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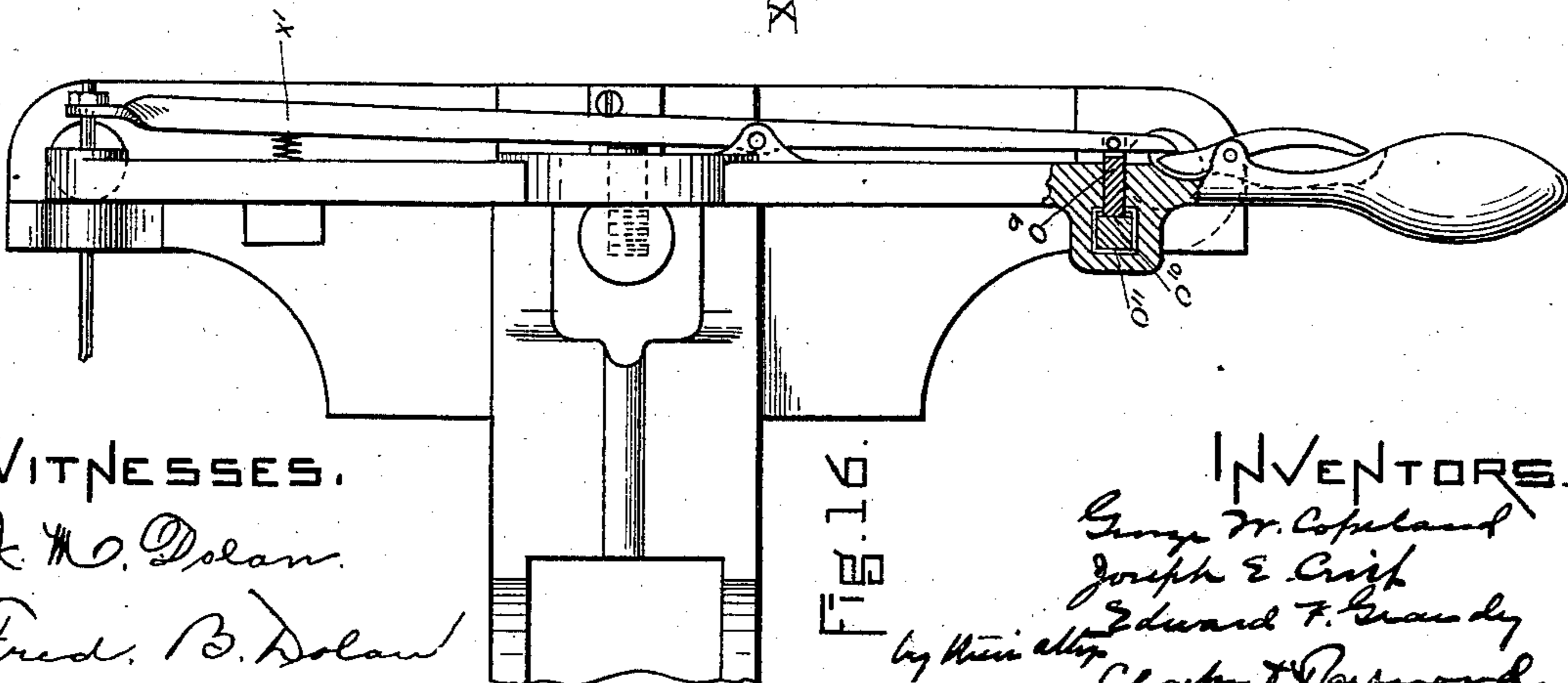
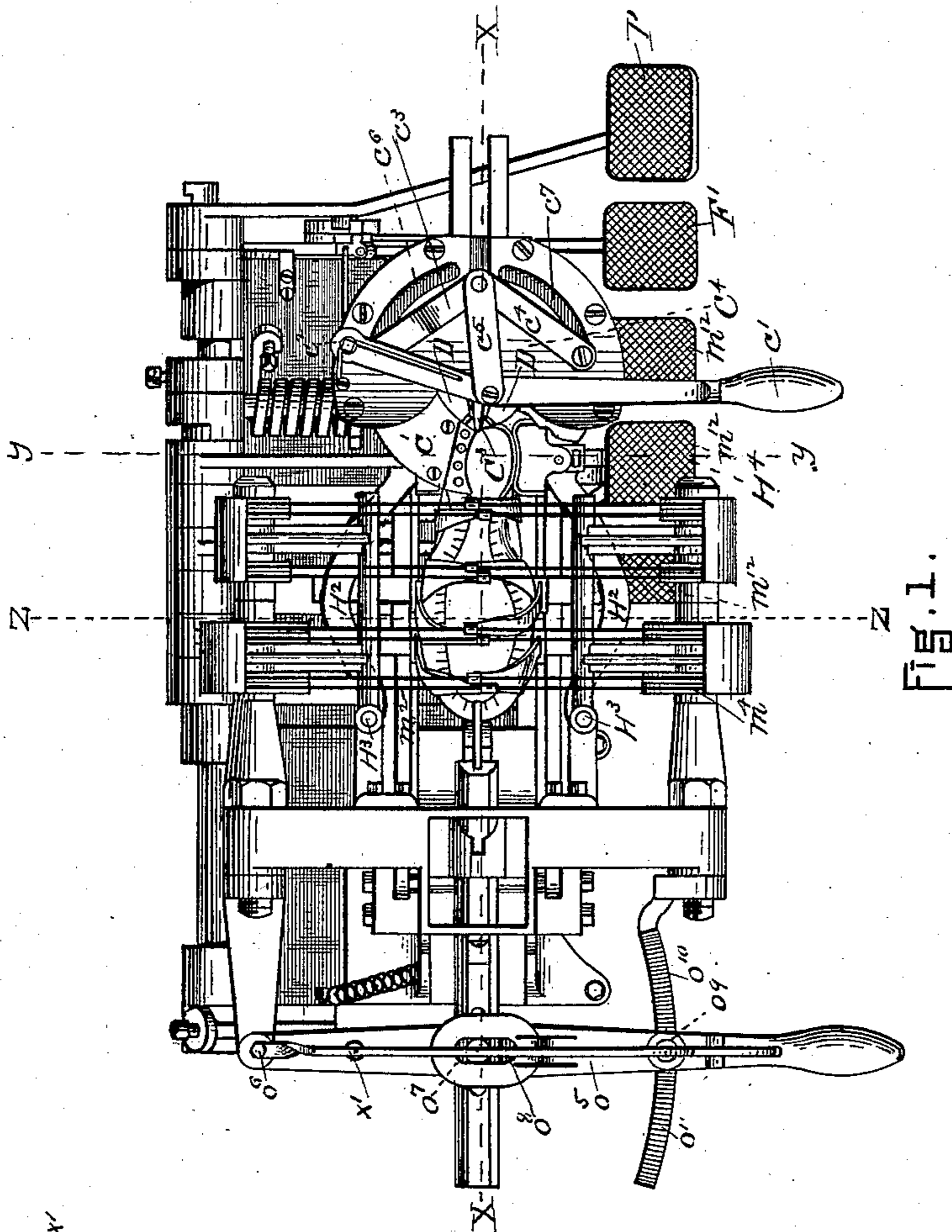
7 Sheets—Sheet 1.

G. W. COPELAND, J. E. CRISP & E. F. GRANDY.

LASTING MACHINE FOR BOOTS OR SHOES.

No. 365,505.

Patented June 28, 1887.



WITNESSES.

J. M. Dolan.

Fred. B. Dolan

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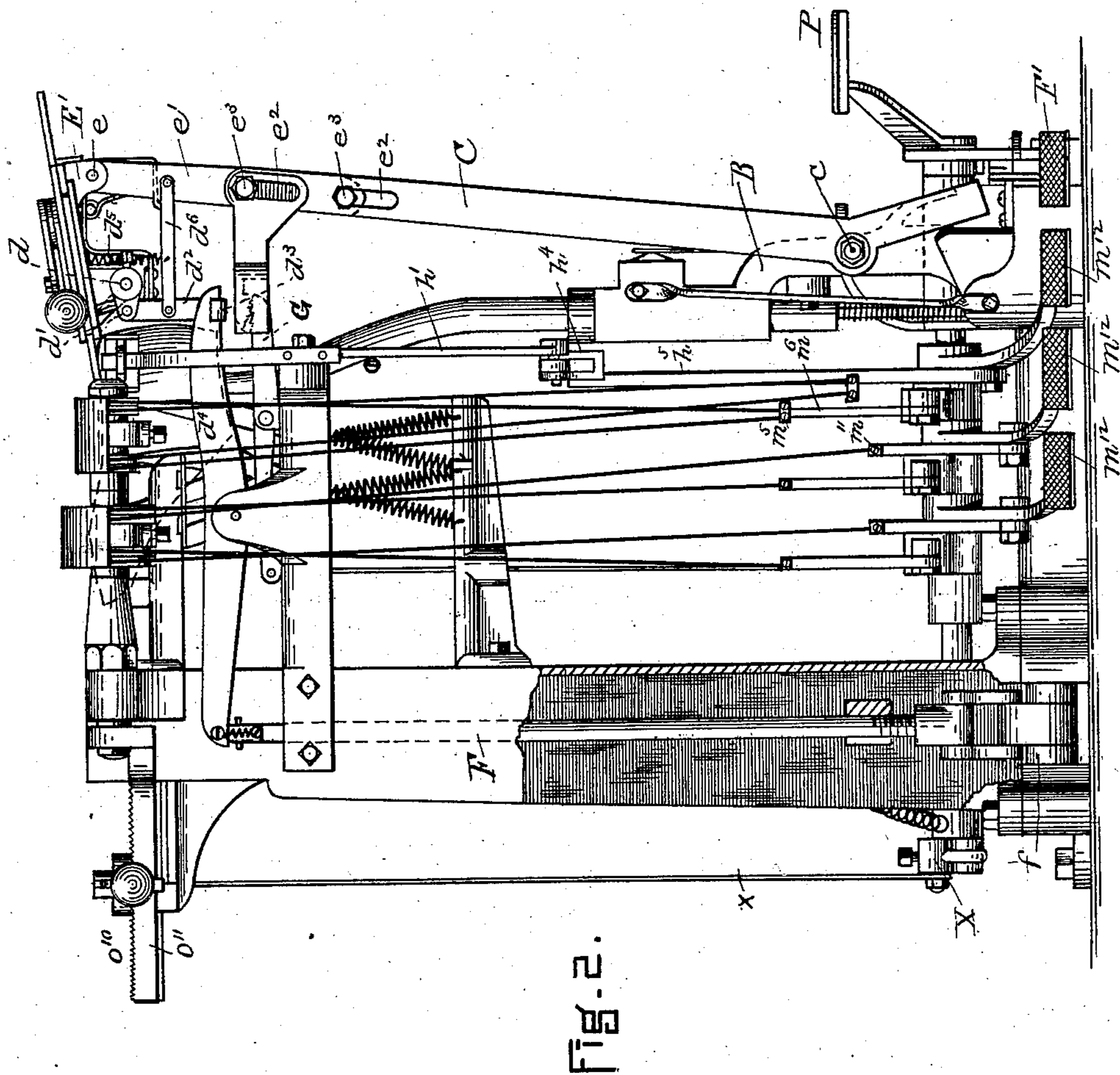
Edward F. Grandy

