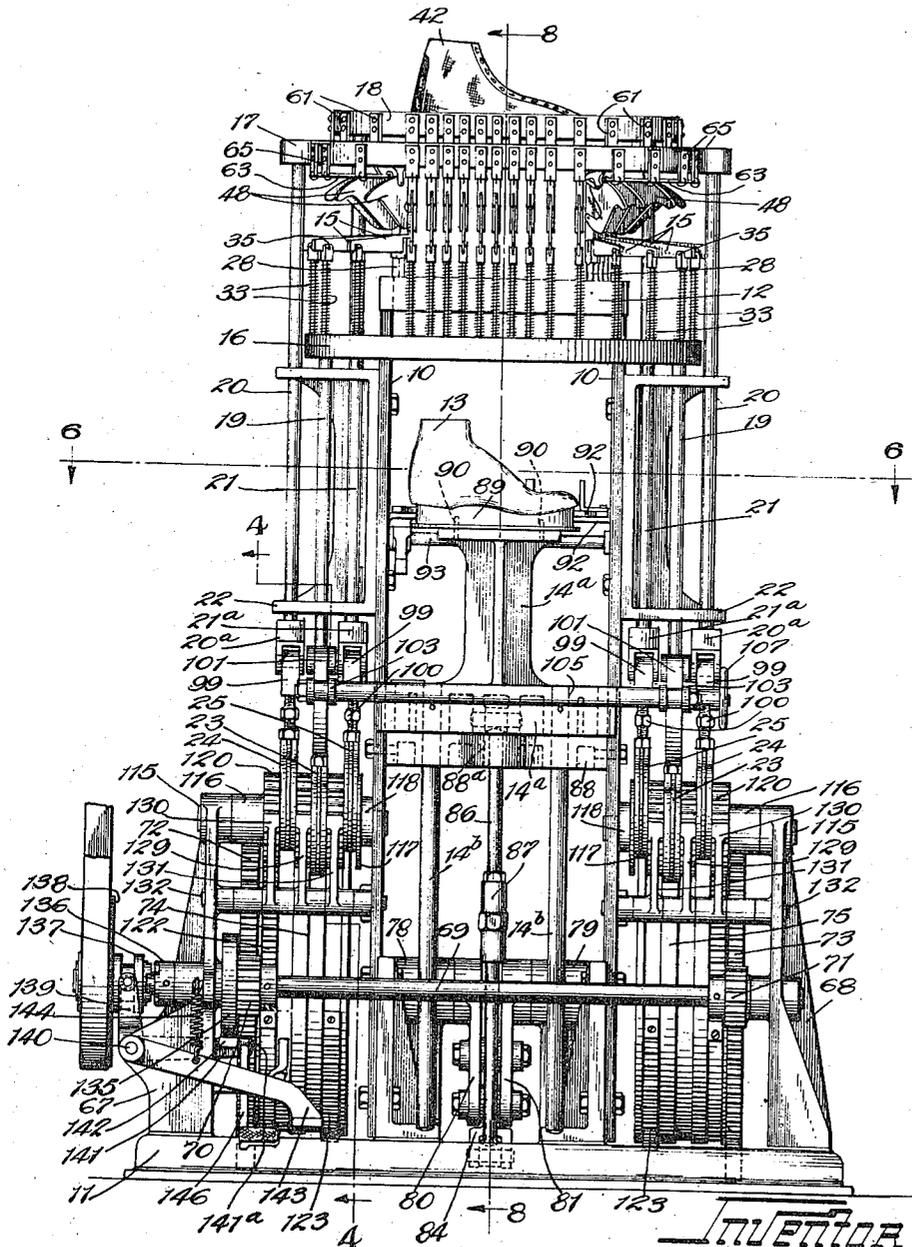
F. J. MacDONALD

LASTING MACHINE

Filed April 5, 1924

10 Sheets-Sheet 1

FIG. 1.



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10 Sheets-Sheet 2

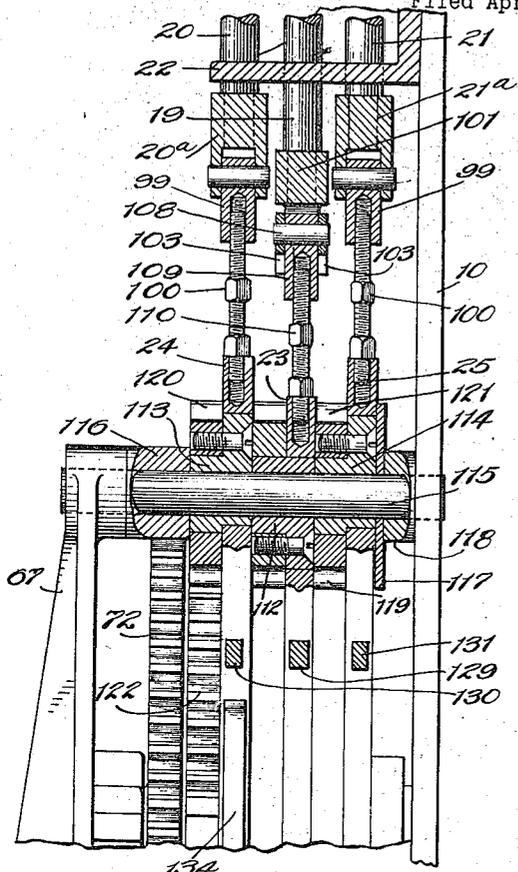


FIG. 3.

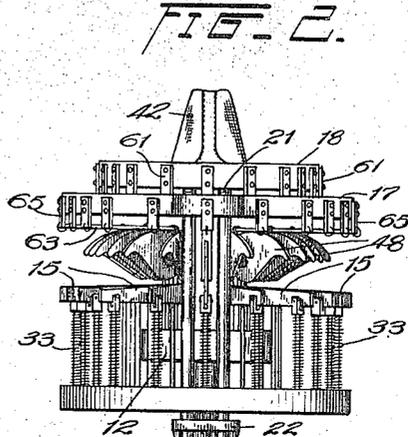
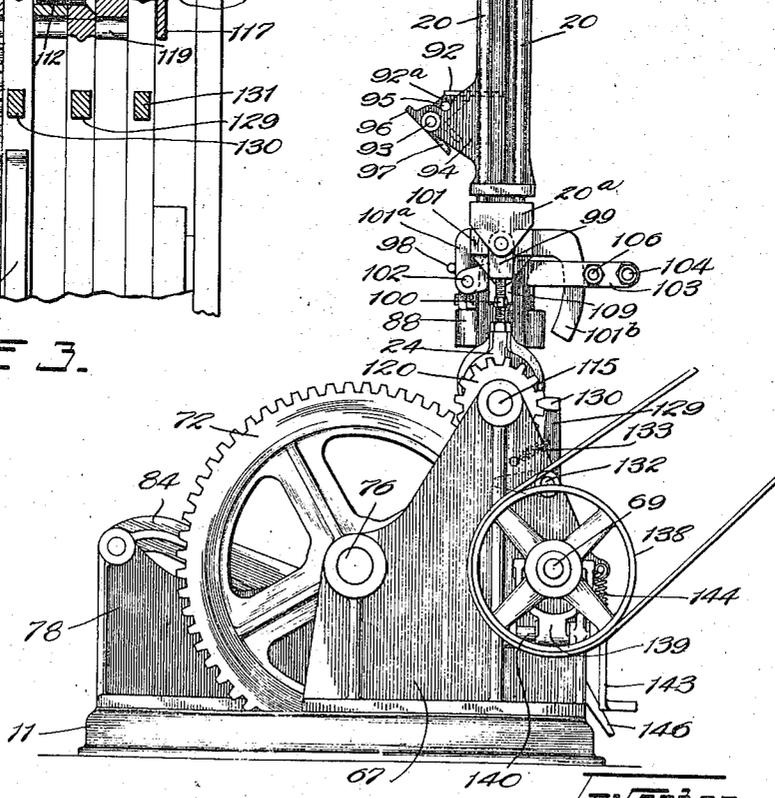


FIG. 4.



