(No Model.)

8 Sheets—Sheet 1.

I. N. FORBES.

LASTING MACHINE.

No. 436,852. Patented Sept. 23, 1890.

Fig. 2.

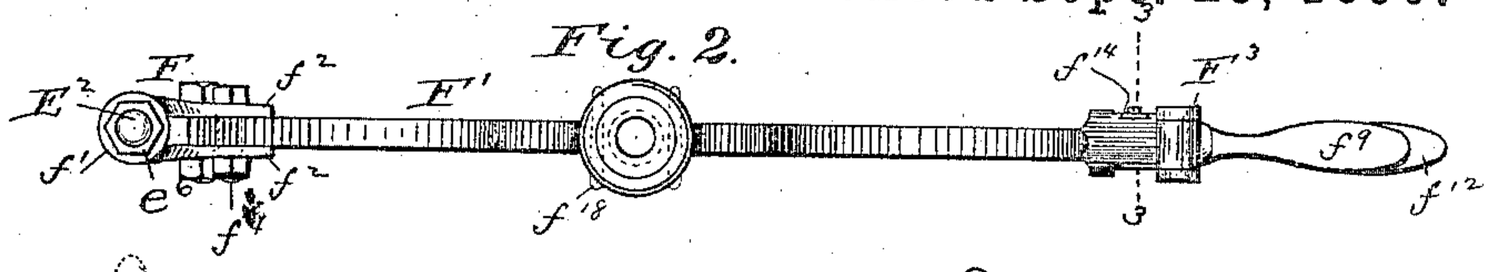
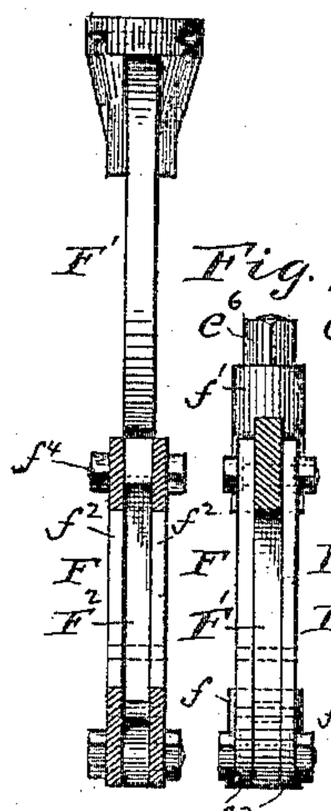


Fig. 6.



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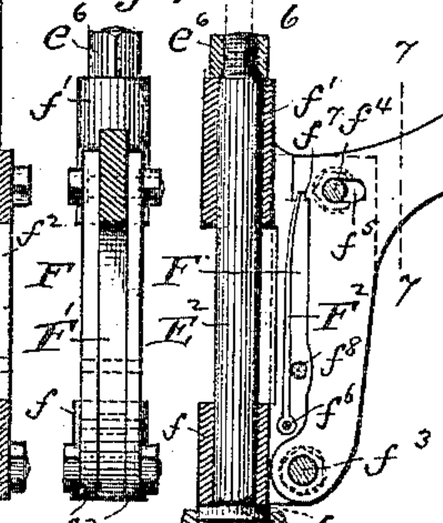

Fig. 1.

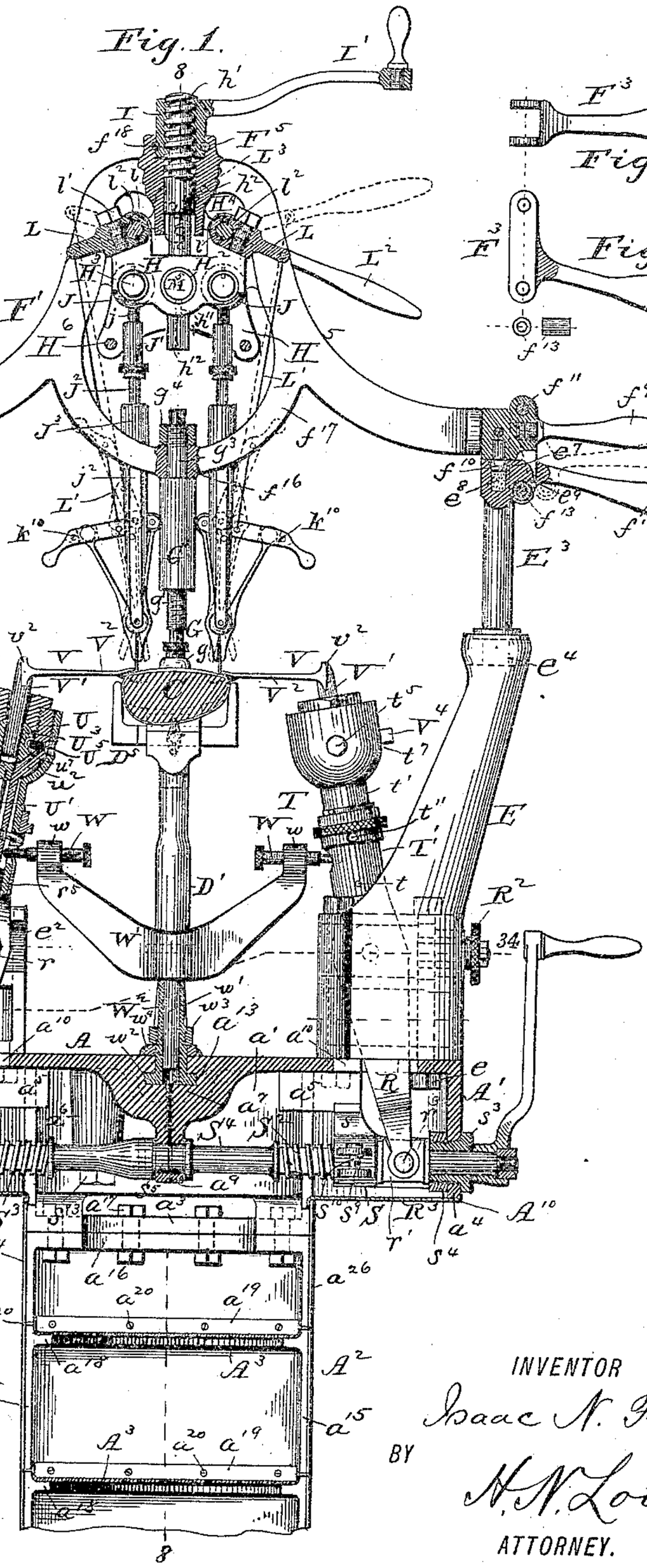

Fig. 4.

Fig. 5.

Fig. 3.

WITNESSES:

E. K. Sturtevant.

D. H. Bury.

INVENTOR

Isaac N. Forbes.

BY

N. N. Low

ATTORNEY.

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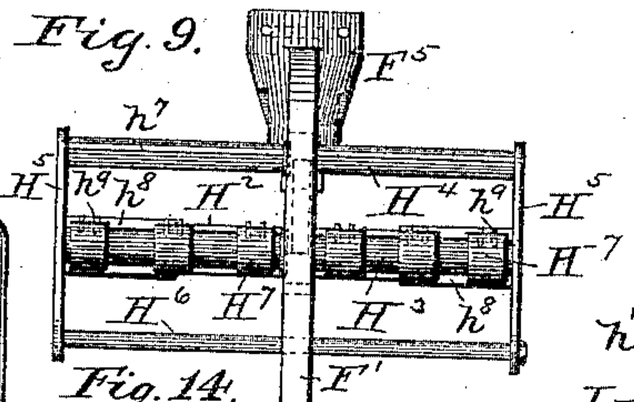
8 Sheets—Sheet 2.

I. N. FORBES.

LASTING MACHINE.

No. 436,852. Patented Sept. 23, 1890.

Fig. 9.



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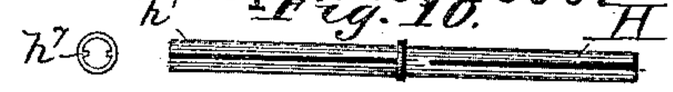
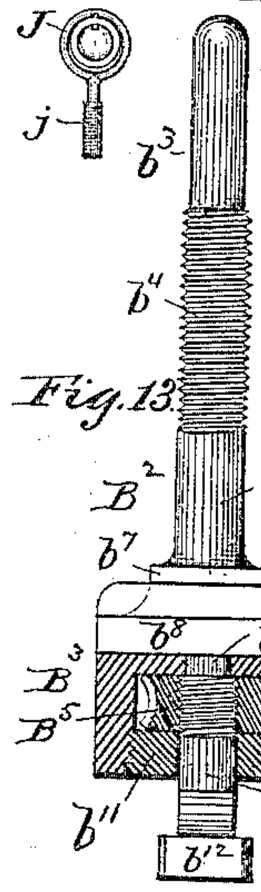


Fig. 11.

Fig. 12



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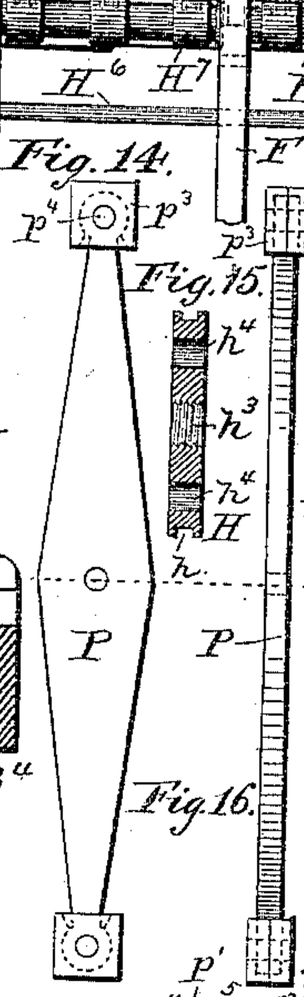


Fig. 15.

Fig. 16.

Fig. 8.

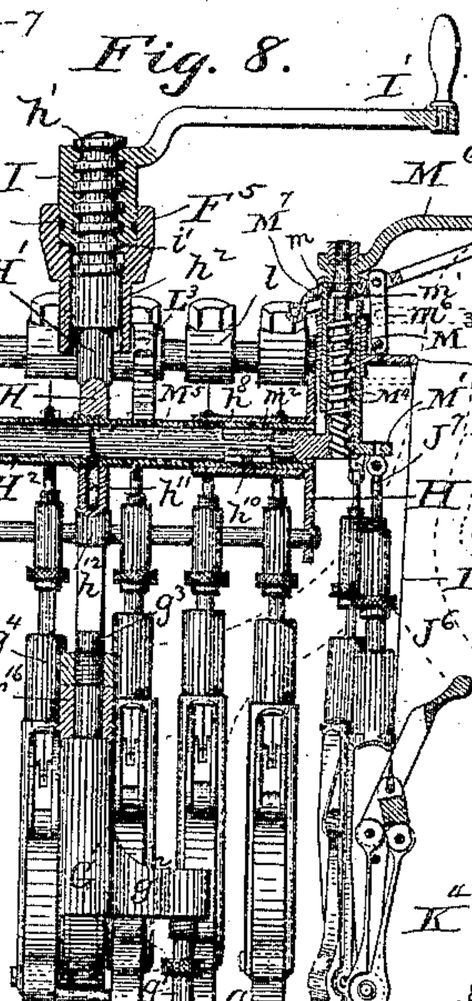
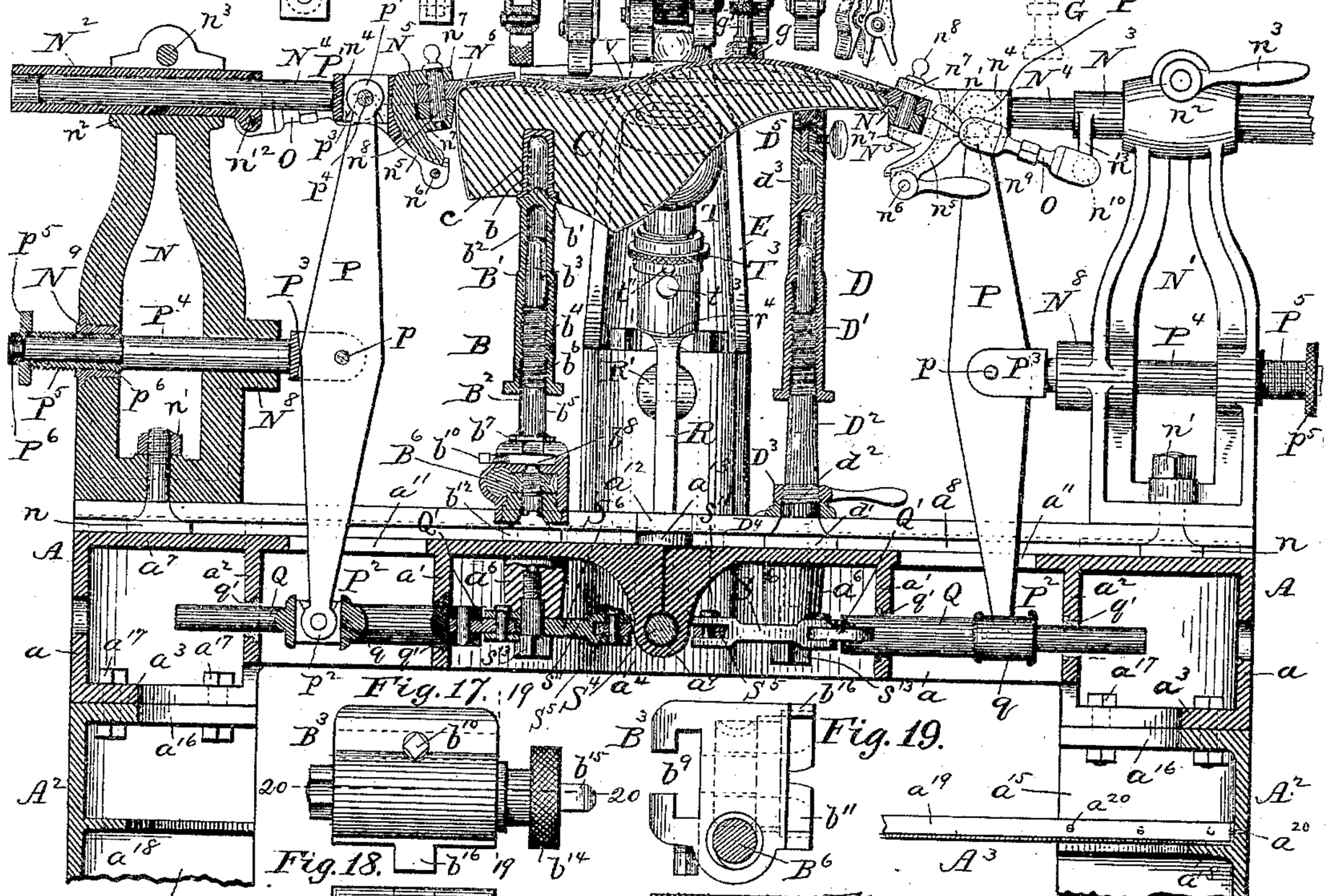


Fig. 13.