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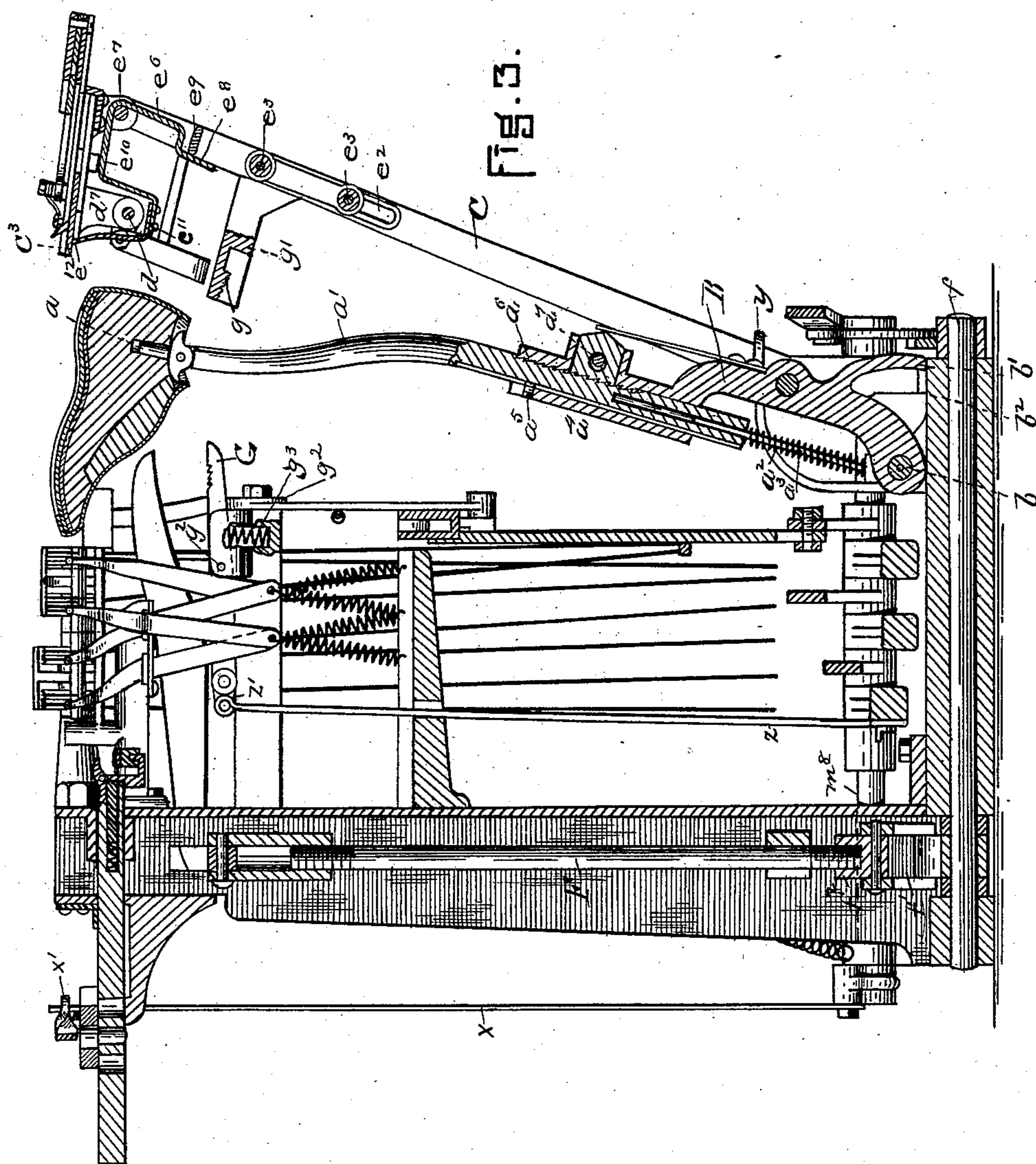
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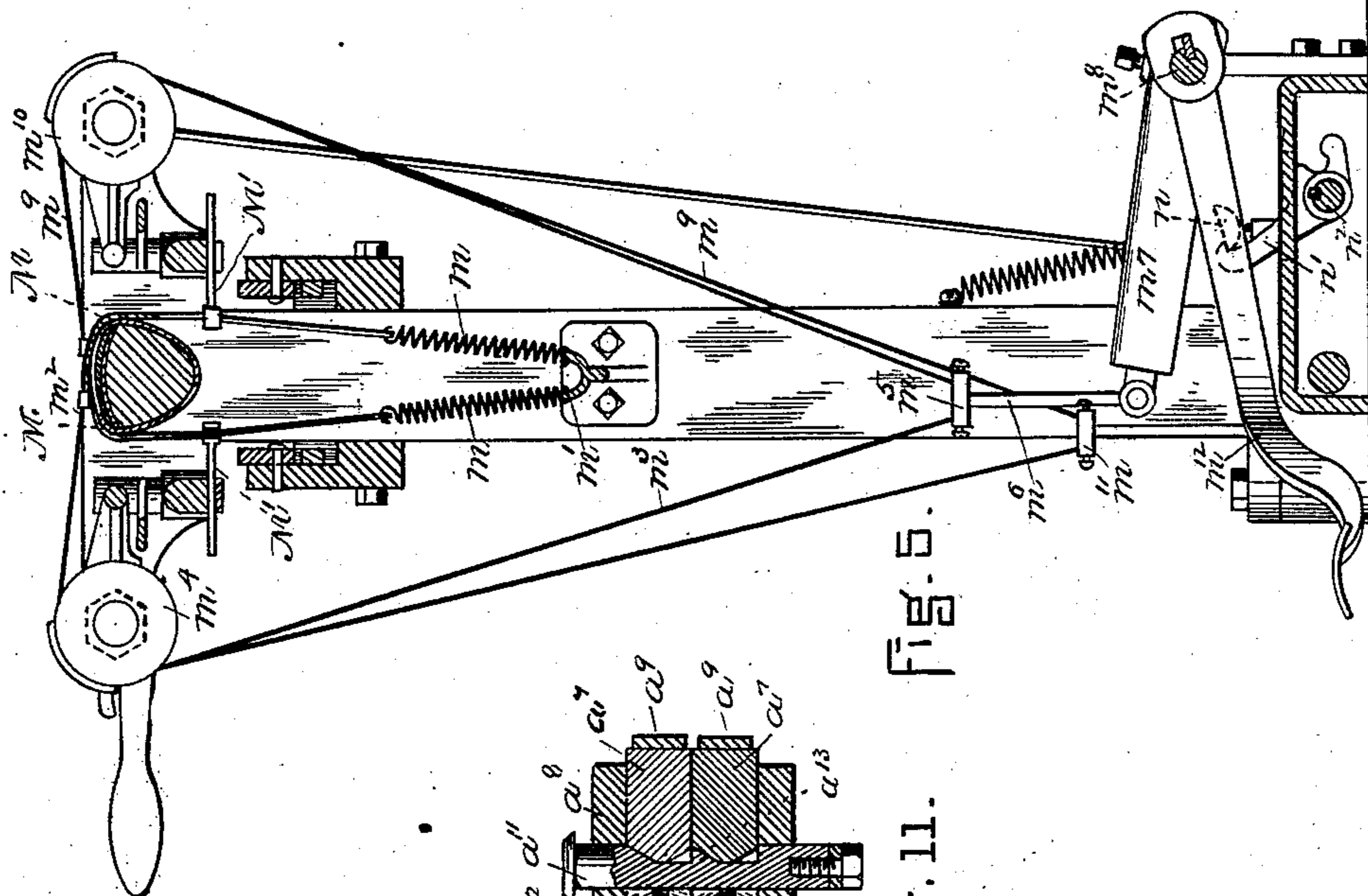
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G. W. COPELAND, J. E. CRISP & E. F. GRANDY.