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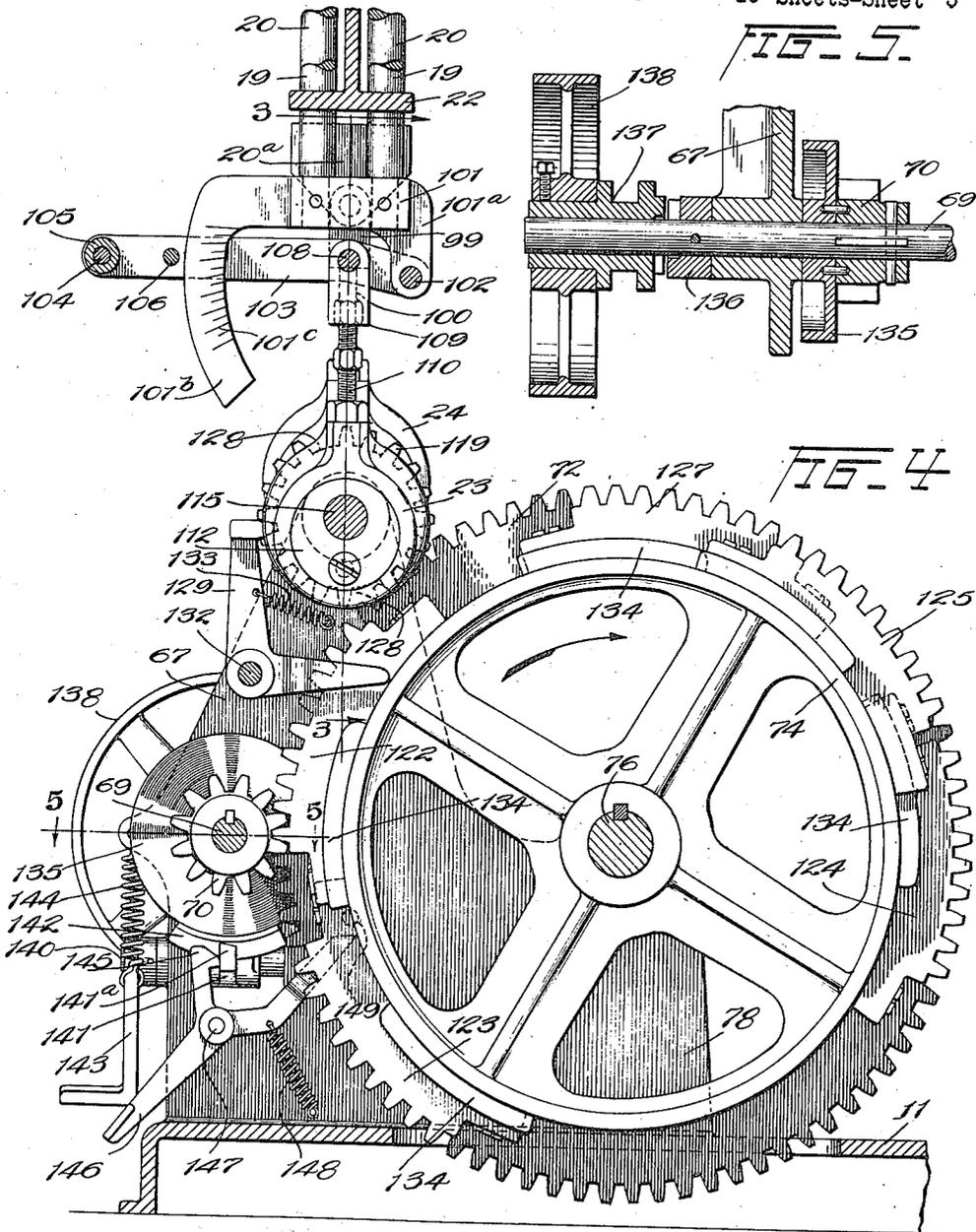
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LASTING MACHINE

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10 Sheets-Sheet 3



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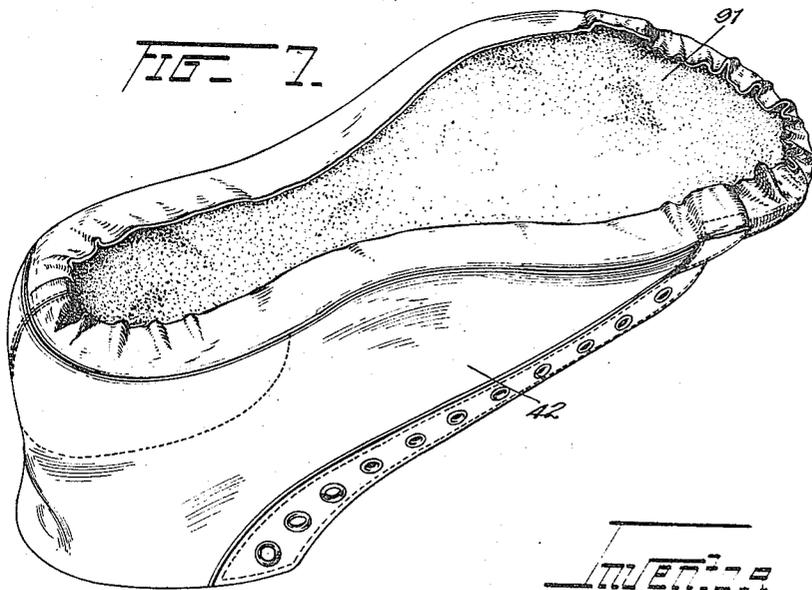
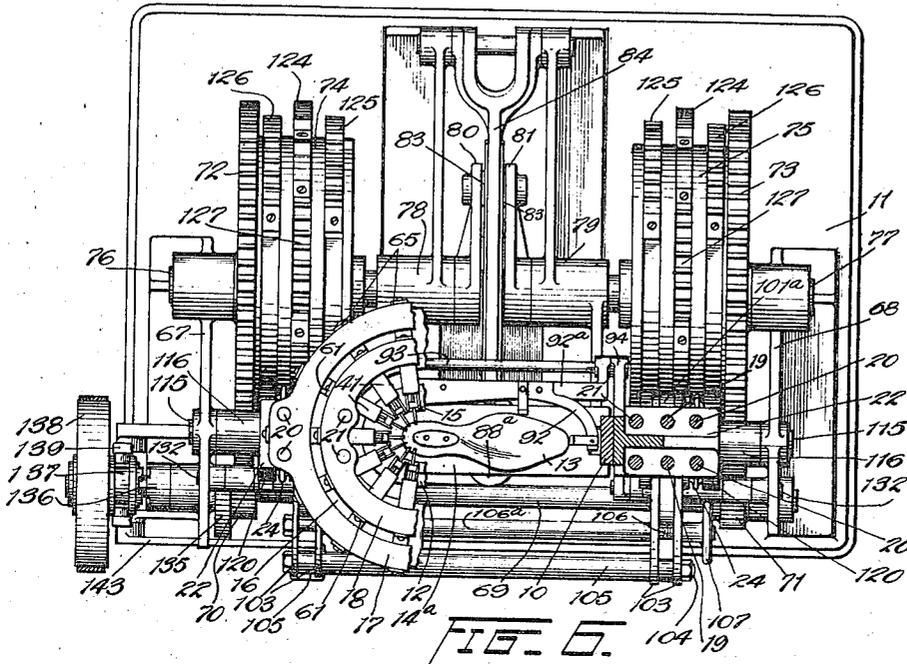
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LASTING MACHINE

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10 Sheets-Sheet 4



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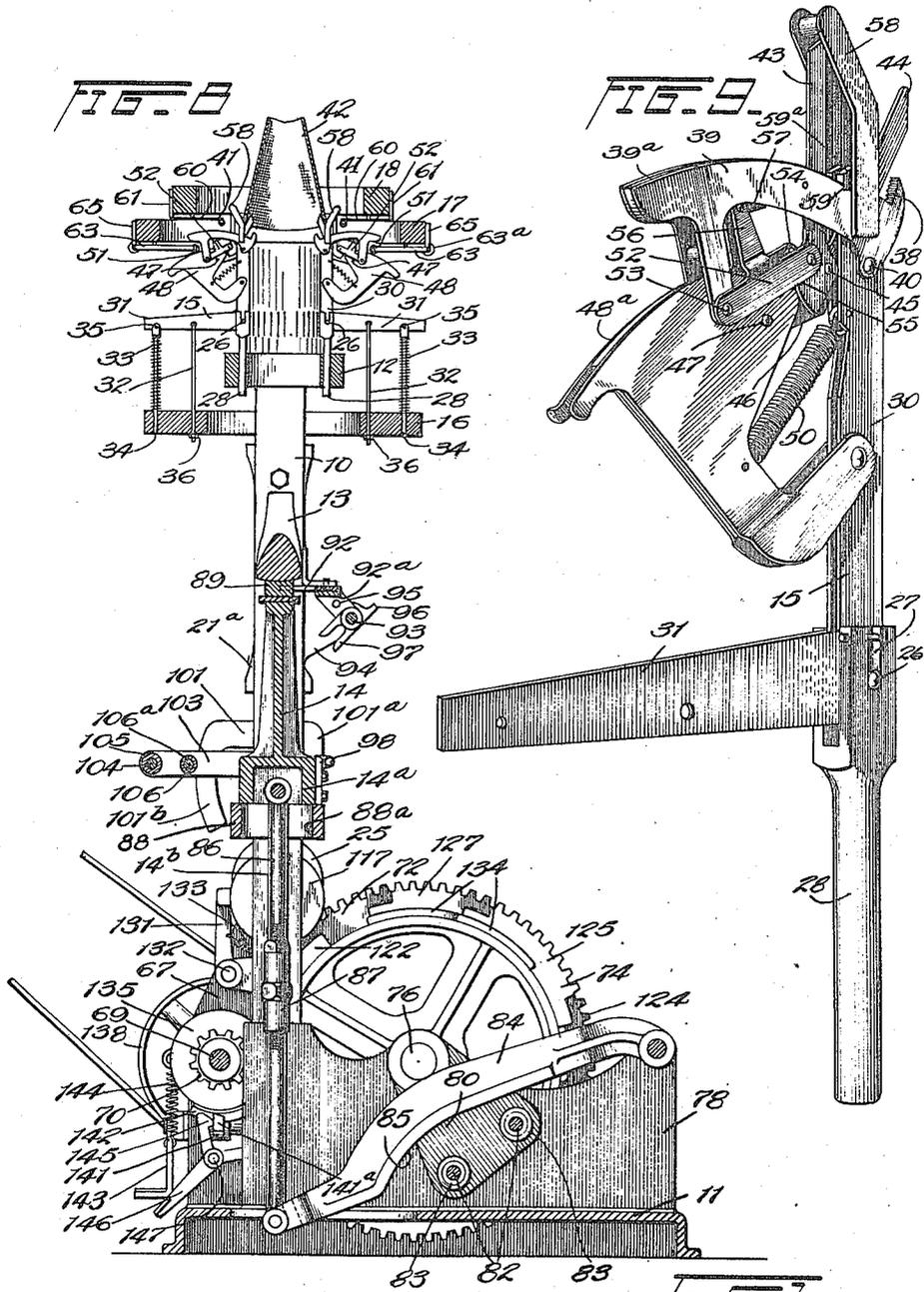
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LASTING MACHINE