Fig. 17.



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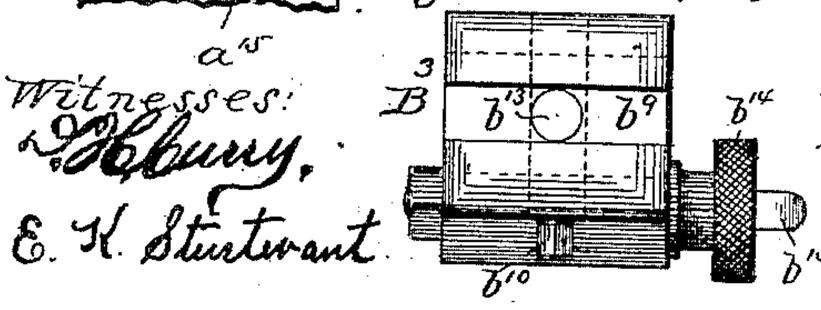

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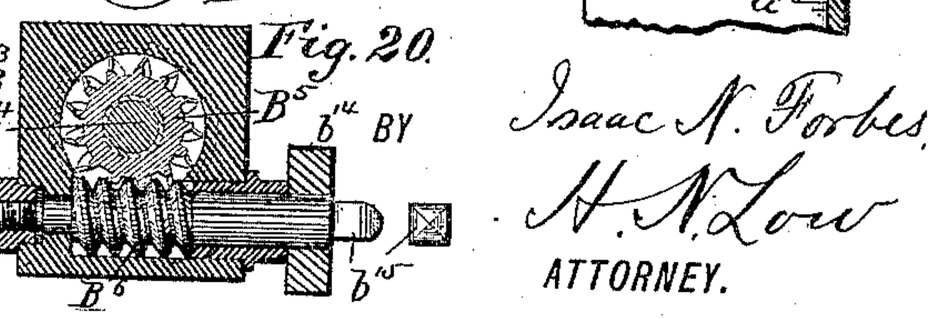

Fig. 20.

Witnesses:
E. Hebury.
E. K. Sturtevant.

Isaac N. Forbes.
BY
H. N. Low
ATTORNEY.

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I. N. FORBES.

LASTING MACHINE.

No. 436,852. Patented Sept. 23, 1890.

Fig. 21.

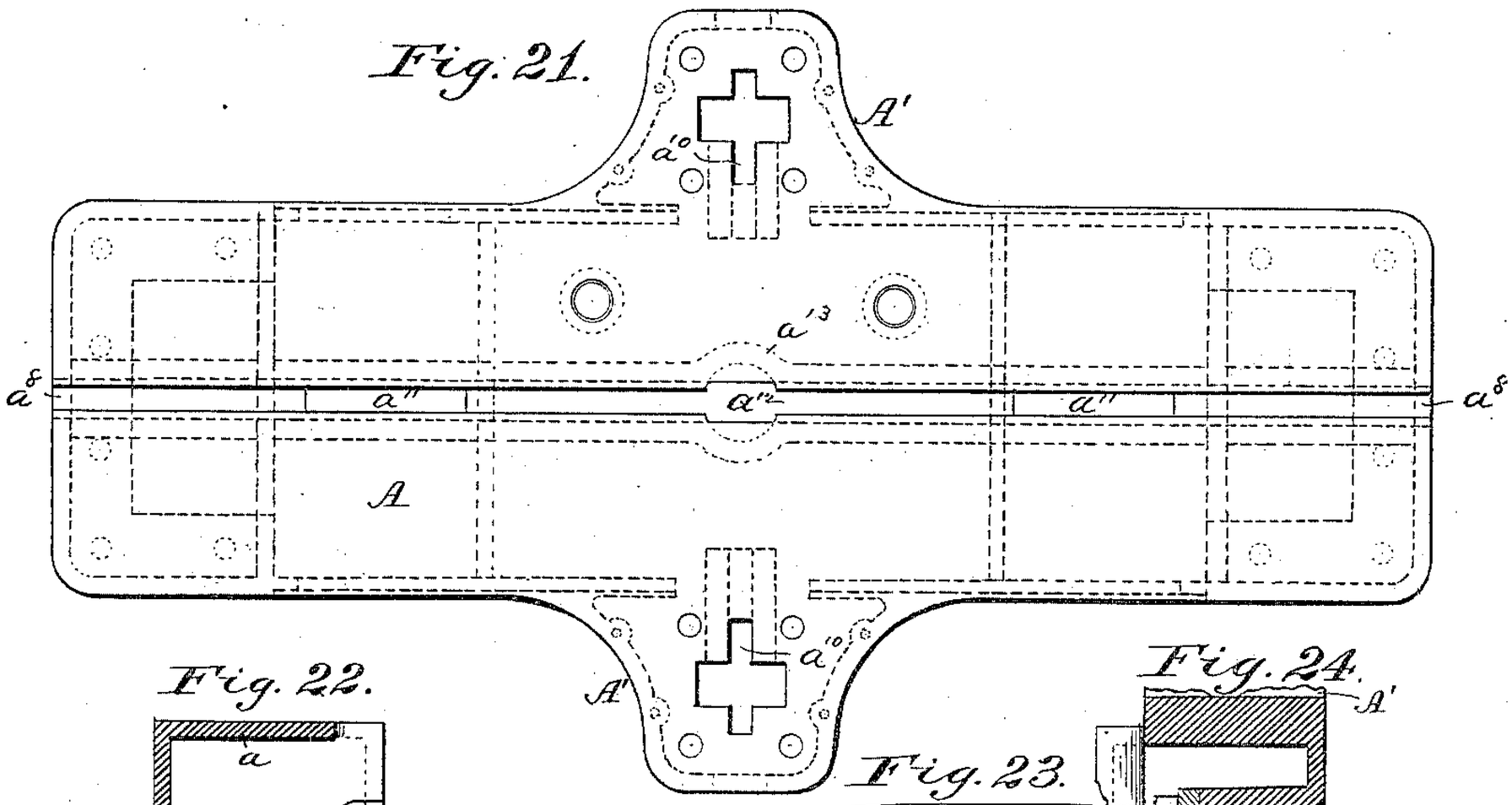
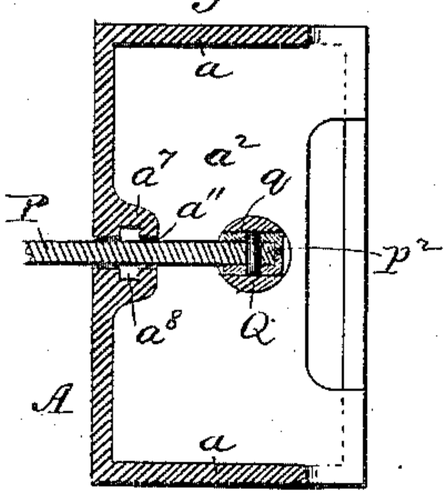


Fig. 22.



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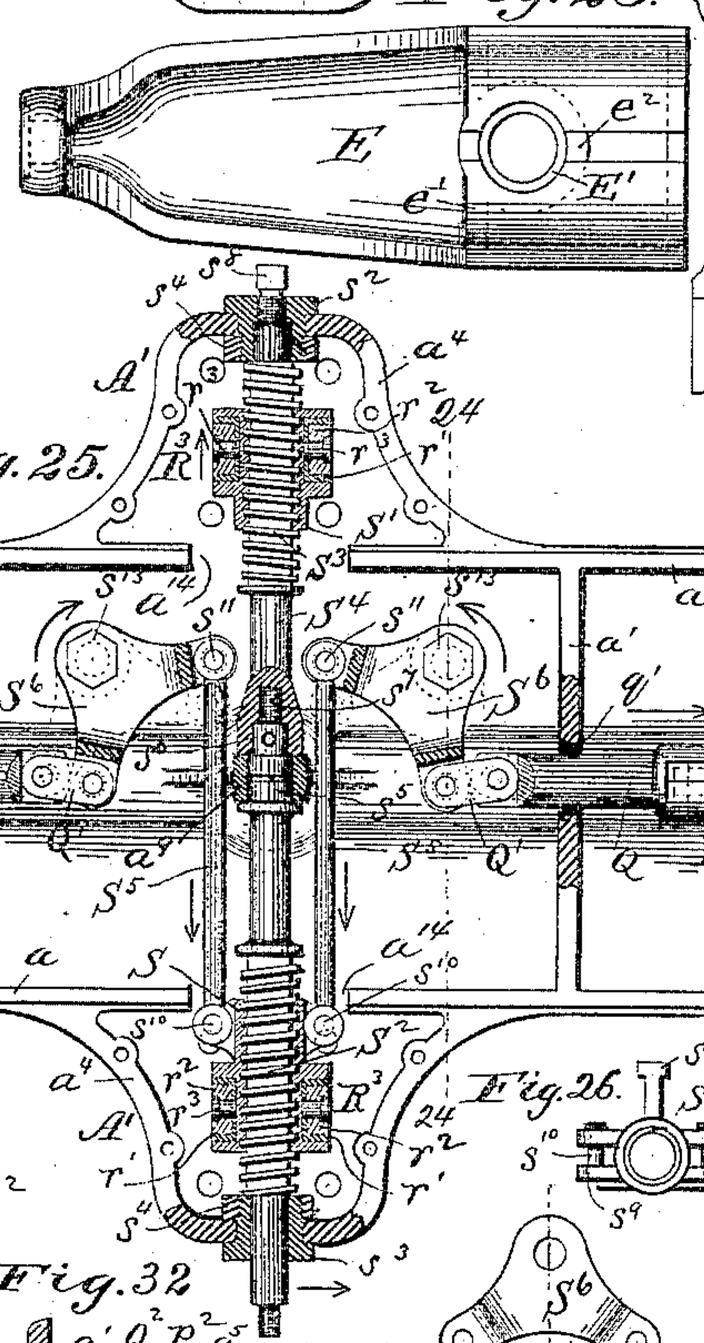

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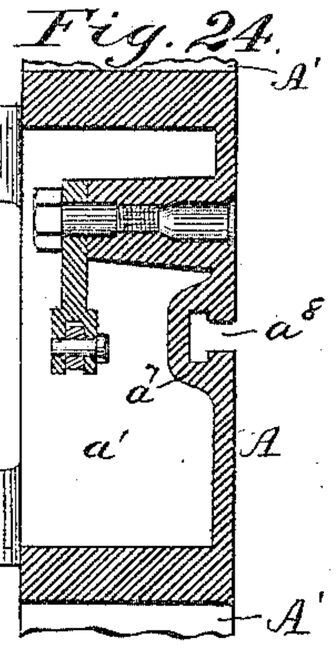

Fig. 25.

Fig. 26.

Fig. 27.

Fig. 28.

Fig. 29.

Fig. 31.

Fig. 32.

Fig. 33.

Fig. 30.

WITNESSES:

E. K. Stuntevant.

D. H. Burry

BY Isaac N. Forbes,

A. N. Low

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(No Model.)

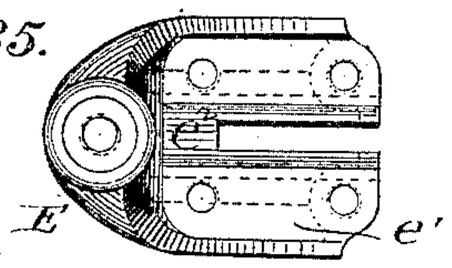
8 Sheets—Sheet 4.

I. N. FORBES.

LASTING MACHINE.

No. 436,852. Patented Sept. 23, 1890.

Fig. 35.



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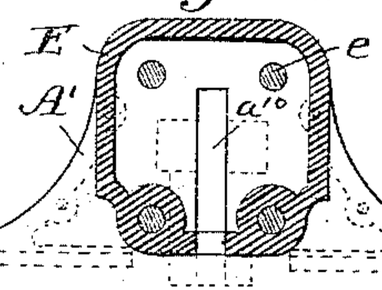


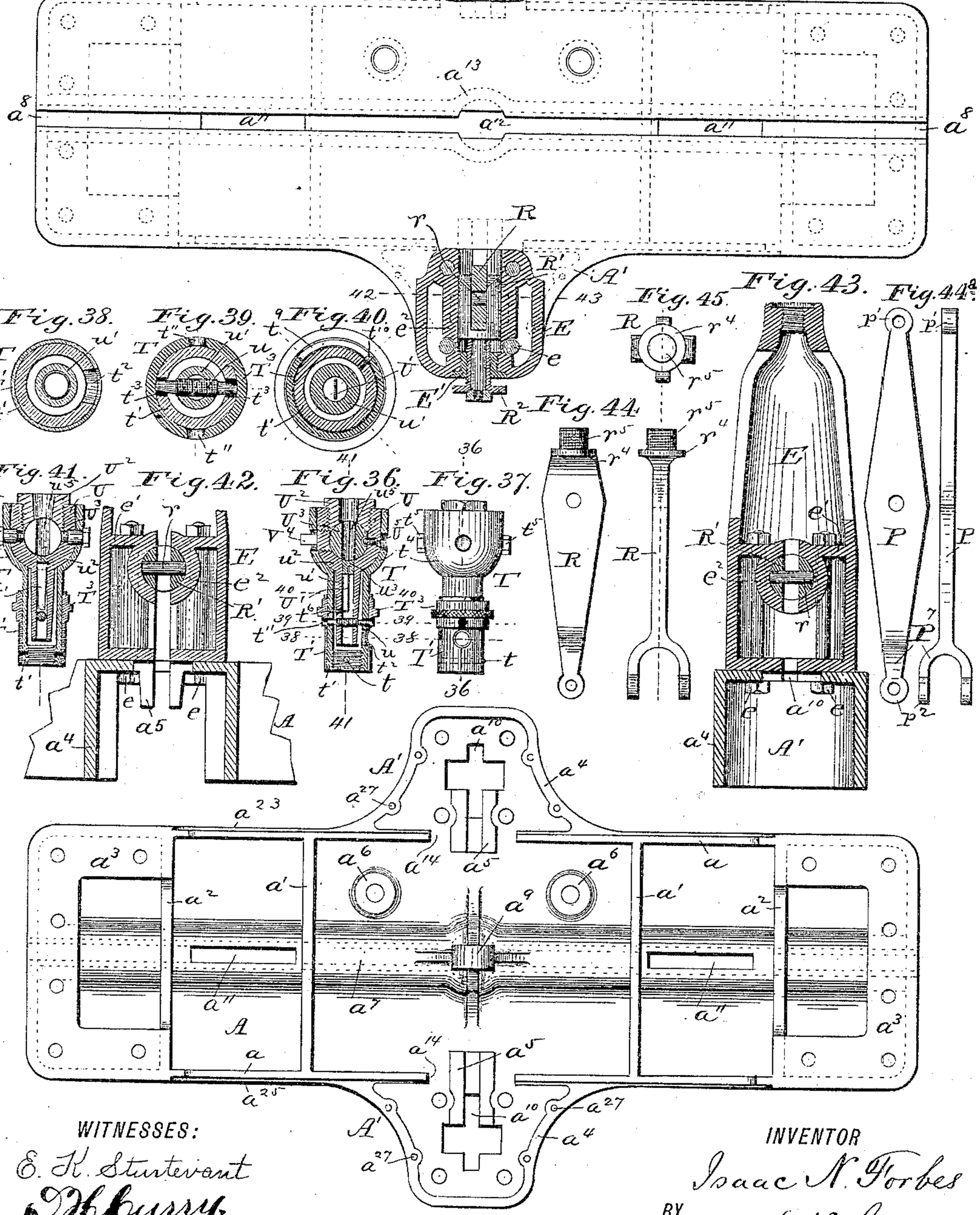


Fig. 38.