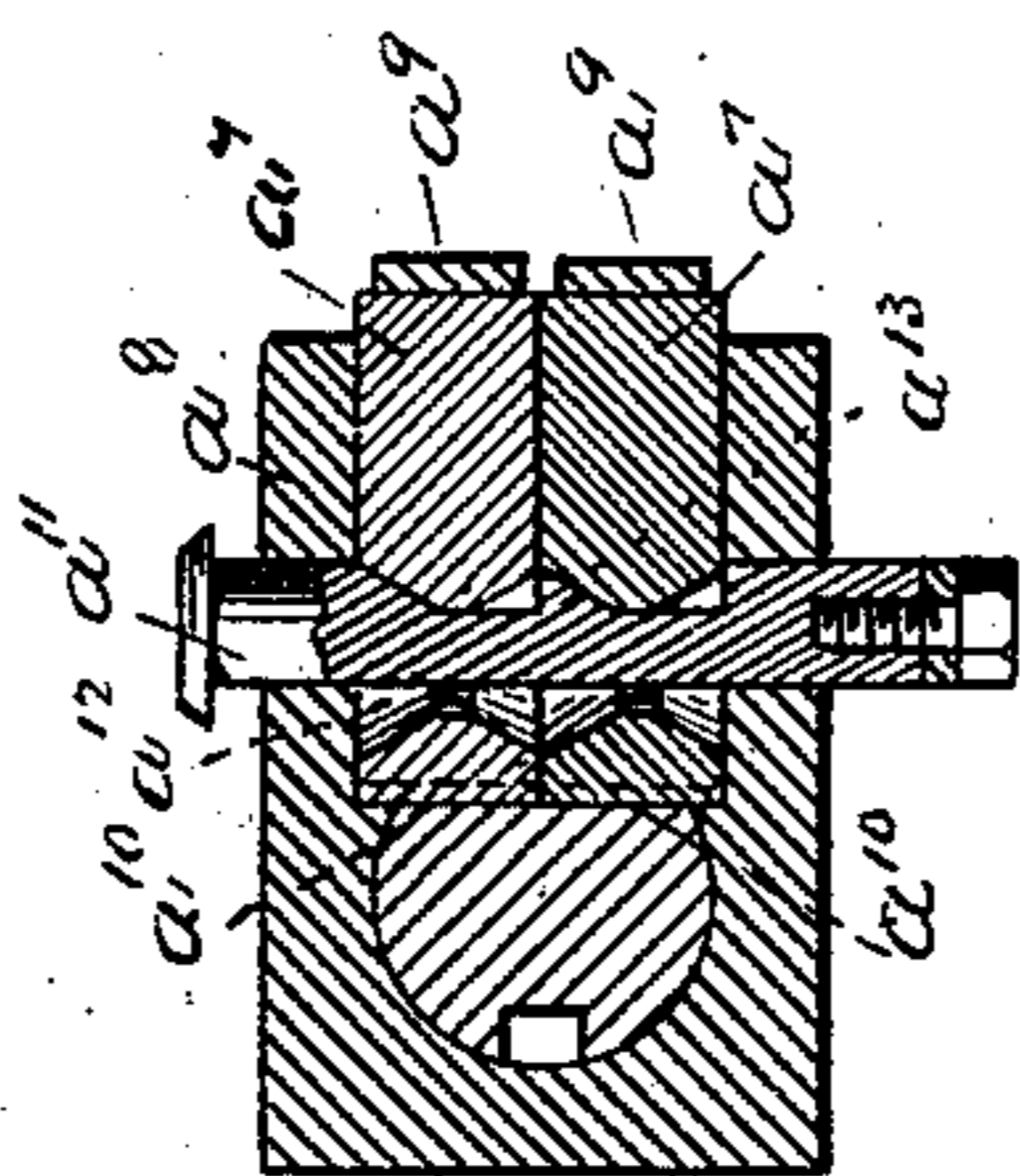
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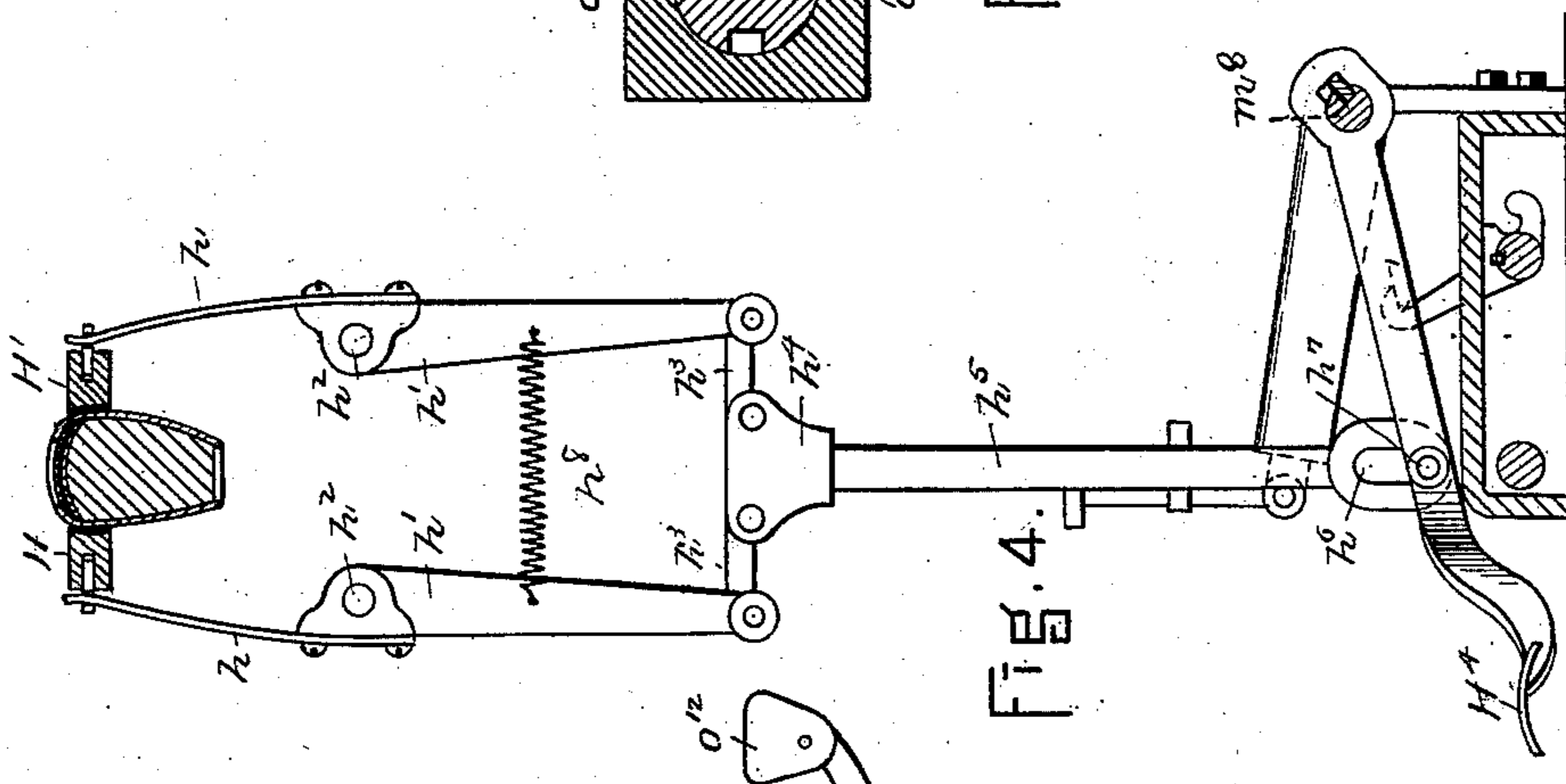
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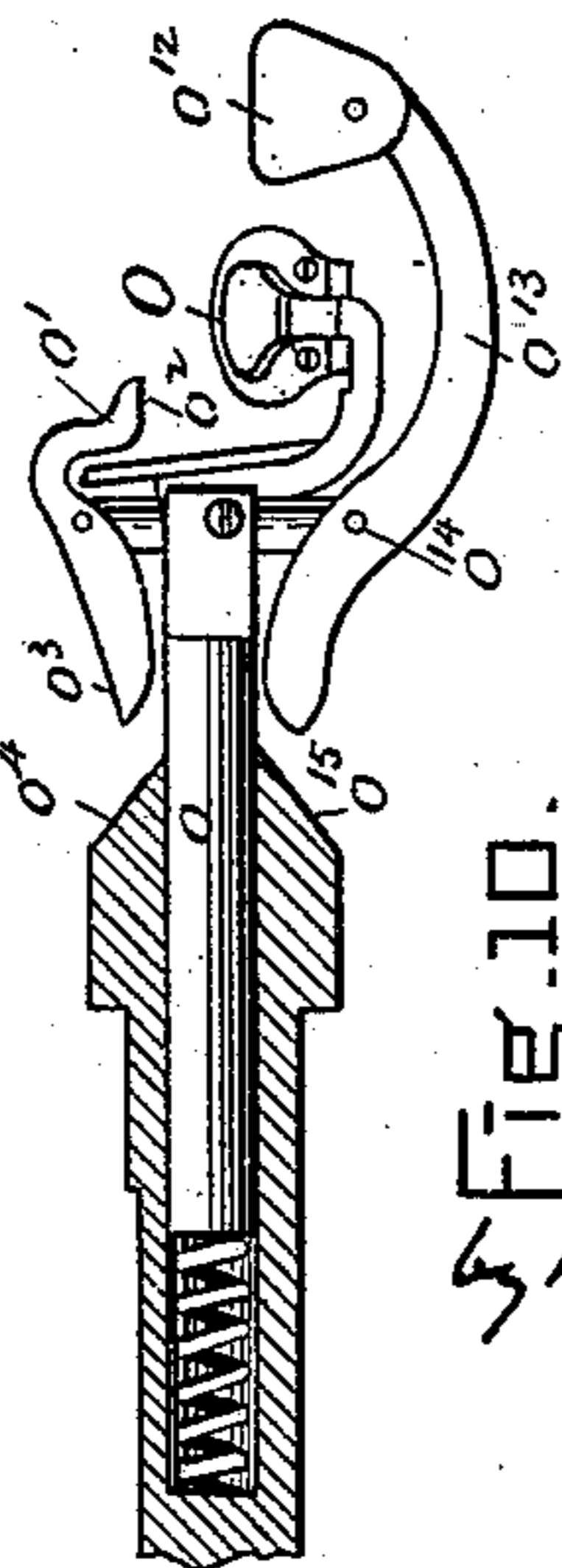
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(No Model.)

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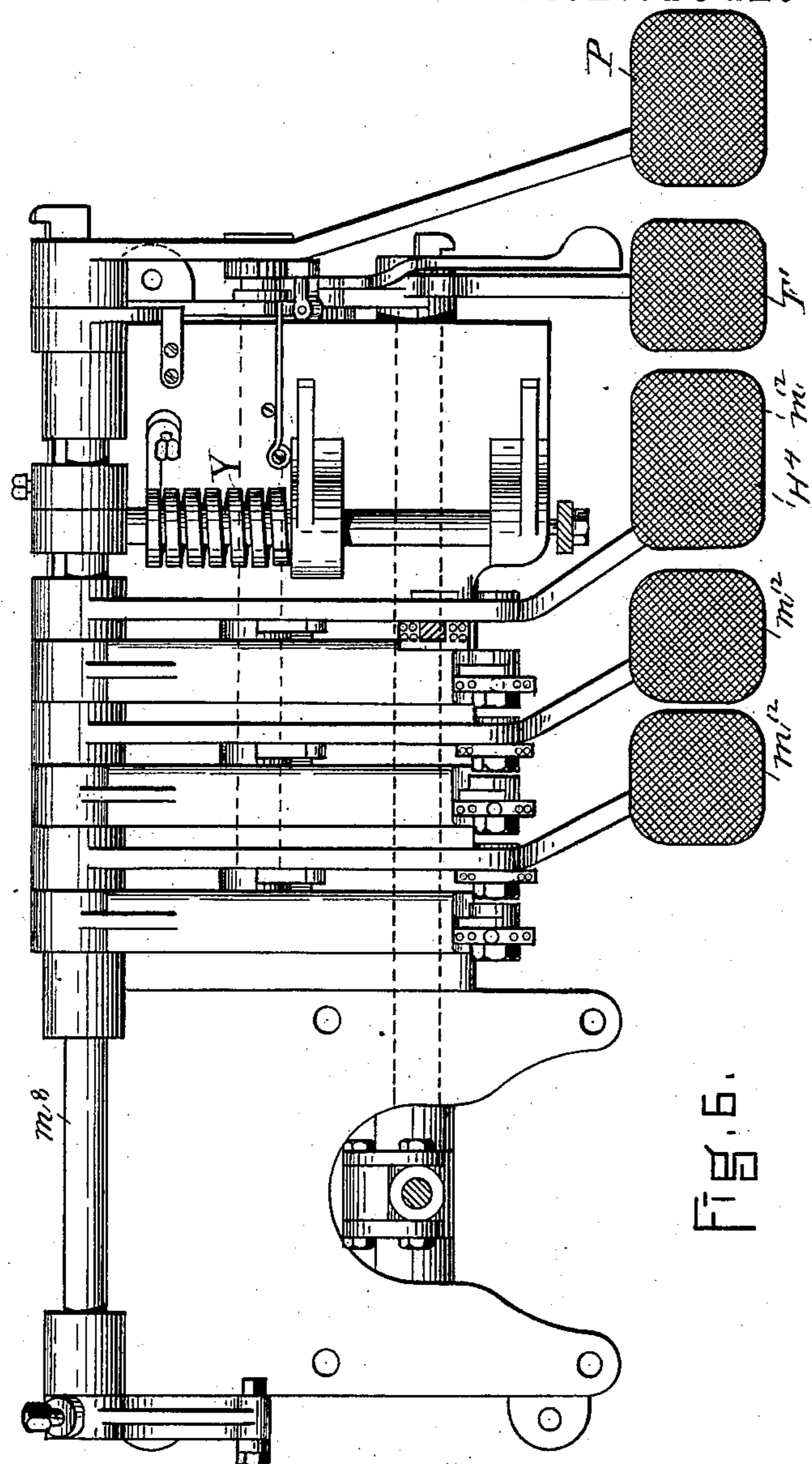


Fig. 5.

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7 Sheets—Sheet 6.