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10 Sheets-Sheet 5



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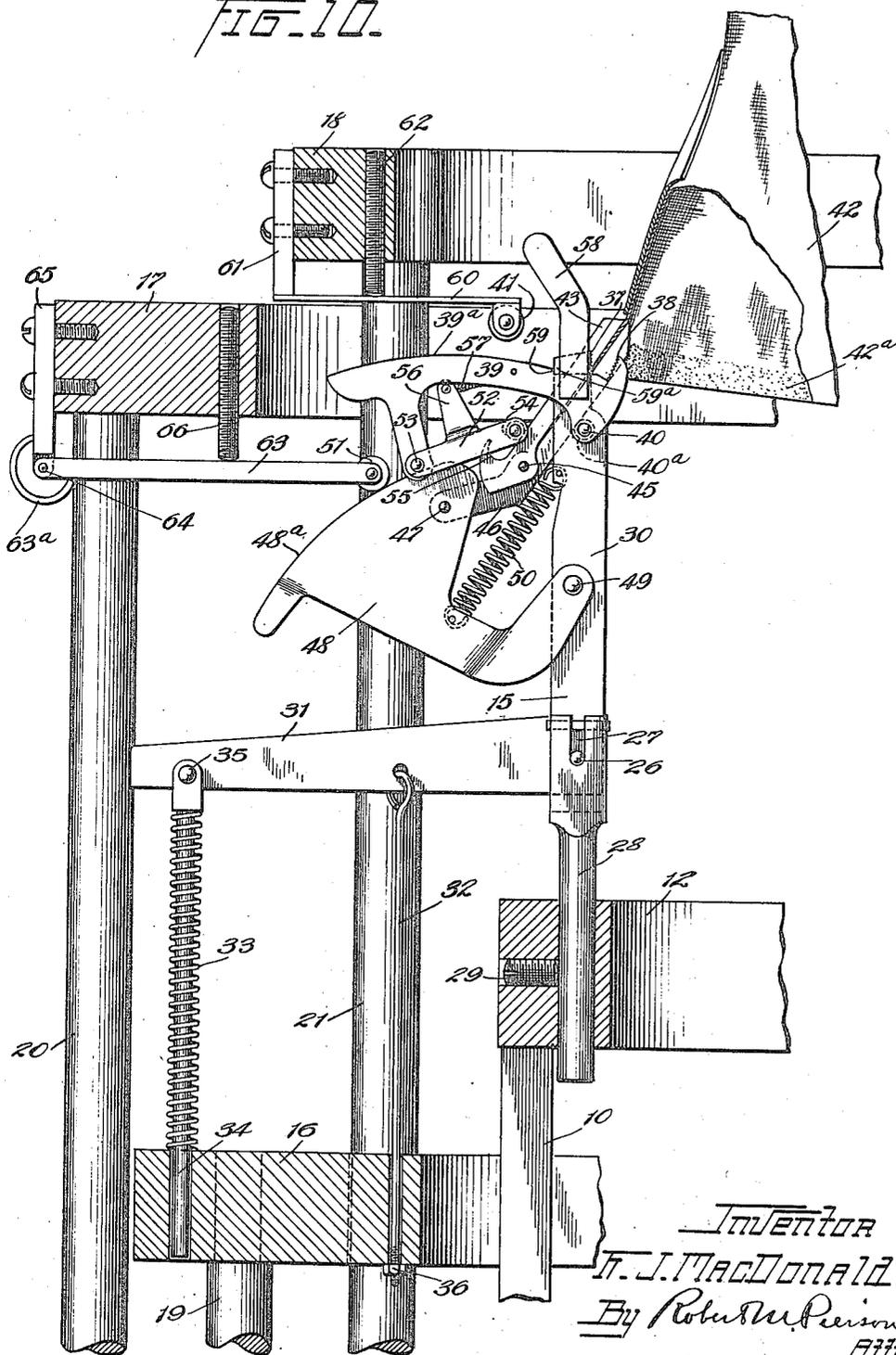
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FIG. 10.



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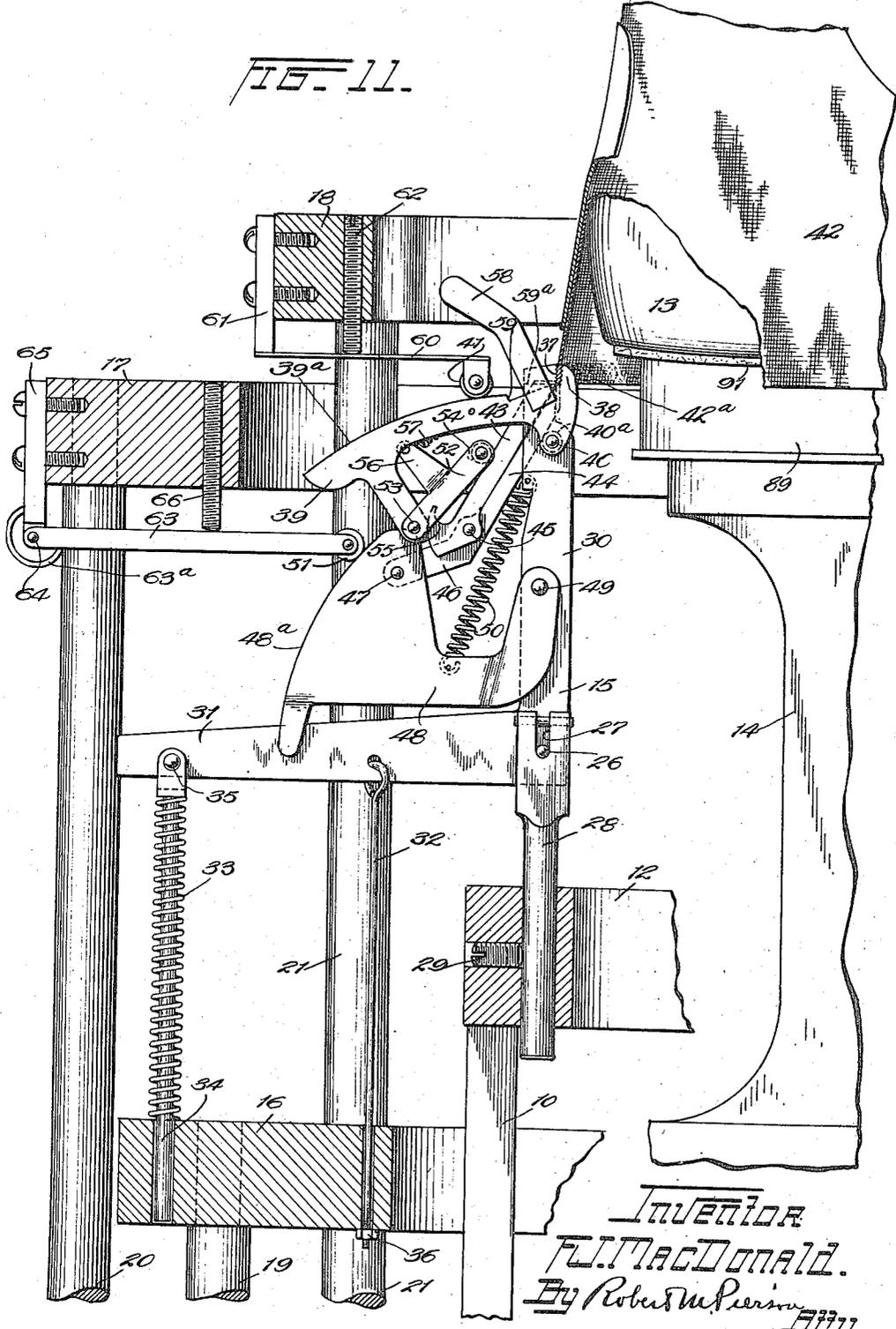
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LASTING MACHINE

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FIG. 11.



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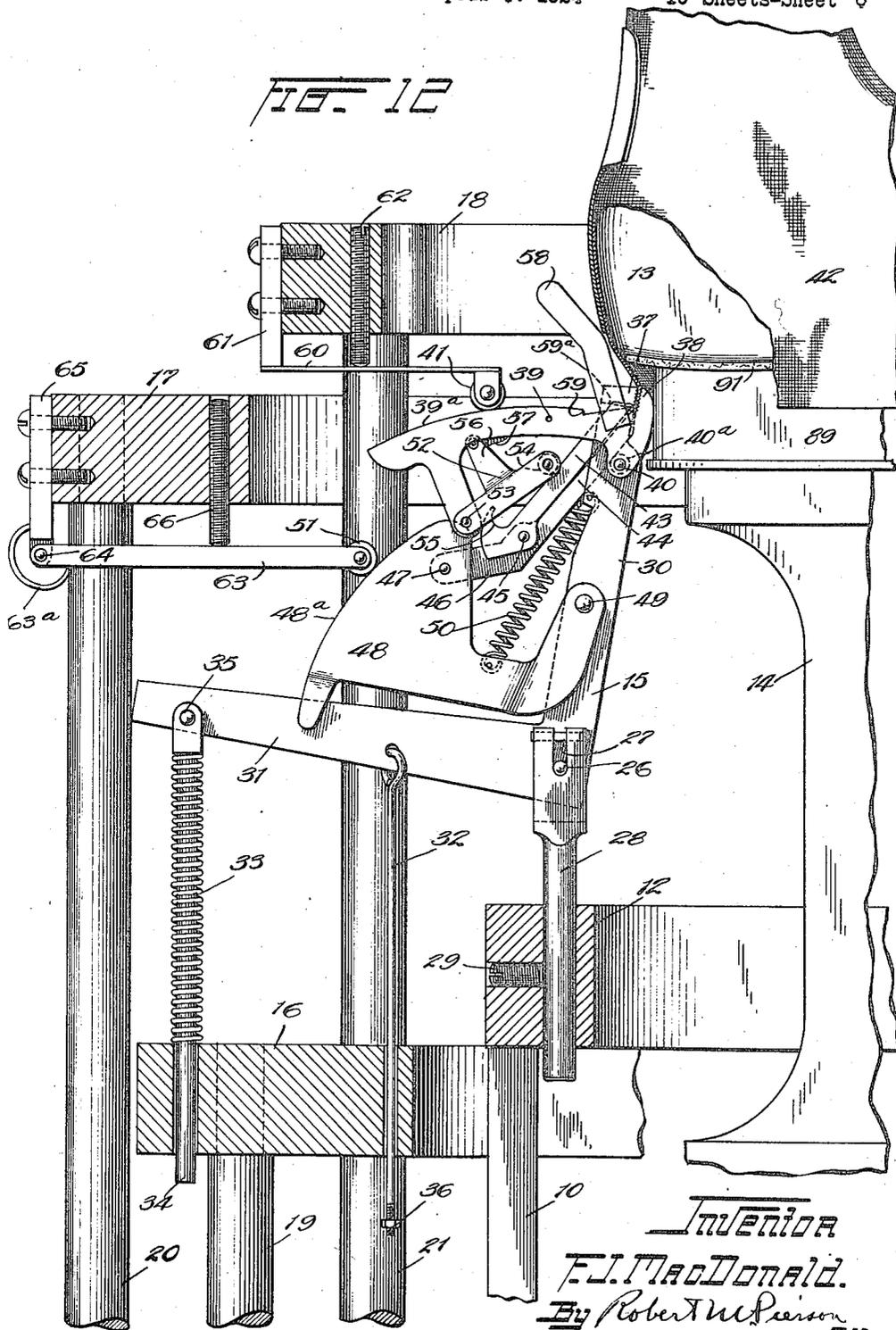
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LASTING MACHINE