Fig. 39.

Fig. 40.

Fig. 45.

Fig. 43.

Fig. 44a.

Fig. 44.

Fig. 41.

Fig. 42.

Fig. 36.

Fig. 37.

Fig. 46.

WITNESSES:

E. K. Sturtevant

D. H. Curry.

INVENTOR

Isaac N. Forbes

BY

H. N. Low

ATTORNEY.

(No Model.)

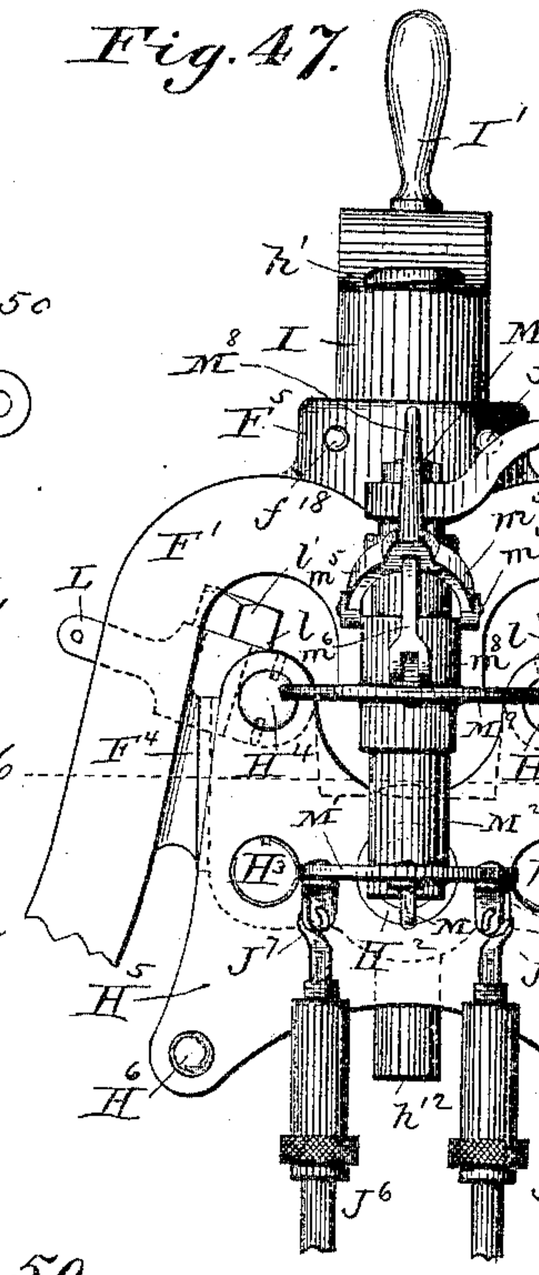
8 Sheets—Sheet 5.

I. N. FORBES.

LASTING MACHINE.

No. 436,852. Patented Sept. 23, 1890.

Fig. 47.



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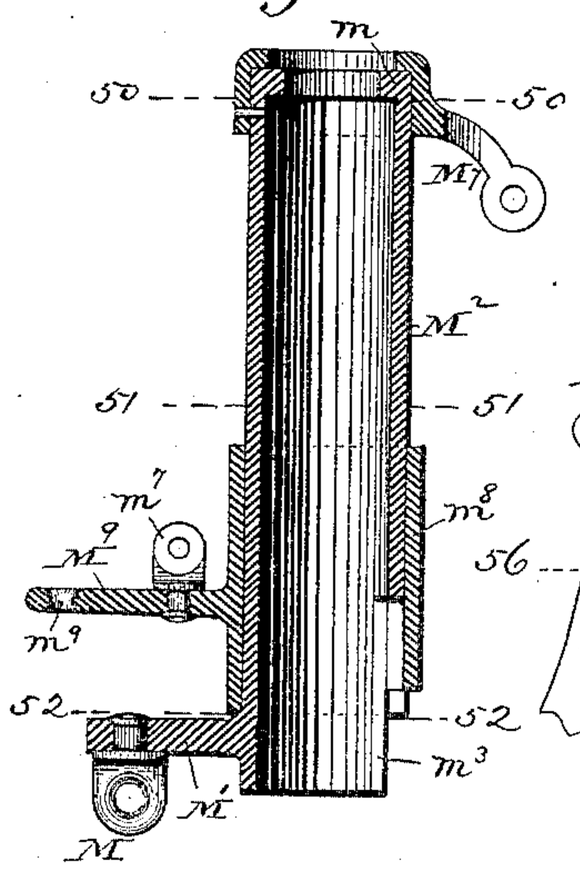

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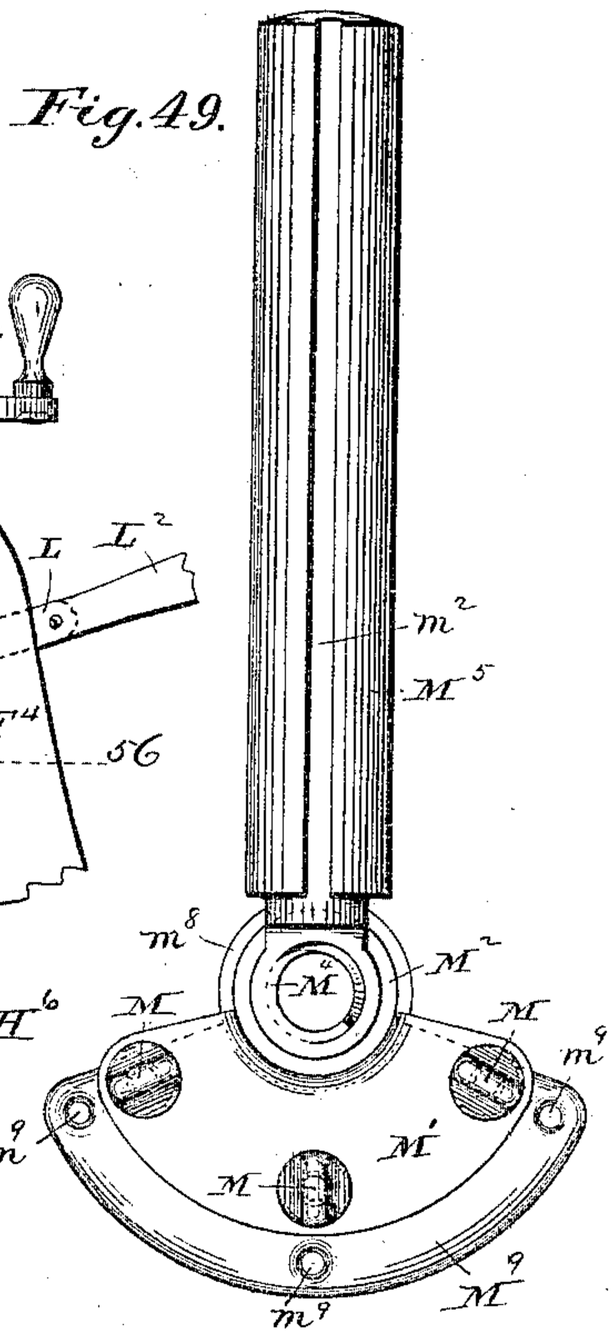

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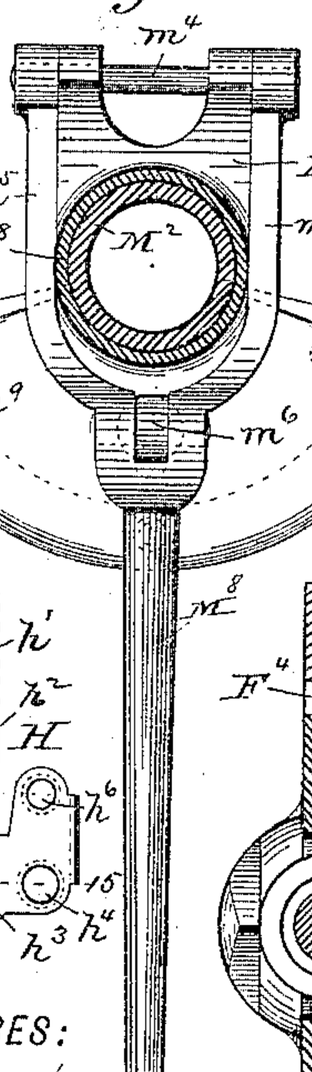

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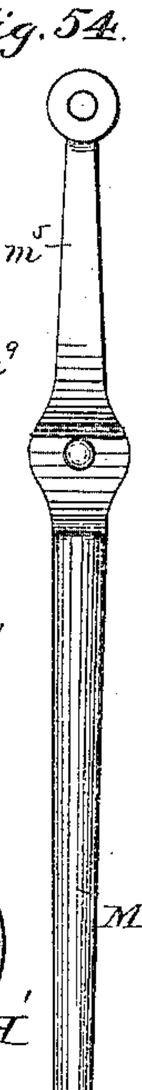

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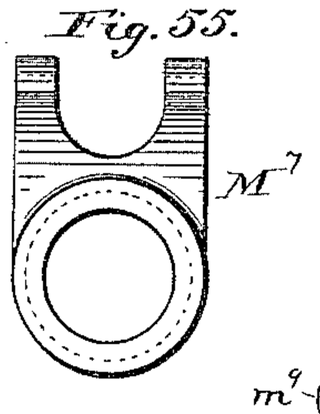

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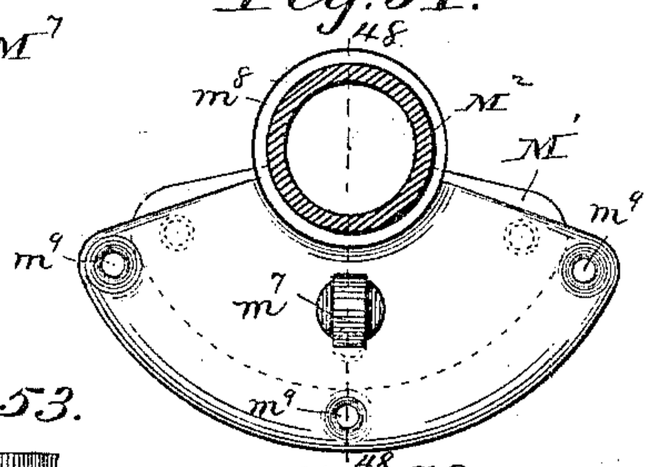

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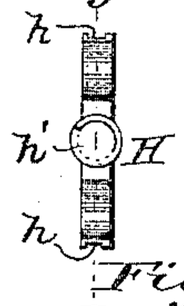

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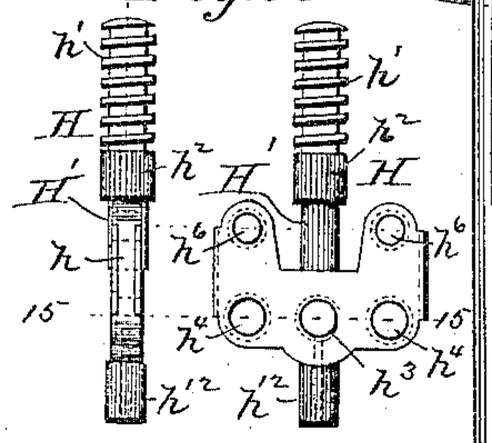

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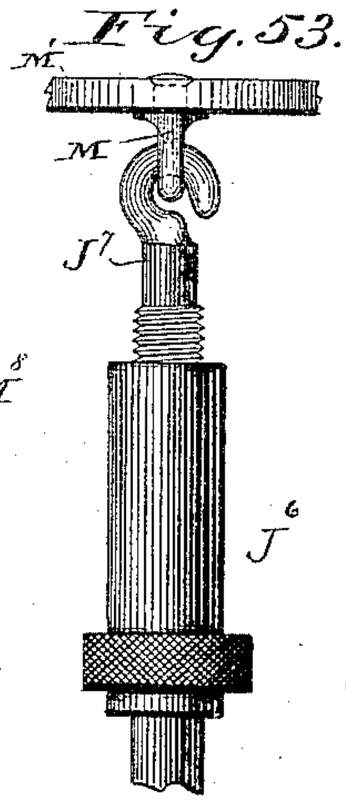

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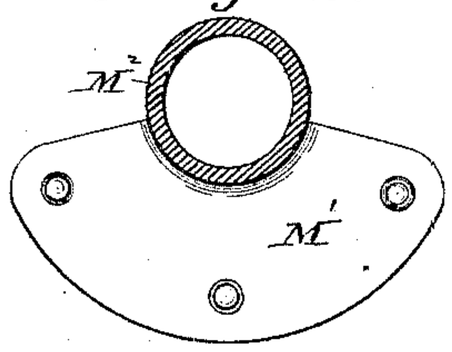

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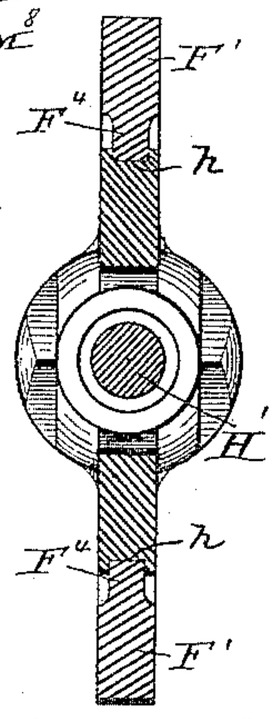


WITNESSES:

E. K. Stuntevant

D. H. Curry

INVENTOR

Isaac N. Forbes.

BY

N. N. Low

ATTORNEY.

(No Model.)

8 Sheets—Sheet 6.

I. N. FORBES.

LASTING MACHINE.

No. 436,852. Patented Sept. 23, 1890.