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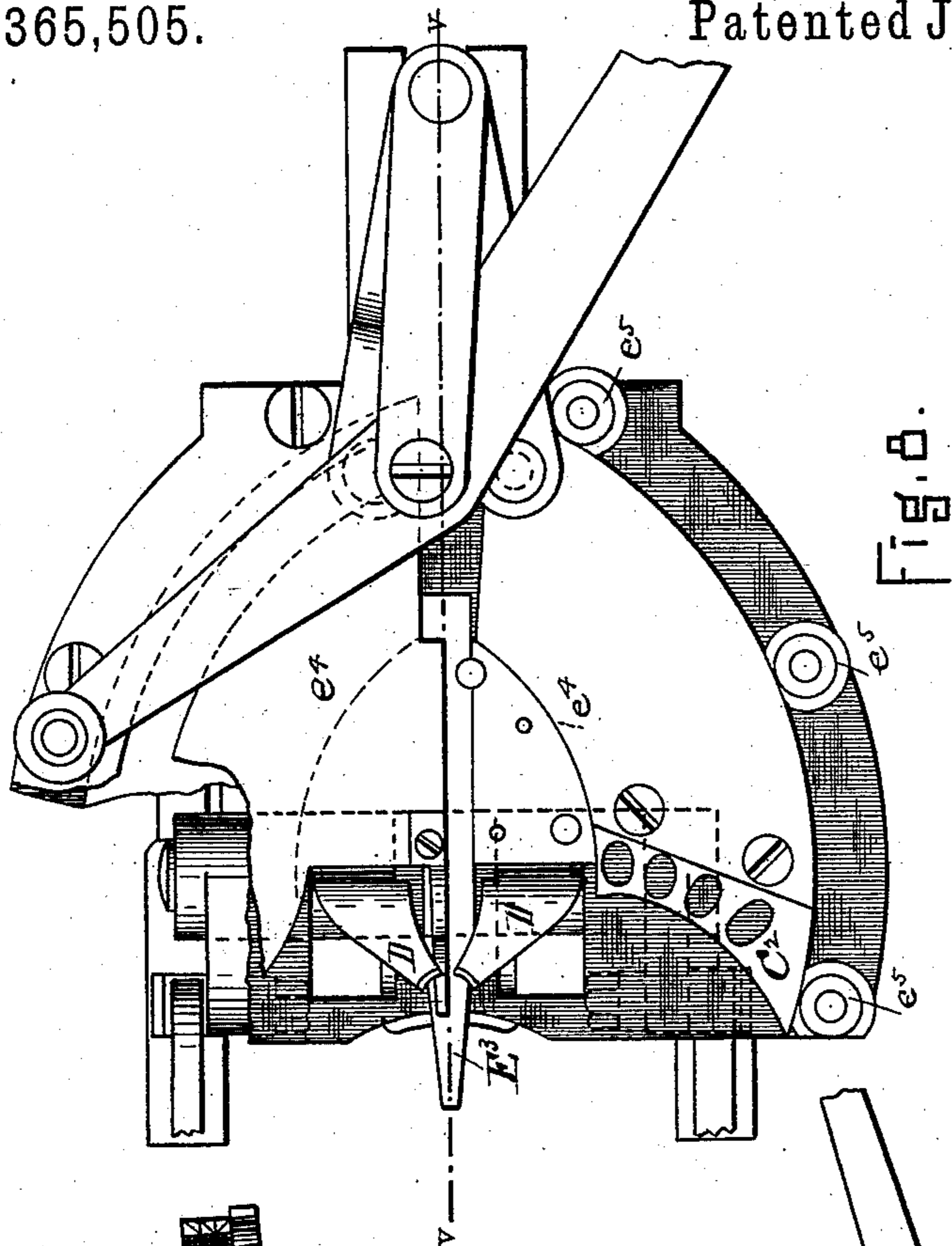


Fig. 8.

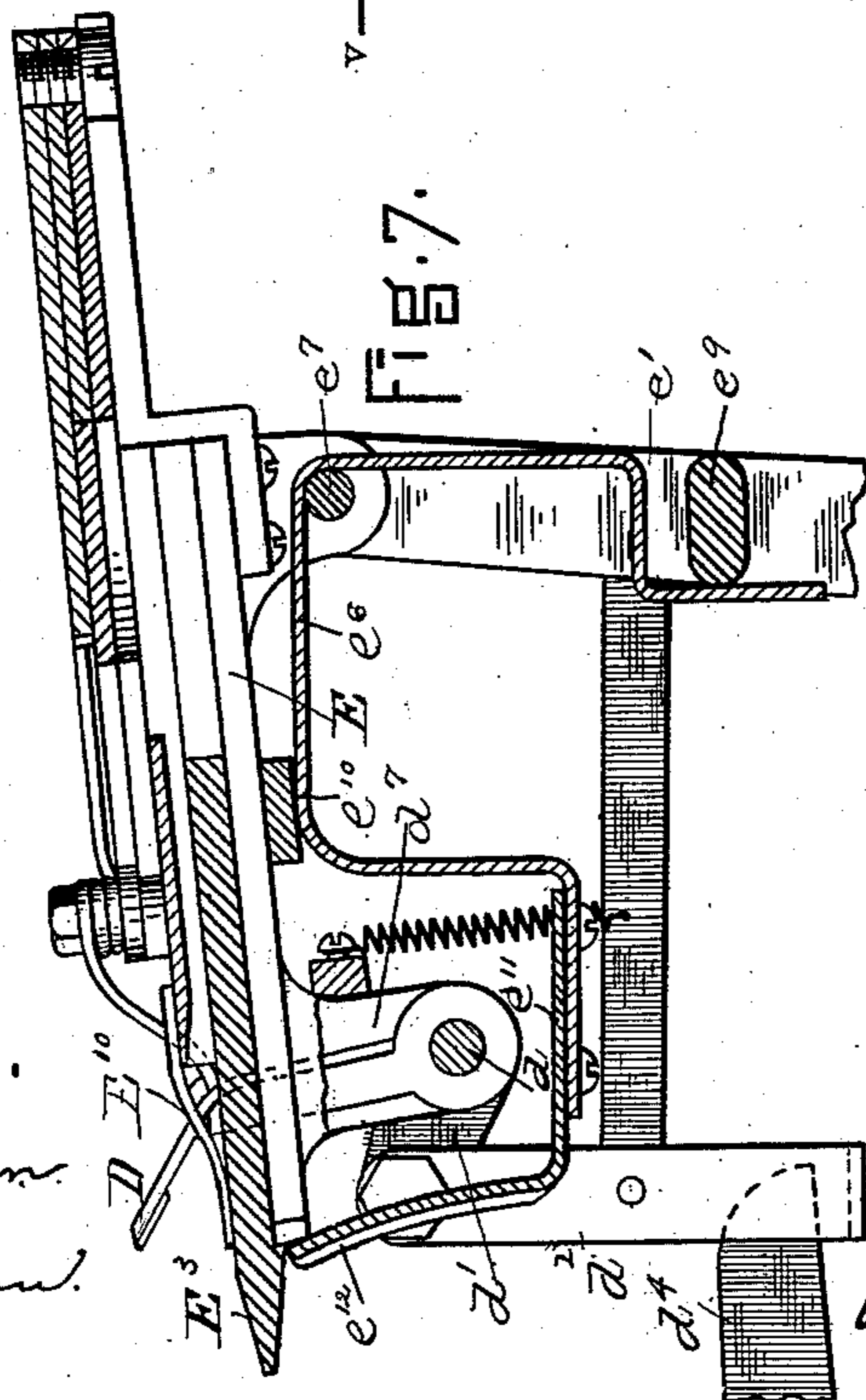


Fig. 7.

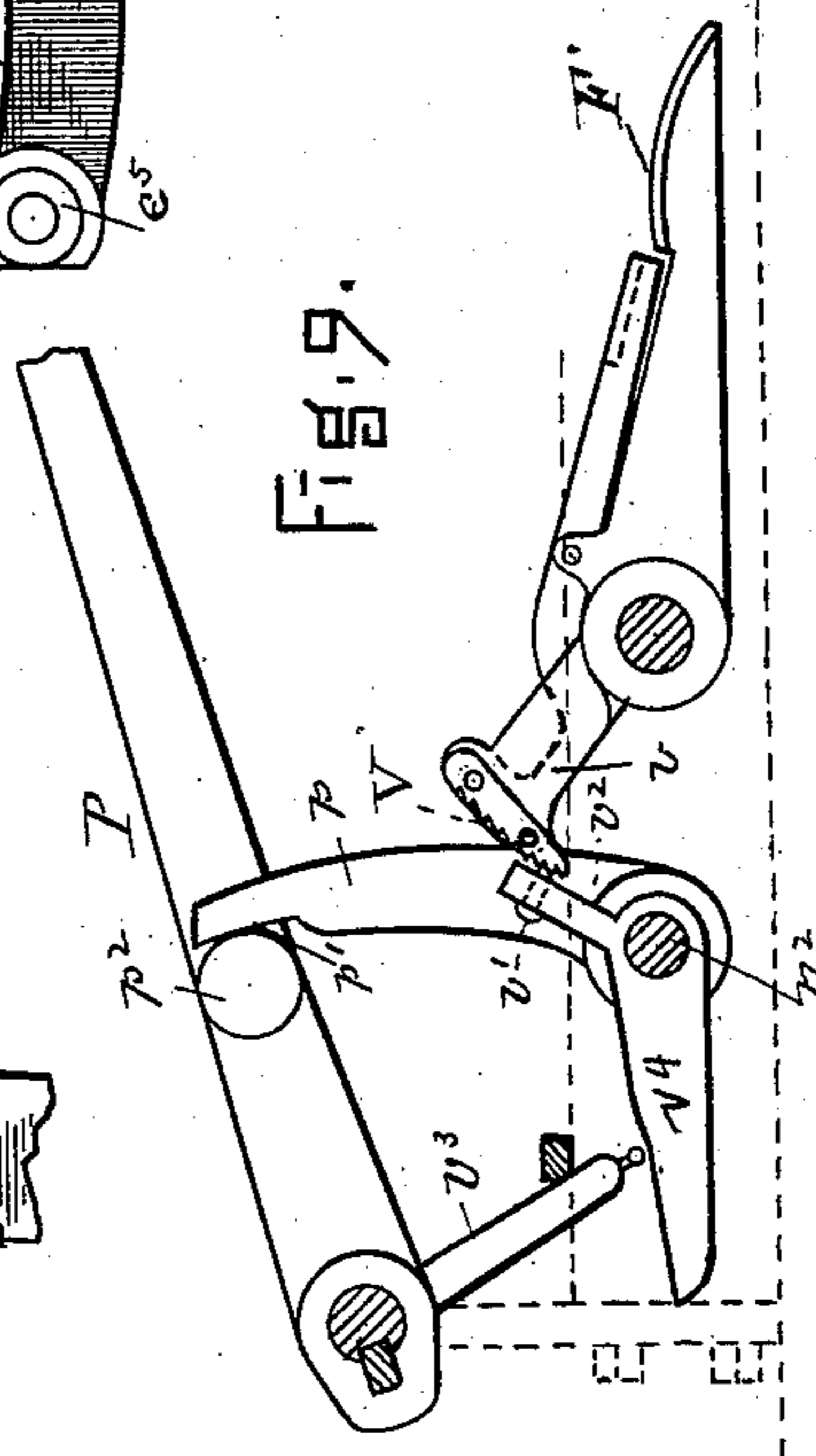


Fig. 9.