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10 Sheets-Sheet 8

FIG. 12



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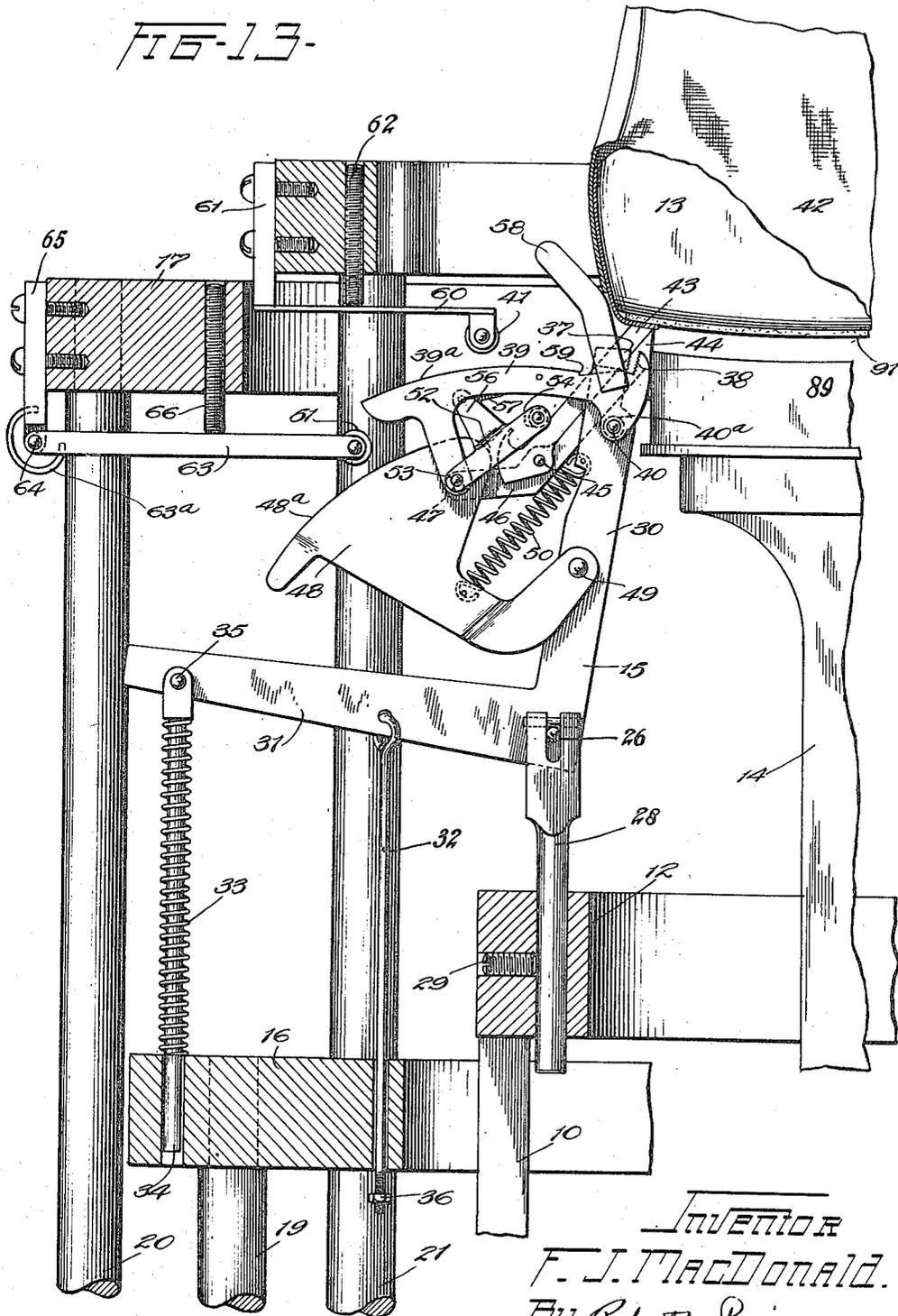
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FIG-13-



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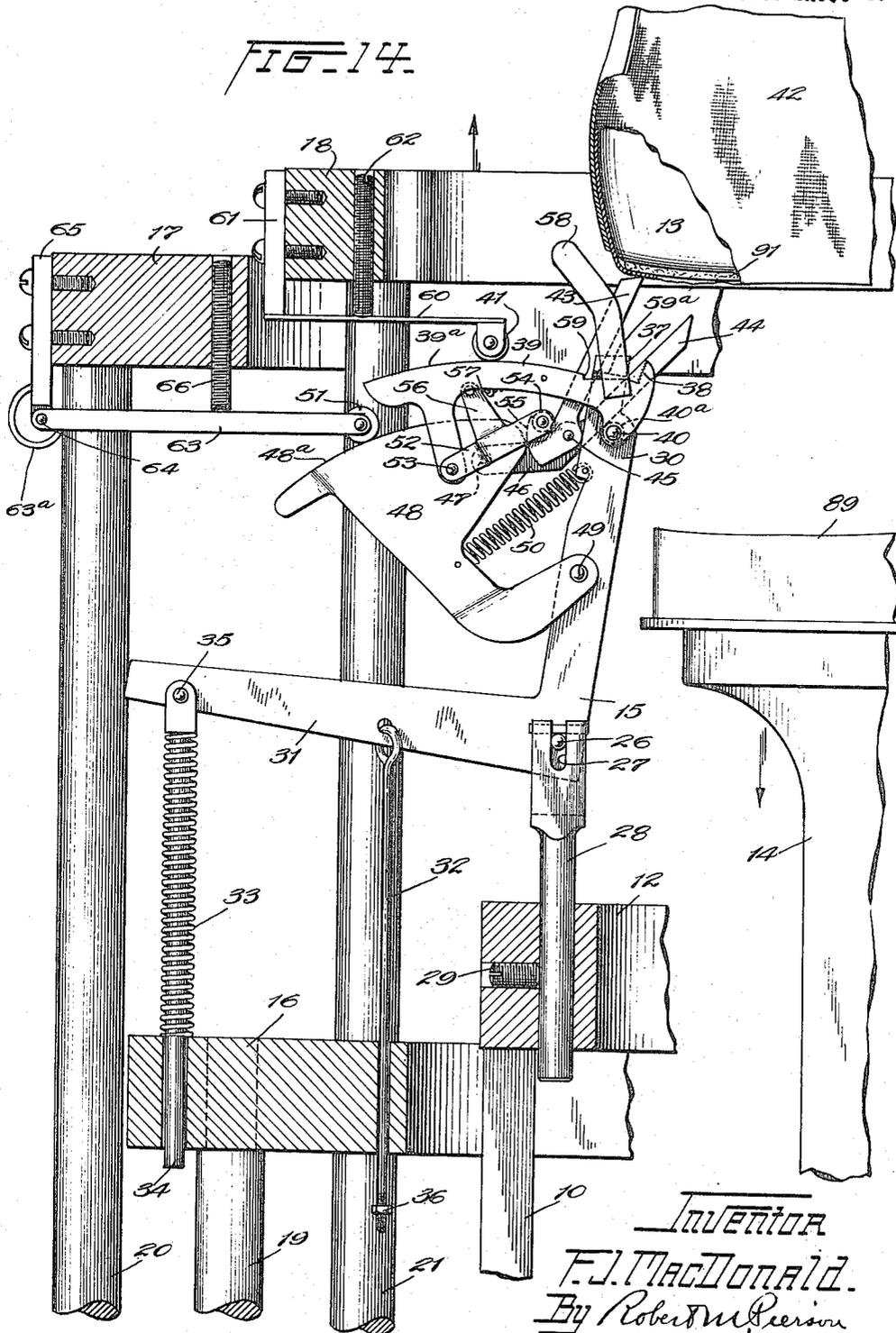
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LASTING MACHINE

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FIG. 14.



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UNITED STATES PATENT OFFICE.

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LASTING MACHINE.

Application filed April 5, 1924. Serial No. 704,502.