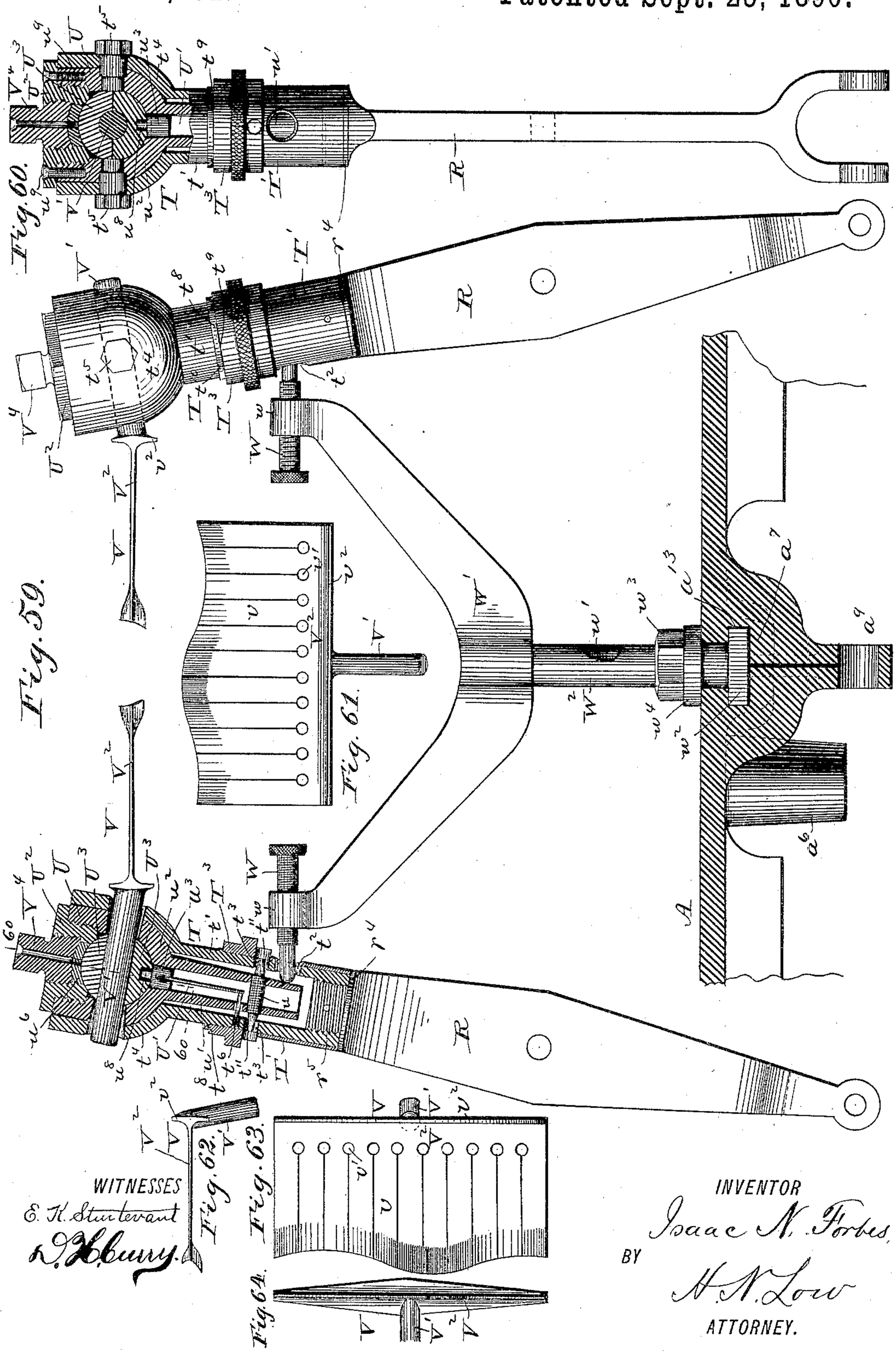


Fig. 59.

Fig. 61.

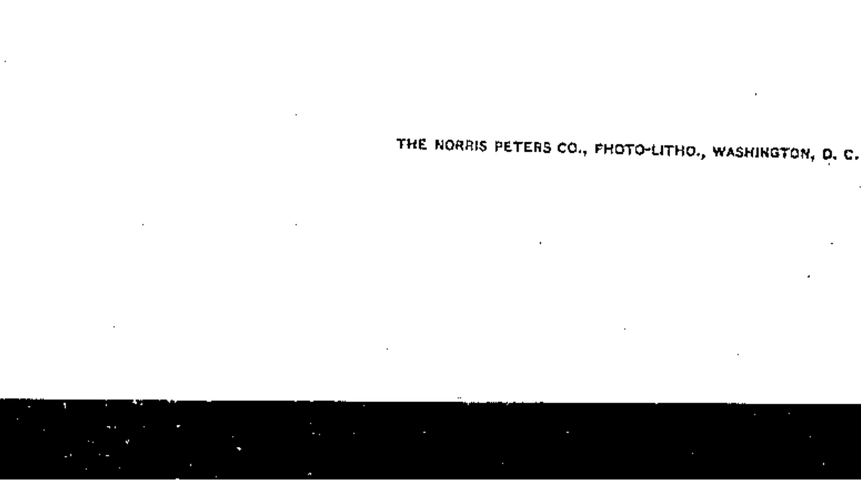


Fig. 62.

Fig. 63.

Fig. 64.

WITNESSES

E. K. Stuntevant

D. Y. Bury.

INVENTOR

Isaac N. Forbes,

BY

A. N. Low

ATTORNEY.

(No Model.)

8 Sheets—Sheet 7.

I. N. FORBES.

LASTING MACHINE.

No. 436,852. Patented Sept. 23, 1890.

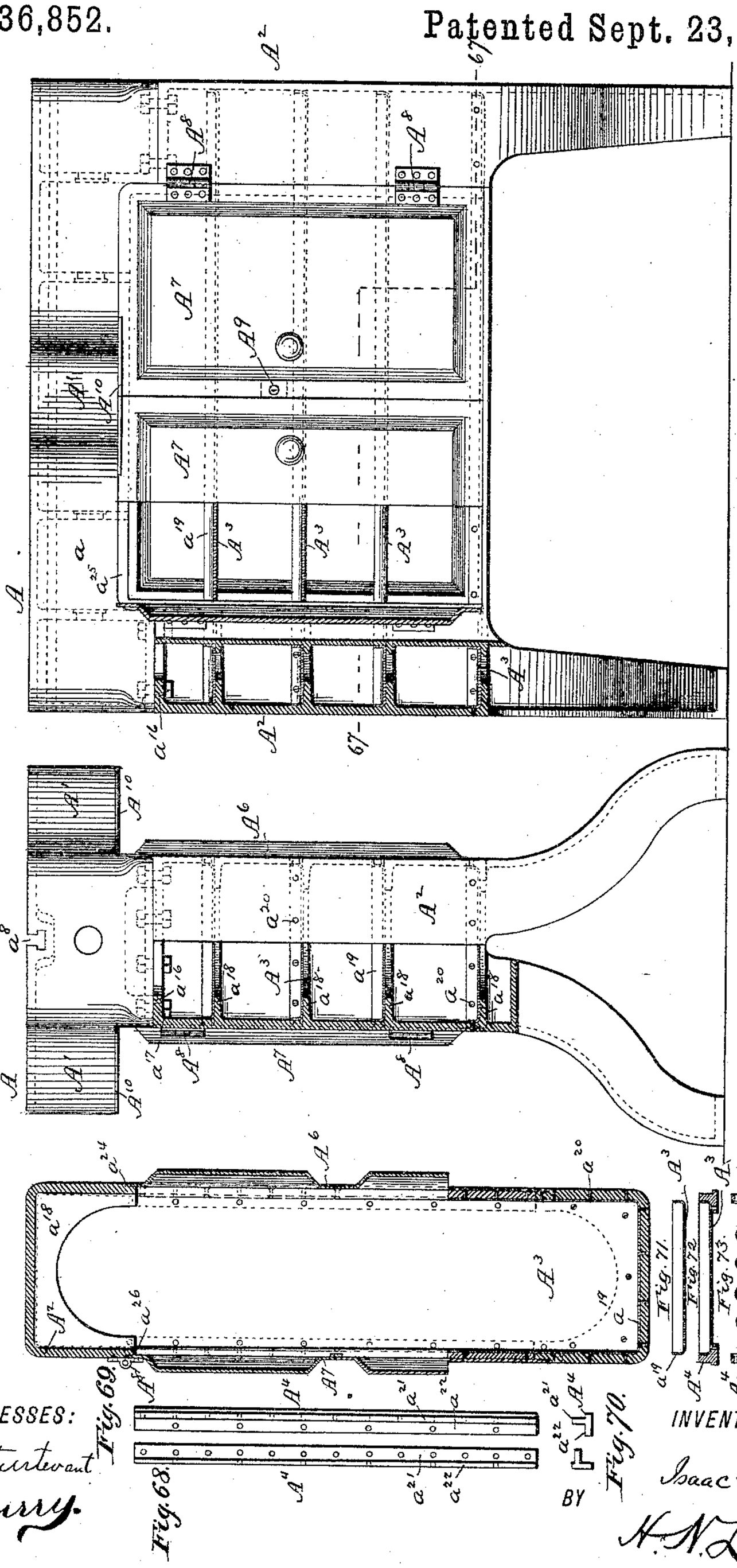


Fig. 66.

Fig. 65.

Fig. 67.

Fig. 69.

Fig. 68.

Fig. 71. Fig. 72. Fig. 73. Fig. 74.

Fig. 70.

WITNESSES:

E. K. Sturtevant

D. Hburry.

INVENTOR

Isaac N. Forbes,

BY

N. N. Low

ATTORNEY.

(No Model.)

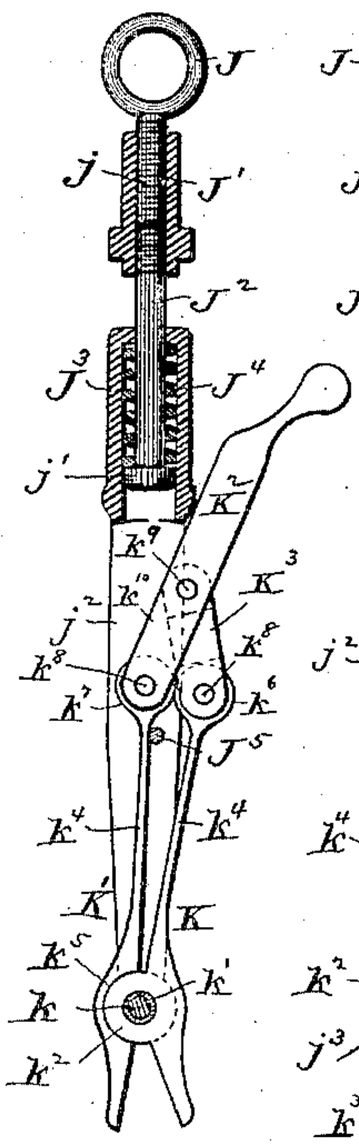
8 Sheets—Sheet 8.

I. N. FORBES.

LASTING MACHINE.

No. 436,852. Patented Sept. 23, 1890.

Fig. 75.



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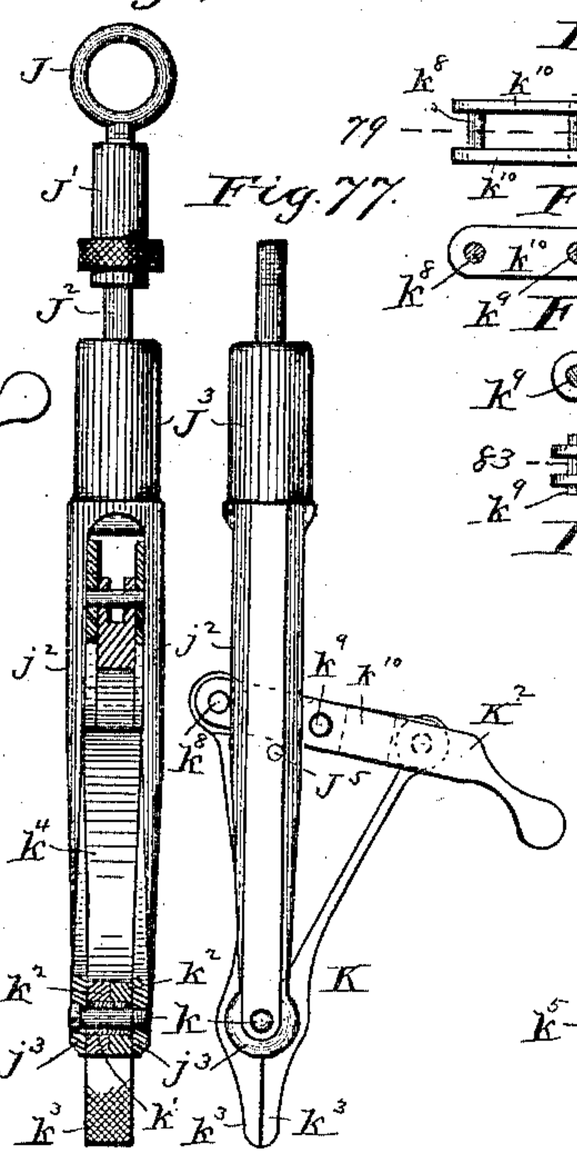


Fig. 77.

Fig. 78.

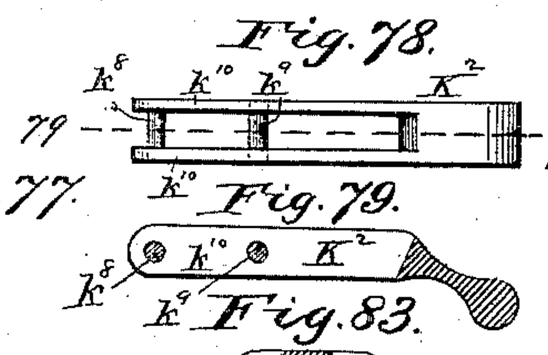


Fig. 79.

Fig. 80.

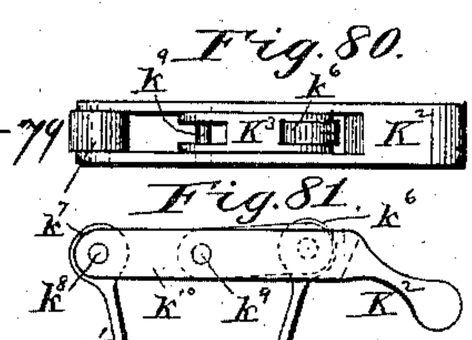


Fig. 81.

Fig. 83.

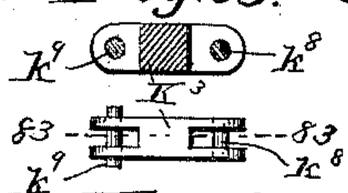
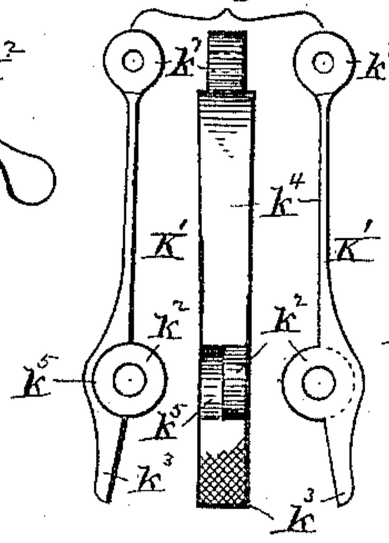


Fig. 82.