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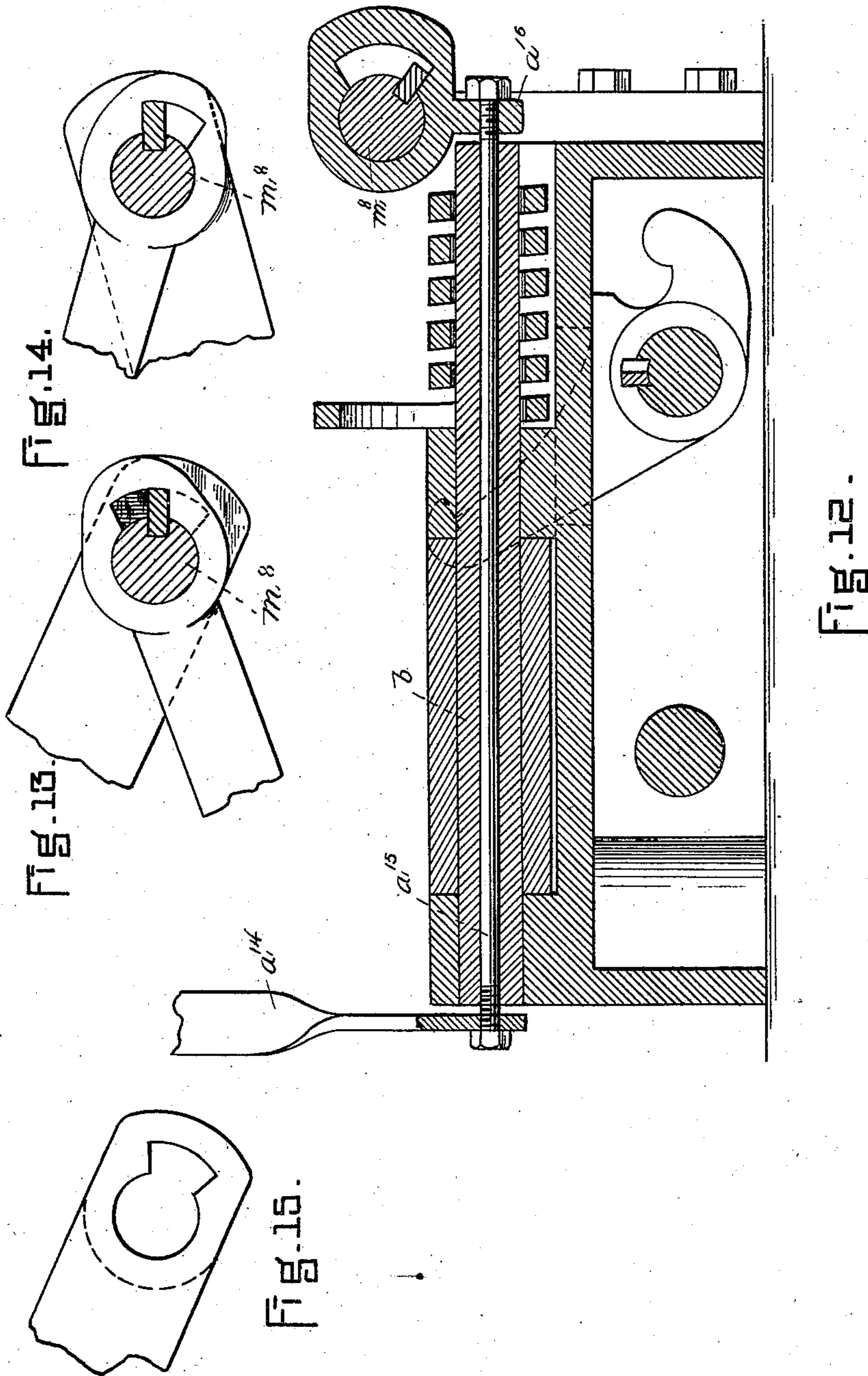
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UNITED STATES PATENT OFFICE.

GEORGE W. COPELAND, OF MALDEN, JOSEPH E. CRISP, OF SOMERVILLE,
AND EDWARD F. GRANDY, OF BOSTON, MASSACHUSETTS, ASSIGNORS
TO THE COPELAND IMPROVED LASTING AND TACKING COMPANY, OF
PORTLAND, MAINE.

LASTING-MACHINE FOR BOOTS OR SHOES.

SPECIFICATION forming part of Letters Patent No. 365,505, dated June 28, 1887.

Application filed March 18, 1887. Serial No. 231,348. (No model.)

To all whom it may concern:

Be it known that we, GEORGE W. COPELAND, of Malden, JOSEPH E. CRISP, of Somerville, both in the county of Middlesex, and
5 EDWARD F. GRANDY, of Boston, in the county of Suffolk, all in the State of Massachusetts, all citizens of the United States, have invented a new and useful Improvement in Machines for Lasting Boots or Shoes, of which the following is a full, clear, and exact description,
10 reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The invention is in some respects an improvement upon that described in Letters Patent No. 329,283; and it relates to various details of organization and construction, all of which will hereinafter be fully described.

In the drawings, Figure 1 is a plan view of
20 a machine having the features of our invention. Fig. 2 is a view in side elevation thereof, a portion of the frame being removed to show the part of the mechanism concealed thereby. Fig. 3 is a vertical central section of the machine upon the line $x x$. Fig. 4 is a view in
25 vertical section upon the line $z z$ of Fig. 1. Fig. 5 is a vertical section upon the line $y y$ of Fig. 1, the heel-folding plates being thrown back. Fig. 6 is a plan view, enlarged, of the lower part or base of the machine and the various operating-treadles. Fig. 7 is a detail
30 view showing a part of the heel-lasting mechanism. Fig. 8 is a view, part in plan and part in section, of a portion of the heel-lasting devices. Fig. 9 is a detail view representing a
35 portion of the unlatching mechanism. Fig. 10 is a detail view representing the construction of the toe-support and toe-downhold. Fig. 11 is a cross-section, enlarged, through the jack-post or bar and its locking mechanism.
40 Fig. 12 is a view which illustrates a part of the mechanism for holding and counterbalancing the jack-post and the support for the heel-lasting devices. Figs. 13, 14, and 15
45 show portions of the treadle mechanism. Fig. 16 is a view in elevation of the upper part of the toe end of the lasting-machine.

The machine is represented as adapted to be operated entirely by hand, and it has all

the component parts of a power-machine, excepting toe-lasting devices.

On account of the construction of the side-lasting devices it is desirable that the machine shall be so constructed that the last may be placed upon its support and then moved horizontally from the rear or heel-lasting end of the machine into the side-lasting mechanism and toward the toe-support, and to accomplish this purpose we have represented the heel-lasting devices and the last at the upper
55 end of vertical supports, which are pivoted by horizontal pivots at their lower ends, to be movable backward from the remainder of the machine to the position represented in Fig. 3, and when the parts are in this position the
60 spindle a is exposed to receive the last. The spindle is formed upon the end of a vertically-movable post or rod, a' , which is adapted to be moved upward to its highest position by a spring, a^2 , which surrounds a rod, a^3 , (see Fig. 70
3,) which rod extends into a hole in the jack post or rod, the spring bearing against the under surface of the post. The post is supported by the sleeve a^4 , and the extent of its upward movement, due to the pressure of the spring, is
75 limited by the stop a^5 , which enters a long slot in said sleeve.

To graduate or limit the extent of the upward movement of the jack-post, we have formed upon that part of it which is inclosed
80 by the sleeve a^4 the ratchet-teeth a^6 , and we have arranged to engage with said ratchet-teeth the latches a^7 , there being two of them employed, which are held by the laterally-extending section a^8 of the sleeve, and are moved
85 into contact with the ratchet-teeth of the post by the springs a^9 , (see Fig. 11;) and their teeth a^{10} are not on the same line, one set being arranged above the other a short distance to provide the post with a more limited range of
90 adjustment than if only one were employed.

To disengage the latches from the ratchet-teeth of the post, we use the slide-stud a^{11} , (see Fig. 11,) which passes through holes a^{12} , formed in the latches a^7 , and also through holes in the
95 section a^8 of the sleeve. This stud has the inclined surfaces a^{13} , which bear against the correspondingly-inclined surfaces upon the

latch-bar a^7 , so that upon the horizontal movement of the stud in one direction its inclines, moving against the inclines of the latches, throw them out and cause their teeth to be removed from the teeth of the ratchet upon the jack-post, and upon the reverse movement of the spindle a^{11} the spring a^9 returns the latches to their original position or in position to engage the ratchet-teeth of the jack-post. This horizontal movement is communicated to the spindle a^{11} by means of the arm or lever a^{14} , (see Fig. 12,) the rod a^{15} , and the lug a^{16} upon the shaft m^8 , and upon the turning of this shaft to release various latching devices hereinafter referred to the latches a^9 are moved out of engagement with the jack-post, and the spring a^2 then acts to lift it to its highest position.

The sleeve a^4 , which supports or carries the jack-post, is formed upon the upper end of the swinging arm or support B, which is pivoted at its lower end to the shaft b , and has an arm, b' , which extends downward to come in contact with the upper surface of the base-plate b^2 , to act as a rest in holding the jack-post and the heel-lasting devices, hereinafter specified, in their open or inclined position. There is pivoted to the swinging arm or support B, at c , the frame C, (see Figs. 2 and 3,) which carries or supports at its upper end the head carrying the heel lasting plates C' C^2 and the heel-downhold C^3 . The heel-lasting plates are operated or moved by means of a lever, c' , which is pivoted at c^2 , and is attached to the links c^3 c^4 by the link c^5 . (See Fig. 1.) The link c^3 connects the end of the link c^5 with the folding-plate C' by means of a pin which is pivoted to slide in the curved guiding-slot c^6 , and the link c^4 connects the link c^5 with the folding-plate C^2 by means of a pin which slides in the curved guide slot c^7 . These plates are supported in a head, C^4 , which is provided with a number of adjustments for the purpose of permitting the plates C' C^2 to be moved inward upon the surface of the insole at any required angle, and generally so as to be moved upon a line substantially parallel with the upper surface of the insole or bottom of the last. These movements or adjustments of the head C^4 are of two kinds—first, that obtained by tilting the head as a whole upon a horizontal center, which is at or near the center of the downhold, whereby the plates are adjusted vertically upon that center to approximate or conform to the inclination of the bottom of the last and so that they may close upon a plane substantially parallel therewith; and, second, a vertical adjustment or movement of each of the plates independently of the other. These adjustments are necessary, because the heel end of the last is shaped to render them essential for good lasting. The head carrying the heel-lasting plates is so supported and attached to the jack-post that it moves a greater relative distance from the side-lasting mechanism than the jack-post, so that upon moving both of them outwardly (and they are

adapted to be moved simultaneously) the heel-lasting plates travel a greater distance than the jack-post, and consequently away from the heel end of the boot or shoe, so that at the end of both their outward movements the shoe is entirely free from contact with either the heel-lasting devices or the side-lasting devices and so that it may be readily removed with its last from the last-pin; and this also leaves the last-pins in a position to receive the last without bringing it in contact with any of the lasting devices, and also brings the last and the upper to be lasted thereon into such position in relation to the side-lasting devices that the movement of the jack-post into a vertical position also brings the last and upper into proper relation to the side-lasting devices; and not only this, but the heel-lasting plates are returned to operative position simultaneously with the movement of the jack-post to bring the last and upper into working relation to the side-lasting devices, so that when this position is assured the heel lasting devices are also in position for operation.

The head C^4 , which supports the heel-lasting plates, is composed of the two plates E E' , each of which is pivoted at e (see Figs. 2 and 7) to the vertical support e' . This vertical support is vertically adjustable on the post C by means of slots e^2 , (see Fig. 3,) formed in said post, and the bolts e^3 , which extend from the support e' into said slots, and the ends of which receive locking-nuts. This provides for the vertical adjustment of the plates E E' . The heel-lasting plates are carried or supported upon the upper surface of these plates E E' , and are guided thereon and held thereto by the guiding-surfaces e^4 and rolls e^5 (see Fig. 8) and a covering-plate in two parts. The heel-lasting plates are thus given a movement upon their head, which is guided or controlled by the shape of the surface e^4 , the shape of the plate itself, and the position of the rolls e^5 . The plates E E' are held in very nearly a horizontal position upon the vertical support e' by means of the spring e^6 , (see Figs. 3 and 7,) which passes over the pivot-bolt e^7 and bears at its lower end, e^8 , against the cross-bar e^9 of the vertical support e' and at e^{10} against the under surface of the plates E E' . This spring also serves to support at its end e^{11} the heel-abutment e^{12} , which yields horizontally. (See Fig. 7.)