This invention relates to apparatus for lasting footwear, in the broad sense of assembling or associating an upper shoe part with a last, and in certain aspects is an improvement upon the inventions described and claimed in my applications Serial Nos. 582,884, 630,796, 703,905 and 11,525, filed August 19, 1922, April 9, 1923, April 3, 1924, and February 25, 1925, respectively.

My chief object is to provide improved apparatus adapted to stretch a shoe upper or an upper shoe part onto a last and especially a heavy, cloth upper, or a cloth-and-leather upper, such as is commonly used for tennis shoes. A more specific object is to assemble such an upper and a last in determinate relation, and more particularly by first accurately positioning them on respective supporting structures held in non-contiguous positions such that they may freely receive and accurately position the work, and then bringing them into the desired association with each other by a determinate relative movement of said structures. A further object is to provide improved means, including strong upper-engaging members, for applying the margin of an upper or the like to the sole face of a last upon which it is mounted, or to an insole associated with the last.

Of the accompanying drawings:

Fig. 1 is a front elevation of a lasting machine embodying my invention in a preferred form, and the work therein, some of the details being omitted.

Fig. 2 is an end elevation of the same, as viewed from the left of Fig. 1.

Fig. 3 is a fragmentary, vertical section of actuating mechanism, on line 3—3 of Fig. 4.

Fig. 4 is a vertical section, on a large scale, of parts of the actuating mechanism, on line 4—4 of Fig. 1.

Fig. 5 is a horizontal section of the driving clutch mechanism, on line 5—5 of Fig. 4.

Fig. 6 is a plan view of the machine, parts being sectioned on line 6—6 of Fig. 1 and broken away for clearness of illustration.

Fig. 7 is a perspective view of the finished work.

Fig. 8 is a vertical section of the machine, on line 8—8 of Fig. 1, some of the nipper units and other parts being omitted for clearness of illustration.

Fig. 9 is a perspective view of a nipper

unit for pulling the upper, in open or upper-receiving position.

Fig. 10 is a fragmentary, vertical section of upper-manipulating instrumentalities at an early stage of operation, one of the nipper units being shown in elevation.

Figs. 11, 12, 13 and 14 are similar views of the same at successive stages of operation.

General description.

The particular embodiment of my invention herein described comprises a pair of vertical frame members 10, 10 rising from a base 11 and having secured to their upper ends an annular gripper-unit-base or frame 12 adapted to permit the passage vertically thereof of a last 13 carried by a vertically reciprocated last carriage 14 guided on the frame members 10. Mounted upon the stationary frame 12 is a set of gripper-units, each comprising an L-shaped lever or jaw carrier 15, said gripper-units completely surrounding and defining a lasting position and being adapted freely to receive a conoidal shoe upper from above, automatically to grip its sole margin and hold it in exact position for the reception of the last from below, and to manipulate the sole margin of the upper, after the last has been forced thereto, to apply the sole margin of the upper to an insole upon which the last rests in being raised to the lasting position.

For actuating the gripper-units, three vertically movable, annular frames, 16, 17 and 18, surrounding the lasting position at different elevations, are secured to the tops of respective sets of lifting bars 19, 19, 20, 20 and 21, 21 respectively, and are adapted to be raised and lowered in timed relation for simultaneously actuating the gripper-units throughout a cycle of operations. Said lifting bars are slidably mounted in brackets 22, 22 secured to the frame members 10, and are pivotally connected below to respective eccentric mechanisms comprising respective eccentric collars 23, 24, 25.

As my invention is not wholly limited to the manipulation of a shoe upper, as distinguished from a lining or other upper shoe part, nor to the presence of an insole in association with the last, the term "upper" will be used throughout the specification and claims as including other upper shoe parts, such as a lining, and the word "last" will be used as including an insole or other inner

shoe part associated with the last, as well as a bare last.

Gripper units.

5 The L-shaped carrier 15 of each gripper-unit is provided at its elbow with a pair of pivot studs such as 26, by which it is pivoted in vertical closed slots such as 27
10 28 formed in the forked upper end of a post 28 mounted upon the frame 12 and adapted to be secured in different vertical positions thereon by a set screw 29. (See Figs. 9 to
15 14.) Each of said carriers has an upright jaw-carrying arm 30 and a horizontal actuating arm 31, an intermediate part of the latter being connected with the actuating
20 frame 16 by a lost motion link 32 adapted to permit the carrier to tilt toward the lasting position, and also to permit it to rise vertically to the extent permitted by the
25 slots 27 in the post 28, when said frame is in an elevated position. The carrier is adapted to be so tilted and raised by the force of a compression spring 33 connecting
30 the arm 31 with the frame 16, said spring being mounted upon a spring rod 34 pivoted at 35 to the outer end of the carrier arm 31, extending with a loose fit into an aperture
35 formed in the frame 16, and having such play therein as to permit its necessary angular movement with relation to said frame. The lower end portion of the link 32 is likewise loosely mounted in an aperture
40 in the frame 16 and provided with a nut 36 below the latter, so that the frame 16 will tilt the several carriers 15 away from lasting
45 position, for the reception of the next upper, when said frame is lowered.

50 The upright arm 30 of each jaw carrier 15 is formed as a pair of parallel plates held in spaced relation by suitable spacing members, and each plate has formed thereon at
55 its upper end a corrugated jaw such as 37, the two jaws being adapted to act as one, and jaws 38, mating with the jaws 37, are formed on a lever 39 consisting of a pair of spaced apart plates straddling the vertical
60 carrier arm 30 and pivoted thereto at 40. The lever 39 is formed with an outwardly projecting arm having an arcuate upper face 39^a which is concentric with the pivot 26 of the jaw carrier when the jaws 37, 38 are in
65 closed relation, so that said jaws may be held closed by a roller 41 mounted upon the upper actuating frame 18, and running upon the arcuate upper face 39^a of lever 39, while the carrier is tilted toward the lasting position, from its upper receiving position.

70 For withdrawing the margin of a conoidal upper 42 into the jaws 37, 38 and abutting its edge against the latter at their angle, to position the upper for the reception of a last, a pair of upper-positioning jaws 43, 44, adapted to grip the upper lightly and slide
75 thereon, are mounted between the side plates

of the vertical carrier arm 30 and between the members of the double jaws 37 and of the double-jaws 38, and are hinged together at 45, the upper jaw being forked at its hub to straddle the lower jaw 44, and the latter
80 having a rearward extension 46 pivoted at 47 to a crooked lever 48, said lever being pivoted at 49 to the vertical jaw-carrier-arm 30. The crooked lever 48 is thus adapted to project and retract the jaws 43, 44 past the corrugated jaws 37, 38, the lower jaw, 44, running upon a roller 40^a journaled between the plates of the arm 30, on the pivot pin 40 of the gripper jaws. For urging the jaws
85 43, 44 toward their projected position, a pull spring 50 connects an intermediate part of the lever 48 with the vertical carrier arm 30, and for retracting them, against the force of said spring, the lever 48 is formed with an arcuate upper face 48^a adapted to be engaged by a roller 51 mounted upon the intermediate actuating frame 17, said arcuate face being concentric with the pivot 26 of the jaw carrier 15 when the sliding jaws 43, 44 are in retracted position, so that the roller 51, running upon the face 48^a of the lever 48, may hold them so retracted while the jaw carrier tilts from its upper receiving position toward the lasting position.

90 For urging the jaw 43 toward closed position except at the end of its projective movement, for there opening it, and for urging the gripper jaw 38 toward open position, a double plate dog 52 has its respective plates pivoted as at 53 to downward extensions
95 from the rear arm of the lever 39, said dog having a roller 54 journaled between its plates at its forward end, adapted to run upon the upper face of the jaw 43 for holding the latter closed, and to engage a projection 55 upon said jaw at its hub for swinging the jaw open, and the plates of said dog being formed mid-way of their length with respective upstanding arms, such arms constituting a lever 56 which is
100 connected by a pull spring 57 with a part of the lever 39 adjacent the latter's hub. Thus the dog 52, by the force of said spring urging it about its pivot 53, is adapted to bear yieldingly upon the jaw 43 as the jaws 43, 44 are projected and retracted, and also to exert upward force on the lever 39 at its pivot 53 for urging the lever 39 and its jaw 38 toward open position, the dog 52 also being so disposed that when the jaws 43, 44 reach the limit of their projective movement the roller 54 will engage the projection 55 of the jaw 43 for swinging the jaw 43 open to receive the shoe upper, as shown in
105 Fig. 9.

110 Secured to the respective plates of the lever 39, near their pivot 40, are upstanding, angled plates, spaced apart to accommodate the jaws 43, 44, and constituting a guide finger 58 for directing the margin of
115 the shoe upper, as shown in Fig. 9.

120 125 130

an upper into the jaws 43, 44 and guiding it so that it will clear the upper end of the upstanding jaw-carrier arm 30, as will be clear upon reference to Fig. 9.

5 The jaws 43, 44 are adapted to be limited in their projective movement by contact of the hub portion of the jaw 43 with the carrier arm 30, as shown in Fig. 9, and in their opening movement by contact of the roller 10 54 with the lower jaw 44, and the jaw 38 is adapted to be limited in its opening movement by contact of shoulders such as 59, formed on the side plates of the levers 39, with stop-lugs such as 59^a, formed on the 15 side plates of the carrier arm 30.