Fig. 84.



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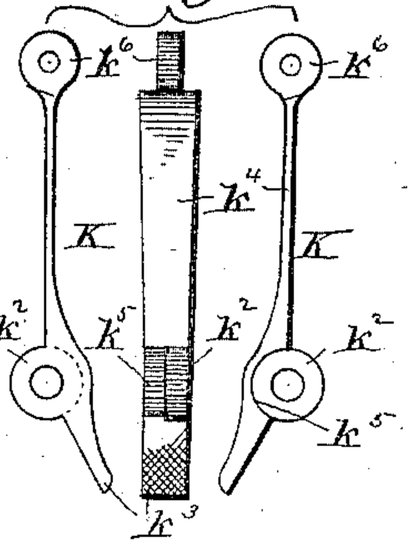

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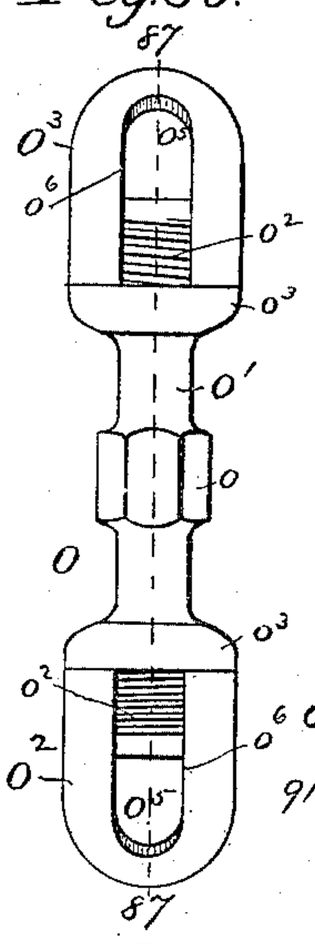

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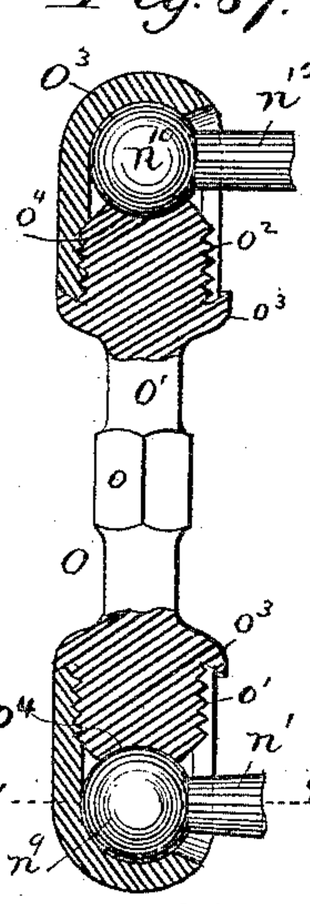

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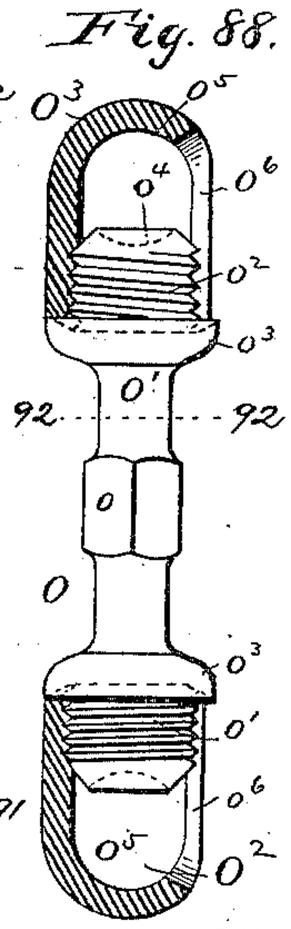

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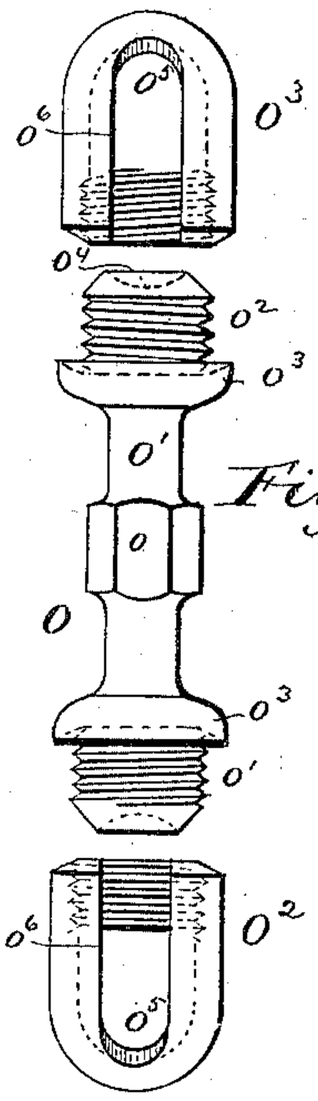

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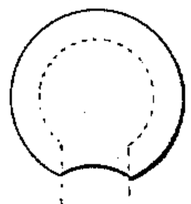

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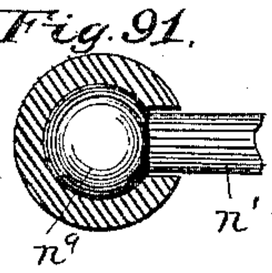
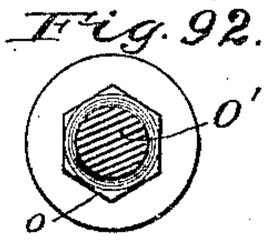


Fig. 92.



WITNESSES:

E. K. Sturtevant

H. Curry.

INVENTOR

Isaac N. Forbes

BY

A. N. Low

ATTORNEY.

UNITED STATES PATENT OFFICE.

ISAAC N. FORBES, OF NEW YORK, N. Y.

LASTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 436,852, dated September 23, 1890.

Original application filed July 13, 1889 Serial No. 317,443. Divided and this application filed December 10, 1889. Serial No. 333,301. (No model.)

To all whom it may concern:

Be it known that I, ISAAC N. FORBES, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Lasting-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in various parts of the machine with a view to simplifying, lightening, and cheapening its construction, while at the same time increasing the convenience and efficiency of its operation.

My invention consists in those parts and combinations thereof, or their equivalents, which are hereinafter set forth and claimed.

With regard to the side-lasting clamps and holders therefor this application is a division of that filed by me July 13, 1889, Serial No. 317,443.

In order to make my invention more clearly understoood, I have shown in the accompanying drawings means for carrying the same into practical effect.

In said drawings, Figure 1 is a transverse vertical sectional view, part full, of a lasting-machine, the lower portion of the stand being broken away, embodying my improvements. Fig. 2 is a plan view of the head-yoke detached. Fig. 3 is a sectional view, on a larger scale, on line 3 3, Fig. 2. Fig. 4 is a plan view of the latch-handle of the head-yoke. Fig. 5 is a vertical section of the same, showing also detached the friction-roller of the latch. Fig. 6 is a sectional view on line 6 6, Fig. 1, the head being removed from the yoke and the latter shown in elevation. Fig. 7 is a sectional view on line 7 7, Fig. 1. Fig. 8 is a longitudinal vertical sectional view, part full, on line 8 8, Fig. 1. Fig. 9 is a side view of the head-frame, showing also a portion of the yoke. Fig. 10 is a plan and end view of one of the shafts of said frame detached. Fig. 11 shows similar views of one of the hanger-carrying shafts. Fig. 12 is an end view of the latter with the eyebolt of one of the hangers in place. Fig. 13 is an elevation, partly in section, of a portion of the heel-stand. Fig. 14 is a side view of one of the end levers with its slide-hinge-joint pieces. Fig. 15 is a horizontal sectional view of the central portion of the head-frame on line 15 15, Fig. 58. Fig. 16 is a view at right angles to Fig. 14 of one of the end levers. Fig. 17 is an elevation, looking from the end of the machine, of the adjustable base which carries the heel-stand. Fig. 18 is a plan view of the same. Figs. 19 and 20 are sectional views on lines 19 19 and 20 20 of Fig. 17. Fig. 21 is a plan view of the table with the mechanism removed. Fig. 22 is a sectional view on line 22 22, Fig. 25. Fig. 23 is an elevation from the inner side of one of the side stands, the stand being laid down on its side. Fig. 24 is a sectional view on line 24 24, Fig. 25. Fig. 25 is a bottom plan view of the table partly broken away and showing the actuating mechanism partly in section. Fig. 26 is an end view of one of the slide-nuts which operate the side levers. Figs. 27, 28, and 29 are respectively a side view, plan, and cross-section of the same. Fig. 30 shows, by plan, side, and end view, the slide-nut of the other side lever. Fig. 31 shows, by plan and edge view, one of the angle-levers which operate the slide-shafts of the end levers. Fig. 32 is a horizontal sectional view of a modified and adjustable means of connection between the lower ends of the end levers and their slides. Fig. 33 shows, by side view, end view, and cross-section, the adjusting-sleeve of Fig. 32 detached. Fig. 34 is a horizontal section above the table, with most of the mechanism removed, on line 34 34, Fig. 1. Fig. 35 is a plan view of one of the side stands. Fig. 36 is a vertical sectional view of one of the side-clamp holders on line 36 36, Fig. 37. Fig. 37 is an elevation from the inner side of the same. Figs. 38, 39, and 40 are sectional views on lines 38 38, 39 39, and 40 40 of Fig. 36. Fig. 41 is a sectional view on line 41 41, Fig. 36. Fig. 42 is a sectional view, looking inward, on line 42 43, Fig. 34. Fig. 43 is a similar view on the same line, looking outward, the upper end of the stand being also shown in section. Fig. 44 shows, by two elevations at right angles to each other, one of the side levers. Fig. 44ª shows, by similar views, a modified and adjustable form of end lever adapted to be used with the screw-shaft and adjustable sleeve

shown in Figs. 32 and 33. Fig. 45 is a plan view of the side lever shown in Fig. 44. Fig. 46 is a bottom plan view of the table with the mechanism removed. Fig. 47 is an elevation, looking from the end of the table, of the head and a portion of the head-yoke. Fig. 48 is a sectional view on line 48 48, Fig. 51, of the toe-plier-supporting sleeve and plate. Fig. 49 is a bottom plan view of the same, showing also the shaft and screw-sleeve for supporting and adjusting the toe-pliers. Fig. 50 is a sectional view on line 50 50, Fig. 48, showing also the releasing-lever of the toe-pliers. Fig. 51 is a similar view on line 51 51, Fig. 48. Fig. 52 in a similar view on line 52 52, Fig. 48. Fig. 53 is a front view showing a portion of the toe-plier-supporting plate and a part of one of the hangers suspended therefrom. Fig. 54 is a side view of the releasing-lever. Fig. 55 is a plan view of the lever-bracket detached shown in Figs. 48 and 50. Fig. 56 is a horizontal section of the middle portion of the head-frame, showing its bearings on the head-yoke, taken on line 56 56, Fig. 47, looking upward. Fig. 57 is a plan view of said portion of the head-frame. Fig. 58 shows, by two elevations at right angles to each other, the same piece. Fig. 59 is a transverse sectional view, part full, showing a portion of the table, the side levers, and a modified form of side-lasting clamp and clamp-holder. Fig. 60 is an elevation of one of said levers and holders, partly in section, on line 60 60 of Fig. 59. Fig. 61 is a plan view of said modified form of side-lasting clamp. Figs. 62, 63, and 64 are respectively end, top, and inner edge views of the side-lasting clamp shown in Figs. 1 and 8, the edge of the clamp shown in Fig. 64 being not yet stamped or formed to fit the last. Fig. 65 is an end view, partly broken away, of the lasting-machine table, a portion of which is shown in Figs. 1 and 8. Fig. 66 is a front view of the same, partly broken away. Fig. 67 is a sectional view on line 67 67, Fig. 66. Fig. 68 is an edge, and Fig. 69 a top, view of one of the lower shelf-supports. Fig. 70 shows end views of the strip illustrated in Figs. 68 and 69. Fig. 71 is a transverse sectional view of one of the sheet-metal shelves. Fig. 72 is a similar view of the lower shelf with its side supports. Fig. 73 is a similar view showing a corrugated shelf. Fig. 74 is a similar view showing the edge of the sheet-metal shelf bent around and inclosing a supporting strip or frame. Fig. 75 is a vertical sectional view, part full, of one of the hangers and pliers. Fig. 76 is a side view at right angles to Fig. 75 and partly in section. Fig. 77 is a side view of a portion of Fig. 75, with the pliers in a different (closed) position. Fig. 78 is a plan view of one of the elbow-levers which connect and operate the legs of the pliers. Fig. 79 is a section on line 79 79 of Fig. 78. Fig. 80 is a plan view of the plier with its elbow-levers. Fig. 81 is a side view of the upper portion of the same. Fig. 82 is a plan view of the inner lever detached. Fig. 83 is a sectional view on line 83 83, Fig. 82. Fig. 84 shows, by two opposite side views and an inner face view, one (the inner) of the plier-jaw and leg pieces. Fig. 85 shows similar views or the other (the outer) piece. Fig. 86 is an inner side view of one of the end-lasting jaw's connecting-links. Fig. 87 is a plan view, the end ball-and-socket joints being shown in section on line 87 87 of Fig. 86. Fig. 88 is a plan view of the central portion of the link, the end caps being shown in section and the balls removed. Fig. 89 is an inner face view of the connecting-link, the caps being shown detached. Fig. 90 is an end view of the same, one of the balls and its supporting-stem being indicated in dotted lines. Fig. 91 is a sectional view on line 91 91, Fig. 87. Fig. 92 is a sectional view on line 92 92, Fig. 88.

Referring to the drawings, A indicates the table, designed especially to meet the various requirements of this machine, both for the support and adjustment of the various parts of the frame and mechanism and for the reception of the detachable and interchangeable parts when not in use. The table is provided around its edge with a depending flange a; transverse bearing-plates a' a' a^2 a^2, situated below the top of the table and within the flange a; horizontal perforated end-clamping flanges a^3, joined to the lower edges of flange a and plates a^2; lateral extensions A′ A′ to accommodate and inclose the side-lever mechanism, and having depending flanges a^4 and horizontal transverse guides a^5; vertically-perforated bearing-bosses a^6 a^6, depending from the top of the table and eccentrically situated, as shown in Figs. 1 and 46; a longitudinal central enlargement a^7 formed upon the under side of the table-top and containing the longitudinal T-groove a^8, and a central depending transversely-perforated bearing-bracket a^9. All these parts are preferably formed by a single casting, although they may consist of several parts bolted together. The table-top is vertically and centrally slotted—transversely, as indicated at a^{10} a^{10}, and longitudinally, as shown at a^{11} a^{11}—to admit of the passage and working of the side and end lasting levers. The middle portion of groove a^8 is enlarged, as indicated at a^{12}, and the lower and wider part of the same is still further and circularly undercut at a^{13}, as indicated by dotted lines, Fig. 34, and the flange a is cut away at a^{14} a^{14}, opposite the extension A′, to admit the side-lever-actuating mechanism.