There is arranged upon each side of the heel-downhold E^3 a finger, D, which is adapted to press a section of the edge of the upper upon each side of the heel-downhold, between it and the parts operated upon by the plates C' C^2 , down upon the surface of the insole. These fingers have a downward-swinging movement, being attached to a shaft, d , (see Fig. 7,) to swing or move downward upon an arc of a circle. They are provided with this downward movement by means of arms d' , which are fastened to the shaft d , which supports the fingers, so that the shaft and the arms in effect make a rock-shaft; and to

the ends of these arms d' are secured downward-extending pieces d^2 , (see Figs. 2 and 7,) having outwardly-extending shoulders or hooks d^3 at their lower ends, which are adapted to be engaged by the levers d^4 when the heel-lasting devices have been moved into operative position. The springs d^5 (see Fig. 2) attached, respectively, to the plates E E' and to the links d^6 , which connect the arms d^2 with the vertical support e' , serve to elevate or return these fingers to their vertical position upon the backward movement of the heel-lasting devices. The shaft d is supported by hangers d^7 , (see Fig. 7,) extending from the plates E E', which have holes sufficiently large to permit the vertical movement of one plate in relation to the other upon said shaft. The plates E E' are prevented from being thrown upward beyond a certain height by means of a stay-rod, which extends from one of the plates to a cross-bar on the vertical support e' . The downhold E³ is provided with a slight vertical movement in relation to the lasting-plates against the pressure of two springs, E¹⁰, (see Fig. 7,) one of which is fastened to the section E of the head and the other secured to the section E', and both of which bear against the upper surface of the downhold. The fingers D are moved downward by means of the levers d^4 , the push-rod F, (see Figs. 2 and 3,) the treadle F', (see Fig. 1,) the shaft f , (see Fig. 3,) and the arms f' and links f^2 , connecting the arms with the lower end of the rod F. Upon a downward movement of the treadle the shaft f is turned, the rod F lifted, the levers d^4 forced downward to engage the hooks or shoulders d^3 . This action not only serves to draw the fingers D down upon the upper surface of the last, but also to lock the head in proper relation to the surface of the heel of the last or of the insole thereon. The head carrying the heel-lasting devices is locked automatically in place at the end of its inward movement by means of notched latching bars G, (see Fig. 3,) which engage the notched latches g in the horizontal arms g' , extending inward from the upper end of the support C, each of which latching-bars is pivoted at g^2 and is held in its highest or engaging position by a coiled spring, g^3 , (see Fig. 3.)

The side-lasting devices comprise the rear side pressers, H H', (see Fig. 4,) and the lasting-straps M. Each of the said rear pressers, H H', is mounted upon a horizontal arm, H², (see Fig. 1,) which is pivoted to the frame of the machine at H³, the pressers being secured to the ends of these arm by vertical pivots in a manner to provide their working devices with adjustment to the side surfaces of the last. These arms H² are oscillated to move the pressers in and out in relation to the last by means of the spring-arms h , (see Fig. 4,) which are mounted on the levers h' , pivoted at h^2 . The lower ends of these levers are connected by means of links h^3 with a vertically-movable head, h^4 , the head being given or pro-

vided with this vertical movement by means of the rod h^5 , having a slot, h^6 , in its lower end, which receives a pin, h^7 , extending from the side of the operating-lever H⁴. The downward movement of this lever straightens the links h^3 , throws the lower ends of the levers h' outward, and moves the rear pressers into contact with the sides of the last. A spring, h^8 , connecting the two levers h' , serves to throw the pressers H H' outward upon the release of the operating-treadle H⁴.

The side-lasting devices are represented as composed of four pairs of straps arranged in substantially parallel lines, which are opposite each other, and are separated by a space sufficiently large to receive the upper and the last thereon. Each strap is secured at its lower inner end to a coiled spring, m , (see Fig. 5,) which springs are fastened at their lower ends to a rigid support, m' . The upper end of each strap is fastened to a cross cord, m^2 , (see Fig. 1,) which is attached or secured at each end to a separate drawing cord or chain, the drawing cord or chain m^3 running over a pulley, m^4 , to the vertically-movable head m^5 , which is attached to the rod m^6 , extending upward from the arm m^7 , attached to the shaft m^8 , and the other cord being the drawing-cord m^9 , and running over a pulley m^{10} , and extending to a head, m^{11} , which is secured to one of the three operating-treadles m^{12} , which treadles are connected or attached to the said operating-shaft. There is attached to each operating-treadle two draw cords or chains, one of which extends over a pulley upon one side of the machine and is attached to the strap adapted to be drawn from the opposite side of the machine, and the other of which passes over a pulley upon the other side of the machine and is attached to a strap upon the side of the machine opposite it, so that upon the downward movement of the treadle the two straps, one upon each side of the last, are caused to be moved or drawn upward against the side of the last in opposition to their respective springs, and over the edge of the insole, upon the surface thereof. This downward movement of the treadle causes the upward movement of the arms carrying the return cords or chains—that is, the cords or chains which serve to draw or return the straps back to their original position; and this arm also supports or carries two of these return cords or chains, one of which passes over a pulley and is attached to the upper end of one strap or cross-cord, and the other of which is passed over a pulley upon the other side of the machine and attached to a strap or cross-cord upon that side, so that upon the release of the treadle the straps are returned by their springs m to their original positions, and the operating portions thereof are also brought into position to be again drawn upon the upper and last upon the downward movement of the operating-treadle. The straps M may be held separated from each other by means of the holders M', (represented in Fig. 5,) which have a

horizontal movement, to follow the movements of the strap. The two pairs of straps which operate upon the shank-sections of the last and the section immediately adjacent thereto are attached to the same operating device. Each of the other pairs of straps has an independent treadle.

In operation either set of straps may first be operated—that is, the foremost set, or the second set, or the shank, as preferred. This independent operation of the straps is of advantage in that it gives them a greater range of action and operation upon the work. Each of the operating-levers is adapted to be automatically locked in its lowest position, or after it has strained its straps about the last, and we have represented for accomplishing this purpose each treadle as provided with a latch-lug, n , extending from the side thereof and arranged to engage the gravity-latch n' , which extends upward from the shaft n^2 and into a position to receive the latch-lug and close upon it.

The toe-support is represented in Fig. 10, and it comprises a toe-rest, O , fastened upon the end of the longitudinally-yielding rod o . This rest has a pad for the support of the toe end of the last. The rod also carries the downhold o' , which is pivoted to an arm extending upward from the end of the rod. Its outer end, o^2 , is adapted to bear upon the upper surface of the insole at the toe, and its rear end, o^3 , is in line with the wedge o^4 , which supports the rod o .

In operation the toe-rest is moved into contact with the toe of the last, and upon the movement of the wedge-block the toe downhold is caused to be moved downward upon the insole, so that the last is held at the toe between the rest and the downhold. The toe-rest of course becomes stationary upon contact with the last while the wedge-block is moved. This movement of the toe-rest and wedge-block is provided by means of the lever o^5 , which is pivoted at o^6 , and which is connected with the wedge-block by a pin, o^7 , which enters a slot, o^8 , in the lever. The lever also has near its outer end a spring-latch, o^9 , which engages the teeth o^{10} (see Figs. 1 and 2) of a ratchet-bar, o^{11} , so that the rest and downhold are caused to be locked in any position to which they may be moved by the lever. There may also be used a presser-block, o^{12} , to bear against the under surface of the last, or rather the upper thereon, upon the median line between the instep and the center of the toe-rest. The block serves two purposes—first, to bring the upper in contact with the surface of the last upon that line and upon sections adjacent thereto, and also to hold it thereon during the straining action of the straps. It is necessary that this block should have a vertical movement, and we have represented it as obtained by securing it to an arm, o^{13} , which is pivoted at o^{14} to a support extending downward from the rod o , the end of the arm being extended sufficiently to come into line with the surface o^{15} , so that upon the movement of the block in relation to the rod the part of the arm or le-

ver with which it comes in contact is moved downward, and the other end moves the presser upward. The presser is pivoted horizontally to the arm o^{13} , to enable it to automatically conform to the part of the last with which it comes in contact.

It is desirable, in order to save time, that the various devices which have been moved into operative position during the process of lasting should be quickly returned to their original position, both in order that the work may be quickly removed from the machine, and also that they may be in proper position for doing their work upon the next boot or shoe in order; and we have provided or arranged each of the operative devices so that the movement of a single treadle shall cause them all to be released and moved to their normal or original positions—that is, upon the completion of the lasting and the downward movement of the treadle P , the head carrying the heel-lasting plates is released, the head automatically falls back, as does also the jack-post and the last and lasted upper thereon, the heel-lasting plates are moved backward by their spring and the heel-fingers D upward, the strain upon the side-lasting straps is released, and the side pressers also opened and the toe-support moved backward to release the toe. To accomplish this result we attach the releasing-treadle P to the shaft m^8 , which carries the treadles for operating the side-lasting straps, which treadles have a sufficient amount of lost motion upon this shaft to permit their movement thereon without turning it. The treadle, however, is fixed rigidly to the shaft. It is also connected by means of the arm p (see Fig. 9) to the shaft n^2 , which carries the latches. This arm has an inclined surface, p' , upon which a pin, p^2 , attached to the side of the treadle P , comes in contact upon its downward movement and moves the arm sufficiently to partially rotate the shaft. This rotation of the shaft moves the latches n' from engagement with the latch-blocks n , and relieves the strap-treadles H' . The treadle also releases the side-latching levers, which comprise a ratchet, V , upon an extension, v , of the lever F' , which engages a pawl, v' , carried by the arm v^2 , by means of an arm, v^3 , which extends downward from the lever B and comes in contact with the arm v^4 , attached to the pawl-arm v^2 , and unlocks the pawl from engagement with the ratchet, so that the lever F' is also released. There is attached to the shaft m^8 an arm, X , which is connected by means of a rod, x , with a lever, x' , the end of which is connected with the spring-latching pawl o^9 of the handle o^5 for moving the toe-rest, so that upon the movement of this shaft this spring-pawl is disengaged, and a spring serves to withdraw or move the lever and rest to their original position. The releasing-treadle P is connected with the latch-levers G by means of the shaft m^8 , the arm m^7 , and the rod z , (see Fig. 3,) extending from the arm to the end of a lever, z' , which is connected with the ends

of the levers G in a manner to cause the latch end to be moved down and the head C' disengaged or unlocked from the rest of the machine. A coiled spring, Y, which surrounds the pivot b, (see Fig. 12,) has one end fast and the other end, y, engaged with the post B, counterbalances the weight of the head C' and jack-spindle upon their outward movement, so that said movement is made easily.

From what we have said it will be seen that this machine is organized to last the entire upper, with the exception of the toe, which is lasted upon a separate machine, for which we have made application for Letters Patent of even date herewith. By thus dividing the work between two machines, one of which is organized to last the sides and heel end of the upper and the other the toe, we are enabled to use comparatively simple lasting devices in each machine for each section or part of the upper lasted, and are also enabled to operate them entirely by hand instead of by power.