The roller 41, which runs upon the lever 39 for closing the jaw 38 is journaled at the end of a spring arm 60, which is adapted to yield to compensate for relatively great 20 thickness of the upper where seams occur, and said arm is welded to a bracket 61 screw-bolted to the outer face of the frame 18. A set screw 62 threaded through the frame 18 bears upon the spring arm 60 and is adapted to be adjusted to vary the force 25 with which the jaws 37, 38 grip the margin of the upper. The roller 51, which runs upon the lever 48 for retracting the upper-positioning jaws 43, 44, is journaled at the end of a rigid arm 63 pivoted at 64 to a 30 bracket 65 screw-bolted to the outer face of the frame 17. A set screw 66 threaded through the frame 17 bears upon the arm 63 and is adapted to be adjusted to determine 35 the position to which the upper positioning jaws are retracted. A C-spring 63^a so connects the bracket 65 with the arm 63 as to hold the latter against the set screw 66 when the roller 51 is lifted clear of the lever 48. The roller 41 may likewise be lifted 40 clear of its lever 39, as shown in Fig. 8, and this arrangement permits the use of mechanism adapted to raise and lower the frames 17 and 18 through an unvarying distance, as in the case of the eccentrics here 45 employed, while the high and low positions of said frames, although always the same distance apart, may be varied by changing the length of their supporting-bar structures, and yet the open positions of the two pairs 50 of jaws will be determined by their respective stops, and not by the positions of said frames.

Last-carriage mechanism.

55 Journaled in brackets 67, 68 rising from the base 11 outside of the frames 10 is a main drive shaft 69, having secured thereon drive pinions 70, 71 meshed respectively with 60 large gears 72, 73 formed upon the outer ends of respective segmental-gear drums 74, 75, the latter being secured upon respective shafts 76, 77 journaled in the respective brackets 67, 68 and extending through respec- 65 tive bearings formed on brackets 78, 79

rising from the base 11 near the middle of the machine. The adjacent ends of the shafts 76, 77, between the brackets 78, 79, have secured thereon respective cam cranks 80, 81, whose outer ends are connected by a pair 70 of pins 82, 82 having rollers 83, 83, loosely journaled thereon (see Fig. 8). Said rollers are adapted to engage the lower face of a lever 84 being formed arcuately at 85, upon a radius equal to the effective length of the 75 twin cranks 80, 81, so that when the lever 84 is raised by the rollers 83, the inner end of said lever will stand still in its uppermost position while both of the rollers 83 traverse the arcuate portion 85 of the lever's face, 80 the proportions of the parts described being such that when the lever 84 is in its uppermost position the curved portion 85 of the lever's face will be concentric with the shaft 76, this construction being such as to raise 85 the last, with its carriage 14, and cause it to dwell in its uppermost position while the gripper units above described are actuated to apply the upper's margin to the sole face 90 of the last.

Said carriage 14 is connected with the forward end of the lever 84 by a two-part connecting rod 86 provided with a turn-buckle 87 for varying its effective length. The carriage is formed with a base or cross-head 14^a 95 slidably mounted between and adapted to be guided by the frames 10, the cross-head when in its lowermost position being adapted to rest upon a cross-brace 88 connecting the frames 10 and formed with a central aperture 100 88^a accomodating the connecting rod 86. Guide bars 14^b, 14^b, Fig. 1, have their upper ends secured in the cross-head 14^a and extend downward therefrom through guide aper- 105 tures in the cross-brace 88, for maintaining alignment of the last-carriage as it is raised and lowered.

Mounted upon the last carriage 14 is a block 89 constituting a last support, and said last support is preferably formed with suitable apertures and fitted upon dowels 90, 90 projecting from the upper face of the last carriage, so that last supports of different sizes readily may be substituted. The last support conforms to the sole face of the last 115 and is thus adapted to hold snugly against the last an insole 91 interposed between the two, and the last support is of smaller vertical projection than the last, so that the latter overhangs or projects horizontally beyond the last support, with a uniform margin of overhang around the sole face of the last, as will readily be understood upon reference to Fig. 12, such overhang permitting the application of the sole margin of an 125 upper to the insole while the work rests upon the last support.

For initially positioning the last upon its support a generally U-shaped jig 92 is detachably secured upon a jig-carrier 92^a, the 130

latter being hinged upon a bar 93 mounted between brackets 94 projecting from the respective frames 10 (Figs. 1, 2, 6 and 8), and said jig-carrier is provided with a stud 95 (Figs. 2 and 8) adapted to bear against suitable stop faces formed on one of the brackets 94 for holding the jig respectively in horizontal position for receiving the last, and in an over-center position, the stud 95 abutting a projection 96 on the bracket 94, so that the jig is out of the way for the passage of the base portion or cross-head 14^a of the last-carriage. For automatically swinging the jig-carrier 92^a from one to the other of these positions it has secured to the hub of one of its hinge-arms a fork 97 adapted to receive a stud 98 (Figs. 2 and 8) projecting from the cross-head 14^a, the two positions of the jig, as determined by the stud 95, being such that the stud 98 will be received by the fork 97 in both the upward and downward movements of the last-carriage.

Gripper-frame actuating mechanism.

For raising and lowering the gripper unit frames 16, 17 and 18, their supporting slide-bars, 19, 20, and 21 respectively, are connected below by knuckle-joints, to respective eccentric mechanisms, including eccentric collars 23, 24, and 25, as above described. The supporting bars 20 and 21 for the two uppermost gripper frames, 17 and 18, are provided with knuckle members 20^a, 20^b, 21^a, 21^b, pivoted to knuckle members 99, 99 which latter are connected to the respective eccentric collars by right and left threaded bolts 100, 100, so that the knuckle members 99 and bolts 100 constitute connecting rods adapted on occasion to be adjusted in length to vary the starting and stopping position of the frames 17, 18, although when once adjusted their length does not ordinarily require to be changed for operating upon shoes of different sizes, the positioning of the gripper units for shoes of different sizes being taken care of by varying the starting or upper-receiving position of the gripper-tilting frame 16.

In order that such variation may be had in the upper receiving position of the frame 16, each pair of its supporting bars 19 (see Fig. 4), have secured to their lower ends, in common, a bracket 101 formed with a downwardly extending arm 101^a at the rear, to which is pivoted at 102 a pair of parallel, adjusting levers 103, 103.

There is thus a pair of said levers at each side of the machine, (see Fig. 1) and the four levers of the two pairs are connected at their outer ends by a bar 104 and suitable spacer members 105, 105, for manually raising and lowering the levers 103. Each pair of the levers 103 straddles an arcuate, down-

wardly extending projection 101^b formed on the adjacent bracket 101 and marked with a scale 101^c for registering the position of the levers 103. For securing said levers in desired position, a bolt 106 is mounted in apertures in the four levers 103, provided with a spacer sleeve 106^a (Fig. 6) between the two innermost levers, and provided at one end with a hand wheel 107 having a threaded hub mounted on the end of the bolt for drawing the levers 103 of each pair together to clamp them upon the projection 101^b of the bracket 101. The levers 103 of each pair have pivoted between them at 108 a knuckle member 109 which is connected with the eccentric collar 23 by a right and left threaded bolt 110, (Figs. 3 and 4). The gripper-unit positioning frame 16 is thus adapted to be quickly shifted in position with relation to its actuating mechanism, to vary the initial positioning of the gripper units for uppers of different sizes.

The lost motion links 32 which return the gripper units to upper receiving position after each lasting operation are connected to the actuating carrier arms 31 at points on the latter relatively close to the carrier's pivot 26, as to the carriers positioned about the heel and toe of the work, while the links of the gripper units at the instep of the last are connected to the actuating arms 31 at points on the latter more remote from the pivots 26, as will be clear from a comparison of Fig. 8 with Fig. 10 for example, the effect of this being that when the levers 103 are adjusted to vary the effective length of the frame supporting structures which include the slide bars 19, the resulting variation of the starting position of the frame 16 does not affect the positioning of the gripper arms 30 at the instep of the last as much as it does that of the gripper arms 30 which are at or near the heel and toe of the last, this being in accordance with the fact that lasts of different sizes do not have soles of geometrically similar form, but vary more in outline about the heel and toe portions than they do at the instep. The arrangement described is such that the gripper carriers will be properly positioned for lasts of different sizes by the simple adjustment of the levers 103.

The eccentric collars 23, 24, 25 are mounted respectively upon eccentrics 112, 113, 114, (see Fig. 3) said eccentrics of each set, at the respective sides of the machine, being loosely journaled in axially abutted relation upon a shaft 115 mounted in the adjacent bracket 67 or 68 and in the adjacent frame member 10, from which they are spaced by suitable spacing collars 116, 117, 118. Said eccentrics are provided with individual driving gears 119, 120, 121 respectively secured on their hubs, and said eccentrics are adapted to be inter-

mittently driven through half-revolutions, in timed relation, by respective sets of successive gear segments secured upon the adjacent segmental-gear drum 74 or 75. The timing of the mechanism is such that with the machine in starting position, as shown in Fig. 8, the movements of the frames 16, 17 and 18 will be as follows:

1. Downward movement of frame 17 to close upper-positioning jaws 43, 44 and draw the lining into the gripper jaws.

2. Downward movement of frame 18 to close gripper jaws.

3. Upward movement of frame 16 to tilt jaw carriers against the last-support.

4. Upward movement of frames 17 and 18 together to permit spring 33 to press the jaw carriers against the last, while the rollers 41, 51 hold the gripper jaws closed and the upper positioning jaws retracted, continued upward movement of the frames 17 and 18 then permitting the gripper jaws to be opened by the spring 57, and the spring 50 to project the upper positioning jaws and cause the uppermost jaw 43 to apply to the last the portion of the upper's margin theretofore engaged by the gripper jaws, and to lift the last from its support, the spring 57 then urging the jaw 43 toward open position.