A^2 A^2 indicate the legs of the table, Figs. 1 and 8. They consist of castings of a width equal to that of the main portion of the table, provided with side flanges a^{15}, which extend from the end of the table to the plate a^2, with horizontal perforated top flanges a^{16}, which extend the same distance and are secured to the under side of flanges a^3 by bolts a^{17}, and with other horizontal flanges a^{18}, situated at various heights and supporting sheet-metal

shelves A^3, which have upturned edge flanges a^{19}, fastened by rivets or screws a^{20} to the vertical portions of the legs. These shelves serve to hold the interchangeable parts of the machine within convenient reach of the operator, and so disposed that the desired part may be readily selected.

It is highly important that the operator of each machine have under his absolute control the interchangeable parts of his machine, not only conveniently arranged and within easy reach, as already mentioned, but so secured that in his absence other persons may not borrow or abstract these easily-portable pieces. This despoiling of a machine is always a source of annoyance and delay, and is sometimes resorted to for the purpose of bringing a particular workman or type of machine into disrepute. I have therefore provided the working parts of the machine with a substructure which is in effect a metallic safe, within which the detachable parts of the machine may be not only conveniently but securely stored. Referring to Figs. 65 to 74, A^4 indicates horizontal longitudinal supporting-pieces, which are provided with vertical and horizontal flanges a^{21} a^{22}, the latter of which are situated beneath the front and rear edges of the bottom shelf, Figs. 67 and 72, and support the same. These shelves, of sheet metal, may be made plain, as shown in most of the figures, or may be longitudinally corrugated for the sake of additional strength and stiffness, as shown in Fig. 73. If desired, the shelves may be stiffened around their edges by metallic frames A^5, around which the edges of the shelves are bent, as indicated in Fig. 74. On its rear side the table-top is suitably rabbeted at a^{23}, and the rear sides of the table-legs are similarly rabbeted at a^{24}, Figs. 46 and 67, and in the recess thus formed is fitted a sheet-metal panel A^6, which may be embossed or struck up, as indicated, to give greater strength and add to the appearance of the structure. At its base the panel A^6 is screwed or riveted to the rear piece A^4, Fig. 67. I may here state that in securing the different parts of the table and legs together screws or rivets will be employed, accordingly as is desired to produce a structure which may be taken apart for purposes of transportation or one which is permanent. On its front side the table and legs are similarly rabbeted at a^{25} a^{26}, in which recess is seated a door A^7, preferably made in two parts, hinged to the legs at A^8. By means of a lock A^9 this door may be securely fastened, so that it can be opened only by the workman having charge of the machine, who may thus at all times have the interchangeable and portable parts of the machine under his personal control.

The under sides of the extensions A′ are closed by plates A^{10}, Figs. 65 and 66, secured by screws which enter the apertures a^{27} formed in the flanges a^4, Fig. 46.

Last-stands.—B is the heel-stand for the last C, in which I provide for adjustments of the last longitudinally, laterally, vertically, and angularly in horizontal planes, according to the size of the last and the situation in the last of its heel-stand socket. I prefer to fit the latter with a metallic lining or bushing *c*, Fig. 8, for the sake of durability and in order that the last may always fit the stand accurately and be firmly supported. B′ is an internally-screw-threaded sleeve having at its upper end a cylindrical vertical pivot *b*, adapted to fit the bushing *c* and permit the horizontal angular adjustment of the last. At the base of said pivot is a supporting-flange *b*′, and the last may also be supported by the abutting of the pivot against the closed end of the socket *c*. Above the internal thread is a cylindrical bearing b^2, which is accurately fitted by a pin b^3, carried at the upper end of a post B^2. The latter has an external screw-thread b^4, which fits freely the corresponding internal thread of the sleeve B′, and below the thread a cylindrical journal b^5, which accurately fits a corresponding bearing b^6 in the lower part of the sleeve. The last may be vertically adjusted by screwing sleeve B′ up or down, while the accurately-fitting bearings at each end of the thread prevent any looseness of the last, although the screw-threads do not fit each other tightly. The lower end of the post B^2 is provided with a lateral flange b^7 and below the flange with a T-head b^8, which is adapted to fit a corresponding transverse groove b^9 in a base B^3, and may there be secured when the post has been adjusted laterally, as desired, by a set-screw b^{10}. For the sake of compactness and in order that the heel-stand may be more firmly held in place, I have provided the base B^3 with a central clamp below the T-groove b^9 and substantially in line with the post B^2. To this end the base is formed with a central chamber closed on the lower side by a screw-plug b^{11}, having a central vertical opening, through which passes a stem B^4, which is screw-threaded near its upper end and has on its lower end a T-head b^{12}, Fig. 13, adapted to pass down through the enlargement a^{12} of the groove a^8 of the table and to fit within the groove. Above its screw-thread the stem B^4 fits at b^{13} in a corresponding bearing in the said base. A combined worm-wheel and nut B^5 fits upon the thread of the stem B^4 within the base, and bears upon the upper side of plug b^{11}, while its toothed periphery is engaged by a horizontal transverse worm B^6, Fig. 20, which is mounted in suitable bearings in the base and provided at its end next the operator with a milled head b^{14} and squared head b^{15}, by which it may be turned (by hand or key) to rotate the wheel-nut B^5, raise the stem B^4, and clamp the base B^3 to the table. In order to guide the base and prevent its turning as it is moved longitudinally of the table to its desired position, I provide its under side with a rib b^{16}, which fits the narrow portion of the groove a^8. The

plug b^{11} is correspondingly shaped. D is the toe-stand provided with an internally-screw-threaded sleeve D′, supported, engaging, and vertically adjustable upon a corresponding post D^2 in a manner similar to that already described in connection with the heel-stand. The post D^2, however, extends to the bottom of groove a^8, being tapered outwardly or enlarged toward the bottom, in order to be strong enough for its considerable height, and is at its base provided with a T-head d', adapted to fit said groove. Above this head the post is screw-threaded at d^2 and engaged by a handled nut D^3, which bears upon a washer D^4, the latter in turn resting upon the top of the table. It will thus be seen that the toe-stand may be readily adjusted longitudinally and clamped in place and made of the proper height, according to the size of the last which is to be supported opposite to the lasting devices. At its top the sleeve D′ has a vertical pivot d^3, upon which swivels a suitable toe-rest D^5, adapted to support and keep the forward end of the last in proper position.

Head-yoke.—E E indicate two yoke and side fulcrum stands, mounted at the sides of the table upon the extensions A′ and secured rigidly in place by vertical bolts *e*, the heads and nuts of which engage the under side of the table-top and the upper surfaces of the horizontal flanges e' of the stands. With said flanges and the outer walls of the stands are cast horizontal transverse bearings e^2, which are vertically and longitudinally slotted and provided at their outer ends with internally-screw-threaded bushings E′, which are screwed in place in the stands, Figs. 1 and 34. Above the flanges e' the stands E extend outwardly and upwardly, Fig. 1, being U-shaped in horizontal cross-section, with the open or concave side inward, and are at their tops formed with horizontal flanges, in which are cut internal screw-threads which engage correspondingly threaded and flanged stems e^3 e^4. The latter form the bases of posts E^2 E^3. The former constitutes a vertical pivot, upon which fit the sleeves $f f'$ of the hinge-piece F of the head-yoke F′, which sleeves rest upon the flange e^5 of the post and are engaged by a nut e^6, screwed upon the upper end of the post, respectively. The hinge-piece has two inwardly-extending ears f^2, between which the yoke F′ fits, and on which it is mounted by means of a horizontal hinge-pin or bolt f^3, which fits both of the parts neatly, and by a stop pin or bolt f^4, which fits in the ears of the hinge-piece and engages a slot f^5, formed from pin f^3 as a center, in the yoke F′. F^2 is a plate-spring mounted between the ears f^2 on a pin f^6, engaging by its free end a notch f^7 in the yoke, and bearing between its ends and by its inner face against a pin f^8. These parts are so adjusted that the spring F^2 has the necessary tension to lift the yoke F′, with its head and pliers, (when the latter are disengaged from the upper,) oscillating the yoke upon pin f^3 upward and outward until the inner end of slot f^5 strikes the stop-pin f^4. When thus lifted, the yoke, with its head, may be swung easily upon post E^2 from over the last to the position indicated by dotted lines in Figs. 1 and 8, thus affording ready access for securing the upper and removing the lasted shoe. The severe lifting strain imposed upon the workman by the ordinary upwardly-turning head is thus entirely obviated. At the side of the machine opposite to the yoke-hinge the yoke is provided with an outwardly-extending rigid handle f^9, with a tapering or conical projection f^{10}, which is adapted to come over and fit a correspondingly-shaped seat e^7 in the upper end of the part E^3, and with a latch F^3, hinged by pin f^{11} to the yoke. Below the seat e^7 the post is formed with a socket adapted to contain a rubber or other elastic buffer e^8, which the projection f^{10} will strike and compress as the yoke is forced down into place by the latch. For this purpose the latter is swung inwardly on pin f^{11} by means of the handle f^{12}, thereby causing roller f^{13}, which is journaled on the latch, to engage the outer lower edge of a projection e^9, formed on post E^3, and to roll under said projection. This movement brings the yoke, with its downhold, firmly down into place and securely locks it. A reverse movement of the latch permits spring F^2 to lift the yoke, as already described, sufficiently for the downhold to clear the last, projection f^{10} to clear the post E^3, (see Fig. 3,) and the pliers to clear the lasting devices. A spring f^{14}, Fig. 3, is seated in a dovetailed recess in the head-yoke and secured by a screw f^{15}. Its free end, covered with rawhide or other suitable material, f^{19}, extends downward to a point where it will strike the round (or flat) post E^3 and prevent shock when the yoke swings horizontally into place.

Downhold.—G is the downhold comprising a head *g*, adapted to rest upon the inner sole and swiveled upon a screw-threaded stem g'. The latter engages and is vertically adjustable in the horizontal arm g^2 of a bracket G′, which latter has a journal g^3 fitting a vertical bearing f^{16} in the arch f^{17} of the head-yoke. At or near the upper end of said journal it is screw-threaded and engaged by a nut g^4, by which the bracket G′ can be securely clamped to the yoke, with the arm g^2 in any desired position.

Head.—The pliers are so supported that after they have been engaged with the edge of the upper they may all be raised at once to draw the upper tightly over the last. The toe-pliers are, moreover, separately mounted, so that they—say three in number—may be independently raised to stretch the upper sufficiently along the instep and around the toe. F^4 F^4 are inwardly-extending vertical guides formed with the head-yoke F′, Figs. 47 and 56, and engaging corresponding vertical grooves *h*, formed in the central piece H of the head, Figs. 57 and 58. Said piece has formed with or secured to it a vertical stem or shank

H′, on the upper end of which is formed a screw h', adapted to engage a correspondingly-threaded nut I. The latter is mounted and rotary in a vertical bearing-sleeve F^5, with which the central part of the head-yoke is provided, resting upon a washer i', and being held in place by transverse pins f^{18}, which pass tangentially through the sleeve and engage a peripheral groove i in the nut. Below the screw the stem H′ has a round portion h^2, of the same diameter, which accurately fits and is adapted to slide vertically in the lower part of the sleeve F^5, Fig. 1. By means of the crank-handle I′ the nut I may be readily turned in horizontal planes and the piece H and all parts carried thereby, including the pliers, raised vertically. Said piece is formed with three perforations, Figs. 15 and 58, the central one h^3 of which is screw-threaded and receives a longitudinal bearing-sleeve H^2, which is screwed in place therein and keyed in place by a pin h^{11}, which is driven or screwed up through the bottom extension h^{12} of the piece H, Fig. 8. Said extension serves as a stop adapted to abut the upper end of journal g^3 and arrest the downward movement of the head, thus preventing screw h' from becoming disengaged, Fig. 8. The outer h^4 h^4 of the said perforations receive and rigidly hold longitudinal shafts H^3 H^3, Figs. 9, 11, 12, and 47, each of which has a longitudinal groove h^5. Above the perforations h^4 the piece H has two other perforations h^6 h^6, Fig. 58, in which are carried two longitudinal oscillatory shafts H^4 H^4, each of which has two longitudinal grooves h^7 h^7, Figs. 10 and 47. H^5 H^5 are two vertical end plates mounted upon the ends of shafts H^3 H^4 and additionally connected by means of screw-rods H^6 H^6, Figs. 8, 9, and 47. Said end plates are also provided with inwardly-extending sleeves h^8, which fit neatly around the ends of the central bearing-sleeve H^2. The shafts H^4 are adapted to turn in their bearings in the parts H and H^5. Upon shafts H^3 are mounted longitudinally-movable sleeves H^7, Figs. 9 and 12, which are kept from turning by pins h^9 h^9, with which each of said sleeves is provided, and which enter the groove h^5.

Hangers and pliers.—Each of the sleeves H^7 supports a side plier, the hanger-eye J of which surrounds the sleeve between pins h^9, by which latter the eye is kept in place. By sliding the sleeves by hand along their shafts the side pliers may be properly distributed to operate upon the upper of a long or short shoe. The lower ends of eyes J have screw-threads j, upon which are vertically-adjustable screw-sleeves J′, Fig. 75. Into the lower ends of said sleeves are rigidly screwed pins J^2, the heads j' of which fit within the hanger-sleeves J^3. Above said heads and below the upper ends of the sleeves are springs J^4, through the medium of which an elastic tension is put upon the pliers. The sleeve J^3 has downwardly-extending legs j^2, the space between which tapers slightly toward the bottom, as seen best in Fig. 76, whereby the plier-jaws are made narrow at their operative ends. Between said legs are hinged the plier-jaw and leg pieces K K′ by means of a screw-pin k, which carries a sleeve k' and fits into eyes j^3, formed on the ends of legs j^2. The sleeve k' fits in eyes k^2, formed on the plier-pieces just above the jaws k^3 and below the spring-legs k^4, Figs. 75, 84, and 85. The eye k^2 is one-half the width of the plier-piece; but the other half of the piece is provided with a semicircular bearing k^5, of a radius equal to that of the outer periphery of the eye k^2 of the other plier-piece and adapted to fit the latter, whereby, although the pieces are in line with or opposite each other when fitted together, each plier-piece has a bearing for its full width. Moreover, the piece is much strengthened by the wall which forms the bearing k^5 and connects the jaw with the spring-leg. The lower portion of the outer piece K is formed like that of the inner piece K′, excepting that the jaw and leg are not so nearly in line, Fig. 85, thereby throwing the plier-handle out into a convenient position and enabling the leg of the inner piece K′ to remain nearly perpendicular and still give the desired distance between the legs when the plier is closed, Fig. 77. At the upper ends of the plier-pieces are formed eyes k^6 k^7, which are hinged by pins k^8 to two elbow-levers K^2 K^3. The latter are hinged together by pin k^9. The lever K^2 is divided vertically at its inner end, and its two arms k^{10} pass one on each side of the eye k^7 and receive the pin k^8 thereof. At its other end said lever receives between its arms the lever K^3, Fig. 80, which latter at its outer end is forked or divided to receive the eye k^6. This eye is consequently thinner than the eye k^7 of the piece K′. The outer extremity of lever K^2 is prolonged, bent slightly downward, and forms a handle by the depression of which the spring-arms may easily be forced apart and their jaws caused to seize the edge of the upper. J^5 is a stop-pin passing transversely through and fixed in the hanger-legs between the spring-plier pieces k^4, and at such height as to arrest the downward movement of the elbow-levers when the pin k^9 has reached a point slightly below a straight line drawn between pins k^8. The levers are thus self-locking. The elasticity of legs k^4 permits this locking to be easily effected, notwithstanding the varying thickness of the uppers. The pins J^2 are of different lengths, those carrying the pliers at the ball of the last being the shortest, Fig. 8.