The operation of the machine in lasting the heel and sides of the upper is substantially as follows: The insole is placed upon the bottom of the last and the upper adjusted to the last and secured to the insole at its toe and heel end by one or more temporary fastenings. The machine when in a position to receive the last has the last-spindle exposed and the heel-lasting devices moved backward from the side-lasting devices, substantially as represented in Fig. 3. This brings the pin of the jack-post into a position removed from other parts of the machine, so that the last may be placed thereon quickly without interference with any of the operative parts of the mechanism. It also brings the last and work in position for the proper presentation of the upper to the side-lasting devices, which, on account of the nature of their construction and manner of operation, demand that the last and upper thereon be presented to them horizontally from the rear end of the machine, the last and upper being moved between the side-lasting straps and beneath their operating-cords, which, of necessity, must extend over the surface of the insole when the last is in position to be operated upon by the side-lasting devices. In Fig. 3 we have shown the last with the upper thereon in the position which it bears to the side-lasting devices immediately before it is moved into operative position therewith; and in Figs. 1 and 2 we show the position of the jack-post, the last, the side-lasting devices, and heel-lasting devices when in operative relation to the work. The head carrying the heel-lasting devices and the jack-spindle are supported by long vertical supports or arms so pivoted to each other and to the base of the machine that they are movable together, and the head carrying the heel-lasting mechanism moves somewhat faster than the jack-spindle; but they are so hung that when the last is in proper relation to the side-lasting devices the heel-lasting mechanism has

also been moved into proper relation to the side-lasting devices and the last, while upon the outward or backward movement of the spindle and the head, the head, moving faster than the spindle, moves away from the last and so as to leave the spindle in a somewhat isolated position. Moreover, the spindle, by its lifting-spring, has been raised so that it is brought into its highest position to receive the last, and upon placing the last thereon the spindle and the jack-post are moved down sufficiently to bring the last into proper position in relation to the lasting devices, and the last and the spindle are then automatically locked in that position. The spindle and the head are then moved to bring the last and upper into operative relation with the side-lasting and heel-lasting devices, and upon the movement of the head carrying the heel-lasting devices into place it is automatically locked to the frame supporting the side-lasting mechanism by the latches G. Before the upper is lasted in any part the toe downhold and rest are moved against the toe end of the last to clasp it firmly beneath the heel-downhold and against the heel-abutment, and they are then locked in that position. Any part of the upper may be first lasted, and this may vary according to the preference of the operator. Supposing, however, that it is the heel-section that is first lasted, the rear side-clamping abutments are moved into position against the side surfaces of the last at the heel end thereof by the treadle H', (which is also lettered m¹²,) the treadle not being moved its entire vertical distance to bring the abutment into contact with the sides of the last. This movement of the abutments, however, may be considered a portion of the jacking of the last. The heel-lasting fingers D and the head carrying the heel-lasting devices are then moved downward slightly to bring the folding-plates into proper relation to the surface of the insole by means of the treadle F' and the levers d'. This downward movement of the head is in opposition to the spring e¹⁰. The sliding heel-lasting plates are then moved over the surface of the insole to fold sections of the edge of the upper upon the surface thereof, and the pressure of the same upon the edge of the upper is increased by moving the treadle F' still farther downward. We would say that the downward movement of the head caused by the lever F' also moves the fingers which fold the sections of the upper immediately adjacent to and upon each side of the heel-downhold upon the surface of the last before the lasting plates are moved inward. The side-lasting devices are then operated in successive order, the operator moving the straps along the sides of the last upon the surface of the insole in such order as he desires by the downward movement of their respective treadles m¹², and each treadle as it is moved downward is locked automatically in position at the end of its downward stroke. Hand-pinchers are used by the operator, espe-

cially at this point of the lasting, to draw the upper by its edge snugly upon the last immediately in advance of the movement of the straps. The edge of the upper is then secured to the insole by fastenings, preferably driven from a small portable tacking-machine.

To remove the last and its lasted upper from the machine, the organization of the mechanism is such that upon the downward movement of the treadle P the locking devices for holding the various operating devices in the places to which they have been moved by the operator are released to permit their return actuating mechanism—generally springs—to withdraw the various devices simultaneously to their original positions, so that upon this movement of the unlatching-treadle the heel-lasting head is unlatched from the side-lasting frame and the heel-lasting plates released from their strain upon the upper, and are automatically withdrawn, together with the lasting-fingers D, to their normal positions, the toe support and downhold are moved away or forward, the side-lasting straps released and returned to their original positions, and the jack-post released to permit its lifting-spring to raise the last. The heel-lasting head and the jack-post are then moved outward by hand and the last removed from the spindle.

We would say that we do not confine ourselves to the specific forms of mechanism for operating the various lasting devices herein specified, and may use in lieu any other operative mechanism which shall be considered the mechanical equivalent therefor. We prefer that the pin connecting the links c^5 c^3 c^4 of the heel-folding plate mechanism enter a block adapted to fit horizontal guiding-ways in the head, (see Fig. 1,) so that the movement of the lever shall cause each of the plates C' C² to be moved the same distance.

In addition to the stop b' for the bracket b , we provide the support C for the heel-lasting head with a bearing-stop to govern its position while being moved, by extending its lower ends sufficiently to come in contact with the sides of the lugs extending from the base. (See Figs. 2 and 3.) It will be seen that the push-rod F is loosely connected with the ends of the levers d^1 , and as upon the downward movement of the push bar or rod F, caused by the downward movement of the treadle P, the said lever d^1 might not be disengaged from the hangers d^2 , we have connected the ends of these levers with the push-rod F or a bar extending across the end of the same by springs, (see Fig. 2,) so that upon the downward movement of the push-bar the springs serve to draw the outer ends of the said levers downward. It will be seen that the latching or locking of the heel-lasting head to the frame of the side-lasting devices also serves to lock the last or work support in operative relation to the side-lasting devices.

Having thus fully described our invention, we claim and desire to secure by Letters Patent of the United States—

1. In a lasting-machine, the side-lasting mechanism having straps adapted to be drawn about the sides of the last and over its inverted surface, in combination with a last-support or spindle horizontally movable in relation to said side-lasting devices by mechanism, substantially as described, to present the last and upper thereon thereto by a horizontal movement, as and for the purposes described.

2. A lasting-machine having side-lasting straps adapted to act upon the sides of the last and the insole placed thereon, to fit the upper to the sides of the last and fold its edge upon the surface of the insole, supported and arranged, substantially as specified, to provide an unobstructed opening from the rear or back of the machine, and means for moving or inserting the last from the back of the machine horizontally through said opening into operative position or relation to said side-lasting devices, as and for the purposes specified.

3. In a lasting-machine, the side-lasting straps movable in relation to the sides of the last and the insole thereon, by means as specified, and arranged with their supporting-frame to receive the last horizontally from the back of the machine, in combination with a vertical jack-post pivoted, substantially as described, to provide the last with a horizontal or substantially horizontal movement to and from the side-lasting devices, as and for the purposes described.

4. In a lasting-machine, the side-lasting devices comprising straps adapted to be drawn about the sides of the last and over the insole placed thereon, as specified, in combination with the horizontally-movable last-support and horizontally-movable heel-lasting devices, movable bodily toward and from the side-lasting devices to enable the machine to be separated or opened to permit the insertion or withdrawal of the last between them, as and for the purposes described.

5. The combination, in a lasting-machine, of side-lasting devices with a head supporting the heel-lasting mechanism, movable bodily toward and from the side-lasting devices by means substantially as described, to open the machine horizontally to enable the last to be horizontally presented to and withdrawn from the side-lasting devices, substantially as described.

6. In a lasting-machine, the combination of the side-lasting devices, a horizontally-movable spindle or last-support, and a horizontally-movable head carrying heel-lasting appliances, and mechanism, substantially as described, for permitting the movement of the same horizontally in relation to the side-lasting devices and for providing the head with a greater range or length of travel during said movement than is given the last, substantially as and for the purposes described.

7. A lasting-machine having side-lasting devices comprising straps adapted to be drawn upon the sides and over the surface of the insole placed upon the last, to fit the upper

thereto and fold its edge upon the surface of the insole, in combination with the rear abutments, H H', the jack-spindle *a*, the heel-abutment and downhold, and the toe downhold and rest, substantially as described.

8. In a lasting-machine, in combination with side-lasting straps adapted to be drawn about the sides of the last and over the surface of the insole placed thereon, to fit the upper to the last and fold its edge upon the insole, with a horizontally-movable heel downhold and abutment and horizontally-movable jack-post and a horizontally-movable toe rest and downhold, as and for the purposes described.

9. In a lasting-machine, the combination of the horizontally-movable jack-post having a spindle, *a*, the horizontally-movable heel-downhold and heel-abutment, and the horizontally-movable toe support and abutment, as and for the purposes described.

10. In a lasting-machine, the combination of the horizontally-movable jack-post having a spindle, *a*, the horizontally-movable heel-downhold and heel-abutment, the horizontally-movable toe support and abutment, and the rear side abutments, H H', as and for the purposes described.

11. The combination, in a lasting-machine, of the side-lasting devices comprising a series of straps oppositely arranged to each other and adapted to be drawn by their upper ends across the upper surface of the inverted last or insole placed thereon, with jacking devices, substantially as described, for jacking the last and presenting it horizontally to the side-lasting devices, comprising a horizontally-movable spindle and horizontally-movable toe and heel clamping devices, the heel-clamping device being supported to be moved sufficiently from the side-lasting devices to permit the removal of the last from the last-pin or spindle at one side or end of the side-lasting devices, substantially as described.

12. The side-lasting devices comprising a series of straps arranged, preferably, in opposing lines, the lower ends of which are attached to extensible springs or are made extensible, and the upper ends of which are attached to horizontal cross cords or supports, the ends of which upon one side are attached to or connected with levers or arms arranged to draw the cord in one direction, and the other ends of which upon the other side are connected with a lever or arm arranged to draw the cross cords or supports in the reverse direction, substantially as described.

13. The combination, in a lasting-machine, of the side-lasting straps *m*, springs connecting their lower ends to a rigid support, the cross straps or cords *m*², the rolls *m*⁴ *m*¹⁰, the draw-cords *m*³, connected with the movable arms *m*⁷, the draw-cords *m*⁹, connected with the treadles *m*¹², as and for the purposes described.

14. The combination, in a lasting-machine, of the straps M with the side-holders M', substantially as described.

15. The combination, in a lasting-machine, of the rear side abutments, H H', supported at the ends of the horizontal swinging arms *h*², the said arms *h*², the levers *h*¹, connected with said arms by springs or yielding extensions *h*, a treadle and connecting devices for simultaneously moving the lower ends of the levers from each other to move the abutment against the last, as and for the purposes described.

16. The combination, in a lasting-machine, of the rear side pressers or abutments H H', a treadle, and connecting mechanism for causing the horizontal movement of said abutments or pressers, as and for the purposes described.

17. The combination of the side-lasting straps connected with the arms *m*⁷, substantially as specified, and also with the operating-treadles *m*¹², with the shaft *m*⁸, connected with the arms *m*⁷ *m*¹², so that its partial rotation permits the reverse movement of the said arms *m*⁷ *m*¹² in relation to each other, as and for the purposes described.

18. The combination, in a lasting-machine, of the side-lasting devices and a head carrying the heel-lasting plates, horizontally pivoted to its support and held in operative position by a yielding spring which permits it to yield upon said horizontal pivot, substantially as described.

19. In a lasting-machine, a downhold and two upper folding-fingers arranged one upon each side of the downhold and adapted to fold the edge of the upper upon the surface of the insole adjacent to each edge of the downhold by a swinging inward downward vertical movement upon the surface of the insole, substantially as described.

20. In a lasting-machine, the upper folding-fingers, D, pivoted or hung upon horizontal pivots and adapted to be moved vertically upon an arc of a vertical circle upon the surface of the last or the work carried thereby, to fold the edge of the upper upon the surface of the insole, as and for the purposes described.

21. The combination, in a lasting-machine, of the last with the folding-fingers D, pivoted or hung substantially as described, and means, substantially as specified, for moving their free ends vertically upon the arc of a circle down upon the surface of the last or work placed thereon, as and for the purposes described.

22. The combination, in a lasting-machine, of the fingers D, attached to the horizontal shaft *d*, and means for partially rotating the said shaft to move the fingers on an arc of a circle upon the surface of the last or work placed thereon, substantially as described.

23. In a lasting-machine, the combination of the fingers D, the horizontal shaft *d*, the arms *d*¹, hangers *d*², springs *d*⁵, levers *d*⁴, push-rod F, shaft *f*, connected with the rod F, as described, and a treadle, F', for partially rotating said shaft, substantially as described.