5. Downward movement of frame 16 to tilt the jaw-carriers back to upper-receiving position.

The two segmental-gear drums, at the respective sides of the machine, are alike, so that a description of the drum 74, at the left of the machine as viewed in Fig. 1, and shown clearly in Fig. 4, will suffice for both. The gear-segment for driving the eccentric 113 (see Fig. 3) through half a revolution, to lower the frame 17 and thereby close and retract the upper-positioning jaws, is shown at 122 in Fig. 4, the drum being adapted to be driven in the direction indicated by the arrow in Fig. 4. The gear-segment for driving the eccentric 114 (Fig. 3) through half a revolution, to lower the frame 18 and thereby close the gripper jaws, is shown at 123. (Fig. 4.) That for driving the eccentric 112 through half a revolution, to raise the frame 16 and thereby permit the jaw-carriers 15 to tilt toward the last support, is shown at 124. (Fig. 4.) The gear-segments for then raising the frames 17 and 18 simultaneously, to permit the lasting movements of the jaw-carriers and jaws, are positioned side by side upon the drum 74, the nearer one of the two, for the eccentric 114, being shown at 125 in Fig. 4, and the two being shown at 125, 126 in Fig. 6. The segment for then lowering the frame 16, to return the gripper units to upper receiving position, is shown at 127. (Fig. 4.)

Each of the gears 119, 120, 121, secured to the respective eccentrics, Fig. 3, has a tooth

omitted therefrom at two diametrically opposite points, as shown at 128, 128 in Fig. 4, as to the gear 119, to permit the gear-segments to come into mesh without binding. For preventing rotation of the gears 119, 120, 121 while they are out of mesh with their respective gear segments, each is provided with a bell-crank pawl lever, 129, 130, or 131, said levers being pivoted upon a common shaft 132, Figs. 2 and 4, each pawl lever being urged into engagement with its gear by a spring such as is shown at 133 in Figs. 2 and 4, and the actuating arm of each bell-crank lever extends toward the segmental gear drum and is adapted to be engaged by successive cams, such as are shown at 134, 134, (Fig. 4) secured upon the drum adjacent the respective gear segments, to disengage the pawl levers from their respective gears during the time that the latter are meshed with the gear segments.

Main drive mechanism.

The main drive shaft 69, journaled in the brackets 67, 68 and having the drive pinions 70, 71 secured thereon as above described, is provided with a brake drum 135 and a jaw-clutch member 136, Figs. 1, 4, and 5, said clutch member being adapted to mate with a jaw-clutch member 137 secured to the hub of a drive pulley 138 which is slidably and rotatably mounted upon the shaft 69 and adapted to be moved axially, to engage and disengage the clutch, by means of a shipper lever 139 secured upon a shaft 140 journaled in the bracket 67, said shipper lever being formed with a horizontal arm 141 formed with a brake shoe 142 adapted to engage the brake drum 135 when the clutch 136, 137 is disengaged. A foot lever 143 is secured to the shaft 140 for engaging the clutch, and a spring 144 connects said foot lever with the bracket 67 for urging the clutch member 137 out of engagement. For holding the clutch engaged during a cycle of operations, the brake-shoe arm 141 is formed with an extension 141^a beyond the brake-shoe, and said extension is adapted to be automatically engaged by a cam-latch pawl 145 formed on one arm of a three armed lever 146 (see especially Fig. 4), said lever being pivoted at 147 upon the bracket 67 and urged toward latching position by a pull string 148. One arm of said lever 146 extends toward the adjacent segmental gear drum 74 and is adapted to be engaged by a stud 149 on said drum at the end of each cycle of operations, represented by one revolution of the drum, for releasing the latching pawl 145 from the brake lever 141, and permitting the spring 144 to disengage the clutch and apply the brake shoe 142 to the brake drum 135. The third arm of the latching lever 146 extends to the front of the machine, constituting a

foot lever by which the operator may disengage the latching pawl 145 at will to stop the machine.

Operation.

5 In the operation of the machine, the same being in starting condition, as most clearly shown in Figs. 1, 8 and 9, and the belt pulley 138 being driven, one operator places the insole 91 and the last 13 upon the last support 89, positioning them against the jig 92, and another operator places the upper 42, provided with a coating of cement 42^a along the edge of its inner sole margin, upon the set of gripper units, as shown clearly in Fig. 8, the lower or sole margin of the upper being received between the guiding finger 58 and the lower upper-positioning jaw 44 of each gripper unit of the set, the gripper units being appropriately positioned by the starting position of the frame 16.

The first operator then depresses the foot lever 143, which engages the clutch 136, 137 and causes it to be held engaged, by the cam-latch pawl 145 automatically engaging the projection 141^a on the brake shoe lever 141. The machine then automatically performs the complete cycle of lasting operations, at the end of which the stud 149 on the adjacent segmental-gear drum 74 strikes the inner arm of the lever 146, disengaging the pawl 145, whereupon the clutch is automatically disengaged and the brake shoe 142 applied to the brake drum 135, by the spring 144, and the machine is thus stopped in its original condition.

In this cycle of operations, the cranks 80, through the intermediate connections described, raise the last 13 to lasting position and hold it there, while the rollers 83 traverse the arcuate face 85 of the lever 84, for the performance of the last operations.

The stud 98 throws the jig 92 out of the way of the cross head 14^a as the last carriage ascends. While the last is rising the gear segment 122 acts to lower the frame 17, which causes the upper positioning jaws 43, 44 to close lightly upon the margin of the upper, under the force of the spring impelled dog 52, and to slide downward and outward thereon, the lower jaw 44 running upon the roller 40^a, this stage of operation being shown in Fig. 10. The margin of the upper is thus drawn into the angle of the gripper jaws 37, 38, its edge abutting them at their angle, and the upper is thus accurately positioned for the engagement of the gripper jaws therewith, the jaws 43, 44 continuing to slide on the upper after its edge has thus been positioned.

When the upper-positioning jaws have thus been retracted to their outermost position, as shown in Fig. 11, the gear segment 123 acts to lower the frame 18, which closes the gripper jaws 37, 38 upon the margin of

the upper as shown in Fig. 11, and said gripper jaws engage the upper's margin to a determinate depth from its edge, because of the positioning of the upper as just described.

Soon after the upper is thus firmly gripped by the jaws 37, 38 the last 13 arrives at lasting position and is forced upward into the upper 42 as shown in Fig. 11, the parts being positioned as there shown.

The gear segment 124 then acts to lift the frame 16, which causes the compression springs 33 to tilt the respective jaw carriers 15 inward against the last support 89, as shown in Fig. 12, the rollers 41 and 51 running upon the arcuate faces of the levers 39 and 48, to hold all of the jaws closed and to hold the upper positioning jaws in their retracted position with relation to the gripper jaws 37, 38, while the carriers are thus tilted, the rollers 41 and 51 also preventing the jaw carriers 15 from rising in the slots 27 of the posts 28, as they are urged to do by the compression springs 33.

Next the gear segments 125, 126 act simultaneously to lift the frames 17 and 18, which permits the jaw carriers to rise in the slots 27, the jaw 38 bearing against the last support 89 in sliding contact therewith, and all jaws being held closed by the rollers 41, 51, until the jaws 37, 38 thus carry the margin of the upper into contact with the insole 91. Further rising of the frames 17, 18, and releasing of the force of the spring 33 by descent of the frame 16, then permits the jaws 37, 38 to open and permits the spring 50 to project the jaws 43, 44, while the latter are held closed by the roller 40^a and the dog 52, but with a decreasing force as the pivot 45 of said jaws approaches the roller 54 of said dog. By such projective movement the jaws 43, 44 apply to the insole 91 the portion of the upper's margin theretofore engaged by the gripper jaws 37, 38. During the actuation of the jaws 37, 38, the work is preferably held down by hand upon the last support 89 with such pressure as to hold it thereon until all of the gripper units have come to bear upon the insole and with sufficient pressure firmly to anchor the margin of the upper.

The downward pressure upon the work is then released, whereupon the jaws 43, 44, further projected by the springs 50, lift the last from its support by a cam action of the lower jaw 44 against the last support 89. As soon as the front ends of said jaws rise above the last support, in sliding engagement therewith as shown in Fig. 13, they are projected over said support. As the jaws 43, 44 are thus further projected they release their grip upon the upper's margin and the jaw 43 slides upon said margin toward its edge and thus irons it out against the insole. Then as the work is further permitted

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to rise, the jaws 43 slide outward in contact with the lower face of the work and are thus returned to full open position, by the roller 54 of the dog 52 engaging the projection 55 on the hub of said jaw.

Further downward movement of the frame 16, by action of the gear segment 127 then causes the links 32 to tilt the jaw carriers 16 outward, to return them to their upper-receiving positions, and meanwhile the cranks 80, passing from the arcuate face 85 of the lever 84, permit the last-carriage to descend, and when the instrumentalities are thus returned to starting position the machine is automatically stopped as above described. The operation is then repeated upon successive shoes as described.

Modifications may be resorted to without departing from the scope of my invention and I do not wholly limit my claims to the specific embodiment here shown.

I claim:

1. A lasting machine comprising a set of gripper units defining a lasting position, each of said units comprising a pair of gripper jaws adapted to receive and grip the margin of an upper presented to said units collectively, and means having a retractive movement past said gripper jaws for drawing the upper's margin thereinto.

2. A lasting machine comprising means for supporting a last and, cooperatively associated therewith, a gripper unit comprising a pair of gripper jaws, retractive, margin engaging means for drawing the margin of an upper to a determinate position therein, and means for closing said jaws and so moving them as to swing said margin onto the sole face of the last.

3. A lasting machine comprising means for supporting a last and, cooperatively associated therewith, a gripper unit comprising a pair of gripper jaws, a pair of upper-positioning jaws having a retractive movement past said gripper jaws and adapted to draw an upper's margin thereinto, means for closing said gripper jaws and so moving them as to swing said margin onto the sole face of the last, and means for then so projecting one of said upper-positioning jaws with relation to said gripper jaws as to apply to the last the portion of the margin theretofore engaged by said gripper jaws.