Plier-detaching devices.—Upon each of the shafts H^4 are mounted a series of levers L, one for each side plier. Said levers are provided with bearings l, which encircle the shafts, and which are partially divided or split, so as to be compressible by bolts l'. They may thus be made to fit said shafts accurately. The levers may be moved longitudinally upon their shafts and kept in line with the side-pliers, but are prevented from turning by pins l^2, which engage the grooves

h^7, Fig. 1. The oscillation of each shaft H^4 thus causes all of its levers L to turn simultaneously, and the outer ends of the levers being connected by cords, chains, or wires L′ with the pins k^9 of the plier elbow-levers the latter may be lifted and all of the side pliers disengaged at once from the upper by suitable movements of said shafts. That one of the shafts H^4 which is on the side of the machine next the operator is provided with a hand-lever L^2, which may be conveniently formed in one piece with one of the levers L, and the movement of this shaft is caused to produce a simultaneous opposite turning of the other shaft H^4 by means of intermeshing toothed segments L^3, Figs. 1 and 8, mounted on said shaft.

Toe-pliers.—The toe-pliers k^4 and hangers J^6 are similar to those for the side of the last, excepting that they are suspended by screw-hooks J^7, which engage and oscillate freely in eyes M, secured to a plate M′, Figs. 8, 47, 48, and 49. The latter is attached to or formed with a vertical sleeve M^2, which has at its upper end an internal flange m, engaged by an external flange m', formed on a vertical screw M^3, Fig. 8. This screw engages by its thread a screw-sleeve M^4, formed with a horizontal longitudinal slide-shaft M^5, which fits within the forward end of the central sleeve or tube H^2 of the head. Shaft M^5 is longitudinally adjustable therein for a long or short last, but is held from turning by short pins h^{10}, Fig. 8, which are driven or screwed into sleeve H^2 and extend inwardly into the longitudinal grooves m^2 of the shaft. M^6 is a crank-handle by which screw M^3 may be operated to raise or lower the screw and with it the sleeve M^2 and plate M′. The toe-pliers may thus be additionally raised relative to the side-pliers. The sleeve M^2 is cut away at its rear at m^3 in Fig. 48 to accommodate the shaft M^5. At its upper end the said sleeve is provided with a rearwardly-projecting bracket M^7, Figs. 48 and 50, to which is hinged by a pin m^4 the forked arms m^5 of a hand-lever M^8. In front of the sleeve said lever is connected by a depending link m^6 with an ear m^7, secured to a plate M^9. This plate has a vertical sleeve m^8, which fits around and slides upon the sleeve M^2, and is perforated in three places, as shown at m^9, for the attachment of the flexible connections or wires L^4 of the toe-pliers. Said connections operate in the same manner as the side connections L′ to detach the three toe-pliers simultaneously when hand-lever M^8 is raised. All of these detaching devices travel with the pliers in their vertical adjustments.

End-lasting devices.—The upper having been stretched and drawn up properly over the last by the devices already described, the lasting devices or clamps begin their operation. I will now describe my improvements in these parts of the machine and in the means whereby they are supported and actuated. N N′ represent the heel and toe lasting clamp stands provided at their bases with T-bolts n, adapted to fit the table-groove a^8, and with nuts n', engaging said bolts, by which the stands may be rigidly screwed in place when properly adjusted. Except for extreme sizes of last these stands will not require to be moved. At their upper ends the stands are provided with horizontal longitudinal clamp-bearings n^2 n^2, adapted to be compressed by hand-screws n^3 upon slide-bearing sleeves N^2 N^3, which latter may thus be longitudinally adjusted and securely held. N^4 N^4 indicate slide-shafts fitting and freely movable endwise within the said sleeves and having near their inner ends vertical mortises n^4. At their extreme inner ends the slides are provided with curved clamp-guides n^5, which are compressible by hand-screws n^6 upon correspondingly-shaped curved slides N^5. The latter are provided with inwardly-extending perforated ears n^7, between which are mounted the heel and toe lasting jaws N^6 N^7, hinged on pins n^8, which pass through the perforations of the ears n^7 and through bearings in the jaws. The slides N^5 are circularly adjustable in vertical longitudinal planes in the clamp-guides n^5 to adapt the end jaws to the forward and rearward slants of the bottom of the last. The outwardly-extending arms n' of the end-lasting jaws are provided with balls n^9, which are connected with stationary balls n^{10}, rigidly secured to the sleeves N^2 N^3. Links O, provided with suitable sockets for said balls, connect the arms of the jaws with parts of the machine which are thus stationary. When, therefore, the jaws are by slides N^4 bodily moved inward, they are caused to simultaneously close by reason of their arms being held back by the said links O. These links, Figs. 86 to 92, each comprise a central shank O′, provided with a nut-shaped part o, by which the shank may be turned by a suitable wrench. The ends of the shank are provided with right and left screw-threads o' o^2, with flanges o^3 at the base of the threads, and with hollows o^4 on the extreme ends shaped to fit the balls n^9 or n^{10}. O^2 O^3 indicate caps which are respectively screw-threaded to fit the threads o' o^2 of the shank, and provided with hemispherical sockets o^5, which fit said balls. At o^6 the caps are cut away or open to accommodate the arm n' of the ball n^9 and the stem n^{12}, which carries the ball n^{10}, and is secured in the slide-bearing sleeve N^2, or, in the case of sleeve N^3, in a depending bracket n^{13} thereof. These parts are so fitted that when the shank O′ has been turned until the flanges o^3 bear against the edges of caps O^2 O^3 the balls will play freely in their sockets. The ends of the shank and the openings o^6 are beveled, as indicated, to give sufficient range of movement to the arms n', and to the links relative to the stems n^{12}. Flanges o^3 are undercut to inclose the edges of caps O^2 O^3 and prevent them from spreading open. P P are the end levers which actuate the slides N^4 and give to the end-lasting jaws the movements already described. Said levers are mounted and os-

cillate upon horizontal transverse fulcrum-pins p, and at both their upper and lower ends are formed with circular eyes p' p^2. The eye p' fits and turns in socketed side pieces p^3, with which it is also connected by a central pin p^4, and said side pieces fit neatly and are adapted to move vertically in the mortise n^4 of the slide N^4, thus forming a combined slide-hinge joint P'. The eyes p^2 below the table have similar joints P^2, with the mortises q, of two horizontal longitudinal slide-shafts Q, mounted in bushings q', which are fitted in the bearing-plates a' a^2. The fulcrum-pins p are carried by the vertically-forked inner ends P^3 of longitudinally-adjustable end fulcrum-shafts P^4, mounted in bearings N^8, formed in the stands N N'. In the outer portions of the stands are screwed internally-threaded bushings N^9, within which fit correspondingly-threaded screw-sleeves P^5, provided with external milled heads or handles p^5. Within these sleeves neatly fit the outwardly-extending stems p^6 of the shafts P^4, which are held from inward movement from the sleeves by nuts P^6, engaging the threaded ends of said stems and abutting against the outer faces of the sleeves P^5. It will thus be seen that the end-lever fulcrums may be readily adjusted to suit the length of last by turning the sleeves P^5, the shafts P^4 being prevented from turning by the engagement of the end levers with their forked ends P^3. During this adjustment screws n^3 are loosened.

Side-lasting devices and actuating mechanism.—The side-lasting-clamp levers are shown at R. They are mounted upon fulcrum-pins r, carried by slide-shafts R', the latter being mounted in the bearings e^2 of the side stands E and adjustable by means of sleeves R^2, engaging the shafts R' and screwing in the bushings E', in a manner substantially similar to that already described in connection with the end levers. At their lower ends, below the table, side levers R are provided with slide-hinge joints R^3, by means of which they connect with slide-nuts S S', moving transversely, with their upwardly-extending ribs s fitting between the guides a^5. Said nuts are formed with lateral recesses s', in each of which fits neatly one of the vertically-movable slide-joint-socket pieces r'. The lower ends of the side levers are forked, Fig. 44, each lever having two eyes r^2, which accurately fit the socket-pieces r' on each side of the slide-nuts S S', Figs. 1 and 25, and are additionally hinged thereto by pins r^3. Nuts S S' are engaged by right and left threads S^2 S^3, formed on a transverse power-shaft S^4, the outer ends of which are mounted in bushings s^2 s^3, fitted into the extensions A' of the table and clamped in place by nuts s^4. Said shaft is further supported at the middle and held from endwise movement by being made in two parts screwed and pinned together, one of which has a journal s^5, mounted in the bracket a^6, and a boss s^6 and screw-threaded stem s^7, which fit in the other part of the shaft. The bushing or bearing s^2 is provided with a set-screw s^8, which bears against the end of shaft S^4, or against an interposed washer or packing, and is adapted to take up end play. The slide-nut S is formed with lateral ears s^9 on each side thereof, which carry hinge-pins s^{10}. The latter engage eyes in the ends of links S^5, which extend horizontally inward by the sides of shaft S^4 to a point where, by pins s^{11}, they are hinged to the longitudinal arms of angle-levers S^6. At their angles these levers are fulcrumed by bolts s^{13} to the lower ends of bosses a^6, and their lateral arms extend inward to points in line with the slide-shafts Q, to which they are connected by links Q'. It will therefore be seen that when the power-shaft S^4 is rotated in the proper direction to the right in Fig. 25 the parts connected directly and indirectly therewith will be moved in the directions indicated by the arrows in said figure, the lower ends of both the side and end levers will be forced outward, and their upper ends, carrying the lasting-clamps, will swing inward toward the last and force the clamps against the upper, which at such time will be held by the pliers.

In Figs. 32, 33, and 44^a, I have shown a modified construction of the slide-shafts Q and their connections, by which the point of engagement between them and the end levers is rendered adjustable longitudinally for extreme lengths of lasts. According to this construction the shafts Q are screw-threaded at q^2 and engaged by screw-sleeves Q^2, having milled edges q^3 and peripheral grooves q^4, Fig. 33. In these grooves and resting tangentially upon the central portion of the sleeves at each side thereof fit the slide-joint pieces q^5, Fig. 32, in the sockets of which are held the eyes p^2 of the forked ends P^7 of the end levers P, which are thus modified in form, Fig. 44^a. Near their upper ends the side levers R are provided each with a transverse flange r^4, above which the lever is continued in the form of a short screw-threaded stem r^5, upon which is screwed a hollow socket-piece T. The latter is then for greater security fastened by a transverse pin t, Figs. 36 and 37, which also holds in position an external sleeve T', inclosing the lower cylindrical extension t' of the said socket-piece. On the inner side the said extension and sleeve are perforated, as shown at t^2, and at t^3 t^3, just above sleeve T', the extension t' is perforated through both the inner and outer sides. In line with the perforations t^3 is situated a screw stop-pin u, mounted and adjustable in the extension u' of the oscillatory holder U, also hollow. The length of the pin is equal to the external diameter of the extension t'. The upper part of the holder forms a hemispherical inner socket-piece u^2, which fits accurately in a correspondingly-shaped portion t^4 of the outer piece T, and is secured in place and permitted to oscillate only in the transverse plane of the machine by hinge-bolts t^5 t^5, Fig. 41, which pass through

and have bearings in the sides of the socket t^4 and screw into the part u^2. A spring U′, held at its upper end in a split tapered plug u^3, driven into a tapered hole in the hollow cylindrical extension u' and situated within said extension, bears at its lower free end against the inner end of a pin t^6, which is screwed or otherwise secured in the wall of the outer side of extension t' and projecting inward through a perforation in the outer side of extension u' into the interior of the latter. The tension of the spring U′ is such that it will always tend to force the lower end of the holder U inward and its upper end outward relative to the socket-piece T, thus elevating the inner ends or edges of the side-lasting clamps V, which are carried by said holder. In this position said lasting devices will pass inward over the edge of the last at a height just above the top surface of the inner sole. Having passed the edge of the latter, the clamps V are depressed tightly against the upper, moving at the same time slightly inward, and the lasting operation proper will be finished and the upper ready to be tacked or cemented in place. During this action of the lasting devices the head and pliers may be lowered slightly to yield a little of the upper to the lasting-clamps and prevent tearing of the material. The said depression of the side clamps is effected by stop-screws W W, mounted and horizontally adjustable in eyes w w, and situated in line with the perforations t^2, so that when the side levers are near the limit of their inward movement the outer ends of said screws will enter the perforations and arrest the extensions u', Fig. 1. The eyes w are carried by a Y-frame W′, the lower portion of which is a cylindrical journal w', vertically mounted and swiveling in a bearing-sleeve W^2. The latter has at its bottom a T-head w^2, adapted to pass down through the enlargement a^{12} of the table-groove and when turned crosswise to fit the undercut portion a^{13} of the same. It is then clamped in place by a nut w^3, which engages a thread on the sleeve and bears against a washer w^4, which in turn rests upon the top surface of the table, Fig. 1.

The holder U is provided with an internal hemispherical socket, which is completed and adapted to form one member of a ball-and-socket joint by a screw-plug U^2, suitably concaved on its inner face and screwed into the upper end of the holder. Within the socket thus formed are situated two hemispherical clamping-pieces U^3, between which and half in each is formed a cylindrical clamp-bearing u^5, adapted to receive the shank V′ of the side clamp. The latter may be formed with its shank substantially vertical or in line with the side lever, Fig. 1, or with the shank at right angles to the lever, Fig. 59, and therefore the clamping-pieces U^3 will be correspondingly arranged, with their bearing u^5 in line with the shank V′. The clamping-pieces are forced together and upon the shank V′ by means of a set-screw V^4, which passes through and engages the holder or a portion thereof either horizontally, as in Fig. 1, or vertically, as in Fig. 59. In the former case the outer socket-piece T is provided with an aperture t^7 on its outer side to accommodate the set-screw. In the latter case the part of the holder engaged directly by the threads of the screw V^4 will be the plug U^2. If desired, a bearing-piece u^6, Fig. 59, may be interposed between the screw V^4 and the clamping-piece U^3 to give a wider bearing on and obviate any tendency to turn the latter.