24. In a lasting-machine, the combination of the fingers D, connected with the treadle F', with said treadle, whereby upon the move-

ment of the treadle the fingers are moved upon the arc of a circle upon the surface of the last and the work thereon, substantially as described.

25. The combination, in a lasting machine, of side-lasting devices, substantially as specified, a head carrying a heel downhold, E^3 , the heel-lasting plates C' C^2 , and the lasting-fingers D , movable lengthwise the machine, as set forth, the said heel-downhold, heel-lasting plates, and heel-lasting fingers, and a latch or lock for locking the head to the support or frame of the side-lasting devices, whereby the heel-downhold, heel-lasting plates, and heel-lasting fingers are held in operative position in relation to said side-lasting devices, as and for the purposes specified.

26. The combination, in a lasting machine, of side-lasting devices, a head supported upon or by arms pivoted below it and carrying heel-lasting appliances, and movable lengthwise the machine, as described, with a locking or latching mechanism to lock the head or its support to the frame of the said side-lasting devices, and mechanism for automatically unlatching or releasing the locking or latching mechanism, substantially as described.

27. The combination, in a lasting machine, of the frame carrying the side-lasting devices, having a spring-latch, G , with the movable support C , carrying the head-supporting heel-lasting appliances, and adapted to be engaged by the latches G automatically when moved into contact therewith, substantially as described.

28. The combination, in a lasting machine, of a latching device for automatically locking the movable support or head carrying the heel-lasting devices to the frame of the side-lasting devices, with latch-releasing mechanism adapted to be operated by a treadle, and means, substantially as specified, for moving said head or support automatically away from the frame of the side-lasting devices upon the release of said latch, as and for the purposes described.

29. The combination of the heel-lasting head, comprising two lasting-plates, each of which is pivoted to a support and each of which has a vertical movement in relation to the other in opposition to spring-pressure, and one of which supports a heel lasting plate adapted to fold the edge of the upper at one side of the heel-downhold and the other of which carries the lasting-plate, adapted to hold the edge of the upper upon the other side of the downhold, substantially as described.

30. The combination, in a lasting machine, of a support for the heel-lasting plates pivoted to the frame e' at e , the spring e^{10} , the lasting-plates carried by said support, and the frame or support C , upon which the head is vertically adjustable, as and for the purposes described.

31. The combination, in a lasting machine, of the jack-post a' , a bracket, B , having a sleeve in which the post is vertically movable,

the ratchet-teeth a^6 , formed upon the post, one or more latches for engaging the ratchet-teeth, and a spring for moving the jack-post upward, as and for the purposes described.

32. The combination, in a lasting machine, of a jack-post, a' , movable in its support, a spring for moving it upward in relation thereto, and latching or locking devices for locking it in any desired elevation, and a latch-releasing device for releasing the latch to permit the spring to move the spindle upward, substantially as described.

33. The combination, in a lasting machine, of the jack-spindle having ratchet-teeth a^6 , the sleeve a^4 , in which the spindle is movable, one or two latching-blocks, a^7 , carried by the sleeve, having holes extending through them and the inclined surfaces, the spring or springs a^9 and the latching bolt a^{11} , having inclined surfaces adapted to be brought into contact with the inclined surfaces of said blocks, and supported by said sleeve, whereby, upon its lateral movement, the latch block or blocks are moved from disengagement with the ratchet-teeth, as and for the purposes described.

34. The combination of the jack-post a' , moving in a sleeve, a^4 , and having the ratchet-teeth a^6 , with the two latches a^7 , having their teeth upon different vertical lines, one of which only is adapted to engage at one time the teeth of the latch a^6 , whereby the range of adjustment of the post is finer than permitted by the length of its ratchet-teeth a^6 , and a single latch-block, substantially as described.

35. The combination, in a lasting machine, of the jack-post a' , vertically movable in relation to its support B , with said support B , hinged at b , substantially as described.

36. The combination, in a lasting machine, of the jack-post a' , vertically movable in relation to its support B , with said support B , hinged at b , and having the stud b' for limiting the extent of its outward movement, substantially as described.

37. The combination, in a lasting machine, of the jack-post a' , vertically movable in relation to its support B , with said support B , hinged at b and having the stud b' for limiting its outward movement, and a counterbalancing-spring, Y , as and for the purposes described.

38. The combination, in a lasting machine, of the support B , pivoted at b , the jack-post supported thereby, and the frame or support C , carrying heel-lasting devices pivoted at c to said support B , substantially as described.

39. The combination, in a lasting machine, of the pivoted support C , supporting the heel-lasting devices, with the counterbalancing-spring Y , substantially as described.

40. The combination in a lasting machine, of the vertically-movable yielding heel-downhold with the springs E^{10} , as and for the purposes described.

41. In a heel-lasting machine, the toe-support O and the toe-downhold o' , mounted upon a horizontally-movable yielding rod, o , with a

movable block having an inclined surface adapted to be brought against the end of the toe-downhold to move it forcibly upon the toe of the last, substantially as described.

withdrawn to release said toe-support and heel-downhold to permit them to be moved backward, substantially as described.

42. The combination, in a lasting-machine, of the toe-support O, the toe-downhold o' , with the rod or support o , carrying said toe-support O and downhold o' , and a lever, o^5 , for moving said rod o , substantially as described.

43. The combination, in a lasting-machine, of the toe-support O, the toe-downhold o' , adapted to be moved horizontally by the lever o^5 , with said lever o^5 and a latch for automatically locking it in any desired position, substantially as described.

44. The combination, in a lasting-machine, of the pressure-block o^{12} , arranged upon an arm, o^{13} , pivoted to a horizontally-movable support, with a block having a cam or inclined surface movable in relation to the end of said arm to move said presser against the surface of the last, substantially as described.

45. The combination, in a heel-lasting machine, of the heel-lasting plates C' C^2 , shaped substantially as specified, the guides e^4 , rolls e^5 therefor, and the lever e' , pivoted at e^2 , and connecting with said plates by means of the links e^3 e^3 e^4 , substantially as described.

46. The combination, in a lasting-machine, of side-lasting devices comprising side-lasting straps M, which are adapted to be drawn about the sides and over the surface of the last or insole, to fit the upper thereto and fold its edge upon the surface of the insole, with the treadles m^{12} for drawing the same by their upper ends and a latch or locking device for locking the treadle or treadles at the end of their drawing movement, substantially as described.

47. The combination, in a lasting-machine, of side-lasting devices comprising side-lasting straps M, which are adapted to be drawn about the sides and over the surface of the last or insole, to fit the upper thereto and fold its edge upon the surface of the insole, with the treadles m^{12} for drawing the same by their upper ends, a latch or locking device for locking the treadle or treadles at the end of their drawing movement, and a latch-releasing device for automatically unlatching the treadle-locking mechanism to permit the straps to be automatically returned to or withdrawn to their original position, substantially as described.

48. In a lasting-machine, the series of side-lasting straps, each series connected with independently-operating treadles, whereby they are caused to be drawn over the sides and upper surface of the inverted last, with said treadles, adapted to be independently or separately operated or moved, whereby each pair of straps may be moved separately or independently in any order desired, substantially as described.

49. The combination of the latching or locking device for locking the toe-support and toe-downhold in operative position, with the treadle P, connected with said latch, whereby, on the movement of the treadle, the latch is

50. The combination of the latch of the toe-support and downhold-moving device, the lever X' , connected therewith, the rod X and crank-arm connecting the rod with the shaft f^8 , and the treadle P, substantially as described.

51. The combination of the heel-lasting head-latches G with the treadle P and connecting mechanism, whereby, upon the movement of the treadle, the latches are caused to be released from engagement, substantially as described.

52. The combination, in a lasting-machine, of the latch-bar G, pivoted at g' , a spring for moving it in one direction, and a treadle or lever for moving it in a reverse direction, with the head carrying the heel-lasting devices and a latch-block with which said latch G is adapted to engage, substantially as described.

53. The combination of the latches G, pivoted at g' , the rod z , connected with the ends of the latches, as described, whereby, upon its downward movement, the ends of the latches are moved upward, the lever P, shaft m^8 , and arm m^7 , to which said rod z is secured, substantially as described.

54. The combination, in a lasting-machine, of side-lasting devices composed of a series of straps adapted to be drawn about the sides of the last over the surface of the insole thereon, and to be locked automatically when thus drawn, with a toe-downhold and a toe-rest adapted to be locked in operative position, its said lock, and a treadle, P, connected with the latching devices of said straps and said toe-downhold and toe-support, whereby, upon the movement of said treadle, the said latches or locks are withdrawn to release said side-lasting straps and the said toe-downhold and toe-support, substantially as described.

55. The combination, in an organized lasting-machine, of side-lasting straps M, adapted to be drawn about the sides and over the surface of the last, to fit the upper thereto and fold its edges upon the surface of the insole, and locking devices for automatically locking the straps upon the completion of their straining movement, with heel-lasting devices carried by a head movable horizontally in relation to the frame of the said lasting devices, and latching mechanism for locking the head to the frame of the side-lasting devices, and a treadle connected with the locking or latching devices for locking the straps under strain and for securing the heel-lasting head to the side-lasting frame in a manner to move the same to release the said parts upon its movement, whereby said parts are simultaneously unlatched or unlocked, as and for the purposes described.

56. In an organized lasting-machine, the combination of side-lasting straps M, adapted to be drawn about the sides of the last and over the surface of the insole and to be automatic-

ally locked under strain, a horizontally-movable last-support, a horizontally-movable head for supporting the heel-lasting devices, adapted to be latched or locked to the frame of the side-lasting devices, a horizontally-movable toe-support and toe-downhold, and a latch for locking it in operative position, with a single treadle connected with the locking or latching devices of the various parts specified in a manner to, upon its movement, disengage or disconnect them from the parts with which they engage, all substantially as described.

57. The combination, in an organized lasting-machine, of a frame, the side-lasting straps M, treadles for operating the same, and latches or locks for automatically locking the treadles, with a head movable horizontally in relation to the frame, heel-lasting devices carried by said head, and latching or locking mechanism for locking the movable head to the said frame, and a lever connected with said treadle and head locks or latches, substantially as specified, whereby, upon its movement, said locks or latches are simultaneously unlocked or unlatched, as and for the purposes described.

58. The combination of the treadle P with the latches n' and their shaft n^2 by means of the arm p , having the inclined surface or edge p' , and the pin or lateral extension p^2 upon the said treadle, which engages or rides upon said surface p' , substantially as described.

59. The combination of the treadles m^{12} , for

operating the side-lasting straps, the latches or locks n , extending from the sides thereof, and the latches n' , adapted to engage said latch-lugs n , substantially as described.

60. The combination of the treadles m^{12} , connected with the ends of the lasting straps and adapted to draw the same in opposition to the springs m , with the latching-lugs n , latches n' , carried by a shaft, n^2 , and a device for partially rotating said shaft to withdraw or move the latches from engagement with the latching-lugs n , substantially as described.

61. The combination of the lever F' , for operating the fingers D, with its latching mechanism, comprising the ratchet-teeth V on the end of the bar v , and the pawl v' , substantially as described.

62. In a lasting-machine, the combination of the treadle F' , for operating the fingers D, its latching mechanism, and the latch-releasing devices, comprising the pawl-arm v^2 , mounted upon the shaft m^2 , and an arm, v^3 , attached to the treadle P in a position to be brought into contact with the arm v^2 to cause it to be moved to disengage the pawl which it carries from the ratchet-teeth V, substantially as described.

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In presence of—

F. F. RAYMOND, 2d,

FRED. B. DOLAN.