4. A lasting machine comprising means for supporting a last, and, cooperatively associated therewith, a gripper unit comprising a jaw carrier, a pair of gripper jaws mounted thereon and adapted to grip the margin of an upper on said last, a pair of upper-positioning jaws mounted on said carrier and having an opening and closing movement and having a projective and retractive movement past said gripper jaws, for positioning the margin of an upper in the latter, and means adapted to close said

upper-positioning jaws on the margin of an upper, to retract them to position the upper in said gripper jaws, and to close said gripper jaws on said margin, all in timed relation.

5. A lasting machine comprising means for supporting a last and, cooperatively associated therewith, a gripper unit comprising a jaw carrier, a pair of gripper jaws mounted thereon, a pair of upper-positioning jaws mounted on said carrier, having a projective and retractive movement past said gripper jaws and adapted to slide outwardly while lightly closed upon the margin of an upper for positioning said margin in said gripper jaws, and means for actuating said upper-positioning jaws and said gripper jaws in timed relation.

6. A lasting machine comprising a last support and, cooperatively associated therewith, a gripper unit comprising a jaw carrier pivoted for movement from and toward said last support, a pair of gripper jaws mounted on said carrier, a pair of upper-positioning jaws mounted on said carrier and adapted to draw the margin of an upper into said gripper jaws, levers mounted on said carrier for actuating the respective pairs of jaws and formed with arcuate faces, said faces being concentric with the pivot of said carrier when said upper-positioning jaws are retracted and said gripper jaws closed, and means bearing upon said arcuate faces for actuating said jaws and holding them in determinate relation while permitting said carrier to be turned on its pivot.

7. A lasting machine comprising a last support and, cooperatively associated therewith, a gripper unit comprising a jaw carrier mounted for movement from and toward lasting position, a pair of gripper jaws mounted thereon, a pair of upper-positioning jaws mounted thereon for movement of translation with relation to said gripper jaws for positioning the margin of an upper therein, a lever pivoted on said carrier and pivotally connected to said upper-positioning jaws for effecting their movement of translation, means for supporting one of said upper-positioning jaws in its movement of translation, yielding means running upon the other of said upper positioning jaws for urging it toward closed position, a lever mounted on said carrier for actuating said gripper jaws, and respective means bearing on said levers for actuating said jaws and adapted to run on said levers to hold said jaws in determinate relation while permitting them to move with their carrier.

8. A lasting machine comprising a last support and, cooperatively associated therewith, a gripper unit comprising a jaw carrier, a gripper jaw fixed thereon, a mate for said gripper jaw formed on a lever pivoted on said carrier, and a pair of upper-posi-

tioning jaws mounted on said carrier for projective and retractive movement past said gripper jaws for drawing the margin of an upper thereinto.

5 9. A lasting machine comprising a last support and, cooperatively associated there-
with, a gripper unit comprising a jaw car-
rier, a pair of gripper jaws mounted thereon,
a lever pivoted thereon and adapted to actu-
10 ate said gripper jaws, a pair of upper-posi-
tioning jaws mounted on said carrier for
projective and retractive movement past said
grripper jaws for drawing the margin of an
upper thereinto, means on said carrier on
15 which one of said upper-positioning jaws
runs in its projective and retractive move-
ment, the other of said upper positioning
jaws being formed with a projection at its
hub adapted to be engaged to swing it open,
20 a dog adapted to run on the last mentioned
jaw for holding it closed during a part of
its movement of translation and for engag-
ing its said projection to swing it open at the
end of its projective movement, said dog
25 being pivoted to the aforesaid lever, and
yielding means connecting said dog with
said lever, and adapted, by urging said dog
about its pivot, to urge said lever toward
jaw-opening positioning and to urge said
30 dog against the upper-positioning jaw.

10. A lasting machine comprising a last
support and, cooperatively associated there-
with, a jaw carrier support, a jaw carrier
pivoted thereon to tilt from and toward said
35 last support and adapted to slide toward and
from the sole of the last, upper-gripping
jaws on said carrier, yielding means urging
said carrier about its pivot toward said sup-
port and urging it to slide toward the sole
40 of the last, and means opposed to said yield-
ing means for reversely actuating said car-
rier.

11. A lasting machine comprising a last
support formed with a face adapted to
45 guide a pair of jaws against the sole face
of a last mounted in overhanging relation
thereon and, cooperatively associated there-
with, a jaw carrier having a jaw fixed there-
on, a mate for said jaw pivoted on said car-
rier, means for moving said jaw carrier
50 along the guiding face of said support to
apply to the sole of said last the margin of
an upper gripped by said jaws, and means
for thereafter applying to the last the por-
tion of said margin theretofore gripped by
55 said jaws.

12. A lasting machine comprising means
for supporting a last and, cooperatively as-
sociated therewith, a gripper unit compris-
60 ing a pair of gripper jaws, a pair of upper-
positioning jaws having a retractive move-
ment past said gripper jaws and adapted to
draw an upper's margin thereinto, means
for closing said gripper jaws and so moving
65 them as to swing said margin onto the sole

face of the last, and yielding means for then
so projecting said upper-positioning jaws
with relation to said gripper jaws as to ap-
ply to the last the portion of the margin
theretofore engaged by said gripper jaws. 70

13. A lasting machine comprising a set of
grripper units defining a lasting position,
each of said gripper units comprising a pair
of jaws adapted to grip the margin of an
upper presented to said units collectively,
75 and a pair of upper-positioning jaws
adapted to draw said margin into said grip-
per jaws and subsequently to apply to the
sole face of the last the portion of said
margin theretofore engaged by said gripper
80 jaws.

14. A lasting machine comprising a set
of gripper units defining a lasting position,
each of said units comprising a pair of
grripper jaws adapted to grip the margin
85 of an upper presented to said units collec-
tively and a pair of upper-positioning jaws
mounted for projective and retractive move-
ment with relation to said gripper jaws, a
frame disposed about the lasting position
90 and having connection with the several pairs
of gripper jaws for actuating them con-
currently, and a second frame disposed
about the lasting position and having con-
nection to the several pairs of upper-posi-
95 tioning jaws for actuating them concu-
rently.

15. A lasting machine comprising a set
of gripper units defining a lasting position,
each of said units comprising a jaw carrier,
100 a pair of gripper jaws and a pair of upper-
positioning jaws thereon, and means for so
actuating said elements in timed relation as
to cause said upper-positioning jaws to draw
the margin of an upper into said gripper
105 jaws, the latter to close on said margin, and
said carriers to carry the gripper jaws to-
ward a central position to draw said margin
under the sole of a last contained in said
upper. 110

16. A lasting machine comprising a set
of gripper units defining a lasting position,
each of said gripper units comprising a jaw
carrier, a pair of gripper jaws and a pair
of upper-positioning jaws mounted thereon,
115 a frame disposed about the lasting position,
constituting a mounting for said carriers
and formed to admit the passage of a last
into an upper held by said gripper jaws,
a second frame disposed about the lasting
120 position and having connection to said jaw
carriers for moving the latter with relation
to their mounting, a third frame disposed
about the lasting position and having con-
nection to said upper-positioning jaws for
125 actuating them concurrently, and a fourth
frame so disposed and adapted concurrently
to actuate said gripper jaws.

17. A lasting machine comprising a set
of gripper units defining a lasting position 130

and adapted to hold an upper in position for the reception of a last and to swing the margin of the upper toward the last, means for relatively advancing a last into an upper
 5 so held, and means for concurrently actuating said gripper units, the last said means comprising a set of frames having actuating connection to the several gripper units, and
 10 respective eccentrics for actuating said frames.

18. A lasting machine comprising a set of gripper units defining a lasting position and adapted to hold an upper in position for the reception of a last and to swing the
 15 margin of the upper toward the last, means for relatively advancing a last into an upper so held, and means for concurrently actuating said gripper units, the last said means comprising a set of frames having actuating
 20 connection to the several gripper units, respective eccentrics for actuating said frames, and a set of mutilated gears for actuating said eccentrics respectively.

19. A lasting machine comprising a set of
 25 gripper units defining a lasting position and adapted to hold an upper in position for the reception of a last and to swing the margin of the upper toward the last, means for relatively advancing a last into an upper
 30 so held, and means for concurrently actuating said gripper units, the last said means comprising a set of frames having actuating connection to the several gripper units, respective eccentrics for actuating said frames,
 35 a set of mutilated gears for actuating said eccentrics respectively, and means for preventing rotation of the respective eccentrics while they are dissassociated from their respective mutilated gears.

40 20. A lasting machine comprising a set of gripper units defining a lasting position,

each of said units comprising a jaw carrier pivoted for movement from and toward lasting position, jaws on said carriers, a frame
 45 disposed about the lasting position and having connection to said carriers for turning them on their pivots from and toward lasting position, a push-bar structure for actuating said frame, means for actuating said
 50 push-bar structure, and means for varying the effective length of said push-bar structure for varying the initial positioning of said carriers for work of different sizes.

21. A lasting machine comprising a set of
 55 gripper units defining a lasting position, each of said units comprising a jaw carrier pivoted for movement from and toward lasting position, jaws on said carriers, a frame disposed about the lasting position and having connection to said carriers for
 60 turning them on their pivots from and toward lasting position, a push-bar structure for actuating said frame, means for actuating said push-bar structure, and means for varying the effective length of said push-
 65 bar structure for varying the initial positioning of said carrier for work of different sizes, the last said means comprising a lever mechanism.

22. A lasting machine comprising means
 70 for holding an upper by its margin for the reception of a last and means for advancing a last into an upper so held, the last said means comprising a slidably mounted last support, a lever operatively connected there-
 75 to and formed with a cam face, a cam crank, and means on said crank coacting with said cam face for actuating said last support.

In witness whereof I have hereunto set my hand this 2nd day of April, 1924.

FRANK J. MacDONALD.