U^5, Fig. 1, is a screw engaging the holder-socket and projecting at its inner end into a recess u^7 larger than the screw, which is formed in one of the clamping-pieces U^3. This screw prevents the clamp-bearing u^5 from being twisted away from the opening in the holder through which the shank V′ enters. In Fig. 59 a similar office is performed by the upper end u^8 of plug u^3. In this latter construction, Fig. 60, screws u^9 are provided engaging the plug and inner socket-piece to prevent any chance of the unscrewing of the former while working the clamp-screw V^4.

It will be seen that by the parts described the side-lasting clamps are so mounted as to be universally adjustable in any direction within limits ample for the purpose, and can therefore be fixed in the position necessary for their proper operation relative to the last. While so adjusting the clamps they are brought forward against the last and should be rigid upon their levers. The stop-pin u, already referred to, is provided for this purpose, and is designed to act in conjunction with a sleeve T^3, which encircles the extension t' below a flange t^8 and rests on the upper end of the fixed sleeve T′. While thus held in position vertically opposite to the pin u the sleeve T^3 may be readily rotated to bring its solid portion against the ends of said pin, or to bring in line with the same the openings t^{11}. In the latter case the holder U may oscillate freely. In the former it will be rigidly held. The upper edge of the sleeve T^3 is cut away for about a quarter of a circle, forming a recess at t^9, the ends of which are engaged by a pin t^{10}, driven into the extension t', Fig. 40.

In order that the blades V^2 of the side-lasting clamps may lie substantially horizontal when the side levers are at the inner limit of their throw, Figs. 1 and 59, I form said blade at an obtuse angle to the shank V′.

The blade of thin elastic steel or other suitable material is stamped or otherwise formed along its operative edge, Figs. 59, 61, 62, and 63, so as to conform to a certain size and shape of last, (or to the average of several lasts,) and is preferably partially divided to form separate spring-fingers v. More elasticity may be given to the latter by perforating the blade V^2 at v' at the bases of the fingers. The nec-

essary strength is given to the blade as a whole by a vertical rib v^2, formed at its rear edge and with the shank V′.

The tapering of the space between the hanger-legs and of the plier-pieces already mentioned need only occur in the toe-pliers, where it is especially necessary to prevent interference between the different pliers as they are attached to the upper around a narrow or pointed toe.

The detaching connections L′ or L^4 may be secured to either of the elbow-joint pieces instead of to the pin k^9—as, for instance, to the piece K^2--by means of perforations or eyes k^{10}, Fig. 1.

The shaft S^4 may be operated by the hand-crank shown or by fast and loose pulleys and steam or other power.

If desired, the table-legs may be dispensed with and the table-top bolted upon a bench or other suitable support.

In adapting the machine to operate in conjunction with the particular shape and size of last which is to be employed the operation is as follows, (referring especially to Fig. 1:) The lasting devices being in the position in which they were left at the close of the previous lasting operation—that is to say, away from the last—the new last, having the insole and upper in place thereon, is placed upon the heel and toe stands. By means of the various adjusting devices with which the latter are provided the last is then brought into line with the end clamps and raised or lowered as may be necessary to the proper height relative thereto. During these adjustments of the last the lasting devices may, by means of the power mechanism, be caused to approach the last, in order that the proper position of the same may be accurately determined. The clamp-screws n^3 having been slackened, the power-shaft S^4 is turned to cause the nuts S S′ to abut against the ends of sleeves s^3 s^2, and at the same time the end clamps to abut against the ends of the last, this result being aided (in case of variation in the lengths of the previous and present lasts) by turning the end fulcrum-screws P^5 and, in extreme cases, adjusting the end stands N N′ in the groove a^8. The sleeves N^2 N^3 are then adjusted longitudinally in their bearings n^2 to such points that the end-lasting jaws N^6 N^7 will assume their closed position, whereupon the bearings n^2 will be caused to rigidly secure the sleeve N^2 N^3 by means of said screws n^3. A pair of side-lasting clamps having been selected which will correspond in the contour of their operative edges with the last already chosen, they are placed in position on the side levers with their shanks inserted in the bearings u^5. The sleeve T^3 having been turned so as to engage both ends of the stop-pin u, Fig. 39, so as to prevent the oscillation of the holder U, the side-lasting clamps are (by the power mechanism) brought approximately into contact with the upper, and said clamps are then adjusted accurately to the last by twisting their shanks in the bearings u^5 and by turning the clamping-pieces U^5 in the socket which contains them. The side clamps are then firmly secured by the screws V^4. By the combined operation of the power mechanism and of the side fulcrum-screws R^2 the parts are brought into such relative positions that when the nuts S S′ are in their outermost position abutted against the bushings s^2 s^3 the operative edges of the side-lasting clamps are in their final innermost position, with the upper suitably stretched and lasted. The lasting-clamp being now retracted by the power mechanism and the sleeves T^3 being so turned as to permit the oscillation of the holder and the screws W having been so adjusted that they will at the proper time (at or near the end of the inner movement of the side clamp) arrest the lower ends of the holders U, the machine will be ready for any desired number of successive lasting operations in conjunction with the last for which the machine has been adjusted, as above described.

It will be noted that the inner ends of the bushings or bearings s^2 s^3 serve as positive stops, which limit the inward movements of the lasting devices beyond a certain point, thus preventing the possibility of injury to the upper or to the last.

While in this application I desire to be understood as making a generic claim to the actuating mechanism comprising the screw-shaft S^4, whether that shaft be arranged longitudinally or transversely relative to the last and head, I do not herein claim specifically that modification in which the said screw-shaft is arranged longitudinally. In accordance with the established requirements in such cases, I have made this specific modification the subject of my pending application, Serial No. 333,685, filed December 13, 1889.

Having thus described my invention, what I claim is—

1. In a lasting-machine, the combination, with the lasting devices, of an actuating-lever extending upward near the last, means for oscillating one of the ends of the lever toward and from the last, and a universal clamp-holder mounted and carried upon and by the said end of the lever and adapted to receive, permit the adjustment of, and secure one of said lasting devices or clamps, substantially as set forth.

2. In a lasting-machine, the combination, with one of the side-lasting clamps, of a lever extending upward near the last, means for oscillating one of the ends of said lever toward and from the last, an oscillatory holder mounted and carried by said end of the lever and adapted to receive the lasting-clamp, and a stop situated in the path of said holder or of a portion thereof and adapted to cause the depression of the clamp as the lever is oscillated toward the last, substantially as set forth.

3. In a lasting-machine, the combination, with the lasting devices or clamps and their

actuating-levers, of slide-nuts engaging or connected with said levers, fixed guides engaging the slides of said nuts, and a power-shaft having right and left hand threads engaging said nuts, substantially as set forth.

4. In a lasting-machine, the combination, with the lasting devices or clamps and their actuating-levers, of slide-nuts engaging or connected with said levers, and a power-shaft having right and left hand threads engaging said nuts, the levers and nuts being connected by joints comprising sliding pieces fitting in the nuts and hinged to the levers, which permit both a hinge and slide motion, substantially as set forth.

5. In a lasting-machine, the combination, with the lasting devices and the side and end lasting levers, of slide-nuts connected with two opposite levers, a power-shaft having right and left hand threads engaging said nuts, angle-levers connected with the other opposite actuating-levers, and links connecting the other arms of said angle-levers with a nut engaged by a thread upon said power-shaft, substantially as set forth.

6. In a lasting-machine, the combination, with the lasting devices and end and side lasting levers, of slide-nuts connected with two opposite levers, a power-shaft having right and left hand threads engaging said nuts, angle-levers connected with the other opposite actuating-levers by means of slides and joints permitting a hinge and slide movement, and links connecting the other arms of said angle-levers with a nut engaged by a thread upon said power-shaft, substantially as set forth.

7. In a lasting-machine, the combination, with lasting devices, an actuating-lever therefor having its end forked and provided with a circular eye upon each fork, and a screw-shaft passing through said fork, of a nut engaging said shaft situated within said fork and provided with guides or slideways running transverse to the axis of the nut, and socket-pieces externally fitting said slideways, situated upon opposite sides of the nut and internally receiving and fitting the eyes of said lever, substantially as set forth.

8. In a lasting-machine, the combination, with lasting devices, an actuating-lever therefor having its end forked and provided with a circular eye upon each fork, and a screw-shaft passing through said fork, of a nut engaging said shaft, situated within said fork and provided with transverse flanges, and socket-pieces externally fitting between said flanges, situated upon opposite sides of the nut and internally receiving and fitting the eyes of said lever, substantially as set forth.

9. In a lasting-machine, the combination, with a lasting device or clamp, of a holder therefor comprising a universal joint and a clamp engaging and adapted to secure the parts of said joint, said holder having between the parts of the joint a bearing extending in a direction substantially at right angles to the plane of the lasting device and adapted to receive and secure a part of said device, substantially as set forth.

10. In a lasting-machine, the combination, with a lasting device, of a holder therefor comprising two hemispherical clamping-pieces adapted to engage a part of the lasting device, a hemispherical socket in which said clamping-pieces fit, a screw-plug fitting the open end of said socket and perforated to admit said part of the lasting device, and means for forcing said clamping-pieces together, substantially as set forth.

11. In a lasting-machine, the combination of an oscillatory holder adapted to receive and secure the lasting device or clamp, an extension carried by the holder, an outer socket or bearing piece in which the holder is mounted, also having an extension, projections carried by the extension of the holder, and a sleeve or stop-piece carried by the extension of said bearing-piece and adjustable to engage said projections and secure the holder rigidly or to permit its oscillation, substantially as set forth.

12. In a lasting-machine, the combination, with a lasting-clamp-actuating lever, of a holder for said clamp, supported and carried by the upper end or free end of said lever, said holder comprising a universal joint and a clamp engaging and adapted to secure the parts of said joint, an adjustable screw-fulcrum having an operating part or handle, and means for operating said lever, substantially as set forth.

13. In a lasting-machine, the herein-described lasting piece or clamp, provided with a flexible blade and a shank at an obtuse angle to the blade, substantially as set forth.

14. In a lasting-machine, the herein-described lasting device or clamp provided with a flexible blade, a longitudinal strengthening-rib, and a shank at an obtuse angle to the blade, substantially as set forth.

15. In a lasting-machine, the combination, with the end jaws hinged together and having outwardly-extending arms, of connecting rods or links jointed to said arms by means of ball-and-socket joints, the balls of which are carried by the arms and jointed at their other ends to balls suitably supported, and means for moving the jaws toward the last, by means of which said links are caused to operate said lasting-jaws, said links comprising end screw-caps and a central shank having right and left hand threads, substantially as set forth.

16. In a lasting-machine, the combination, with end-lasting jaws, of the actuating-links therefor comprising end screw-caps and central shanks having right and left threads for said caps and beveled or made conical at their ends, substantially as set forth.

17. In a lasting-machine, a last-stand comprising a screw-threaded post and a correspondingly internally-threaded sleeve, said

parts having above and below said threads accurately-fitting cylindrical bearings, substantially as set forth.

18. In a lasting-machine, a last-stand having a base, a stem fitting therein having at its lower end lateral projections and having near its upper end a screw-thread, a worm-wheel nut fitting in said base and engaging said stem, and a transverse worm engaging said wheel and adapted to operate the same, in combination with a table having a groove in which the lateral projections of said stem are adapted to fit, substantially as set forth.

19. In a lasting-machine, a last-stand having a post provided with a T-head, a base having a transverse T-groove adapted to receive said head, a set-screw for clamping the head in place, a stem fitting in said base and having at its lower end lateral projections and having near its upper end a screw-thread, a worm-wheel nut fitting in said base and engaging said stem, and a transverse worm engaging said wheel and adapted to operate the same, in combination with a table having a groove adapted to receive the lateral projections of said stem, substantially as set forth.

20. In a lasting-machine, the combination, with a head yoke or frame having a vertical bearing-pivot upon which it may be swung laterally from over the last, of a horizontal hinge upon which said yoke may turn vertically, and a spring for lifting said yoke and turning the same upon said horizontal hinge preliminarily to the turning of the yoke upon said vertical pivot, substantially as set forth.

21. In a lasting-machine, the combination, with a head yoke or frame having a vertical bearing-pivot, of a horizontal hinge, a stop for limiting the movement of the head upon said hinge, and a spring for lifting said yoke to disengage it from its support and permit it to be turned upon said vertical pivot, substantially as set forth.

22. In a lasting-machine, the combination, with the head having an independent toe-plier carriage, and the toe-pliers, of a sleeve or slide vertically movable upon said carriage, connections between the locking devices of said pliers and the sleeve, and means for lifting said sleeve to simultaneously disengage all of the toe-pliers, substantially as set forth.

23. In a lasting-machine, the herein-described pliers, consisting of the jaw-pieces pivoted together and provided with spring-legs and having between the latter an elbow or knee joint for actuating and locking the jaws, substantially as set forth.

24. In a lasting-machine, the herein-described pliers, consisting of the jaw-pieces pivoted together and provided with spring-legs and having between the latter an elbow or knee joint for locking the jaws with a yielding pressure, in combination with a hanger connected with the jaws by the pivot or hinge-pin of the latter, leaving the pliers free relative to the hanger, substantially as set forth.

25. In a lasting-machine, the herein-described pliers, consisting of the jaw-pieces pivoted together and provided with upwardly-extending legs, having between the latter an elbow or knee joint for actuating and locking the jaws, and a stop situated below the knee-joint pieces and adapted to arrest the same in their movement toward the plier-jaws when they have passed their dead-center, substantially as set forth.

26. In a lasting-machine, the herein-described pliers, consisting of the opposing jaw-pieces pivoted directly together and provided with legs and having between the latter an elbow or knee joint for actuating and locking the jaws, in combination with a detaching connection joined to the knee-joint pieces, substantially as set forth.

27. In a lasting-machine, the herein-described pliers, consisting of the jaw and leg pieces, each having the eye k^2 and the corresponding bearing k^5, said bearings being provided with circular walls upon the outer sides of the plier-pieces, in combination with elbow-joint pieces K^2 K^3, substantially as set forth.

28. The support for the herein-described lasting-machine, comprising the bed having the lateral extensions A′ for the side stands, the longitudinal T-groove a^8, and the longitudinal and transverse slots a^{11} a^{10} for the lasting-clamp levers, substantially as set forth.

29. The support for the herein-described lasting-machine, comprising the bed having the longitudinal T-groove a^8, the transverse and longitudinal slots a^{10} a^{11}, the lateral or transverse guides a^5, the central perforated bearing-bracket a^9, the transverse bearing-plates a' a^2, and the eccentrically-situated bearing-bosses a^6, substantially as set forth.

30. The support for the herein-described lasting-machine, comprising the table or bed A, provided with the groove a^8 and flange a, the legs having vertical flanges a^{15}, a back or panel secured to said flanges, a series of horizontal shelves connecting and supported by the legs, a door closing the front of the table and adapted to prevent access to said shelves, and a lock for said door, the whole constituting a safe for the protection of the removable and interchangeable side-lasting clamps and other parts of the machine, substantially as set forth.

31. The support for the herein-described lasting-machine, comprising the table or bed A, provided with the groove a^8 and flange a, the legs A^2, a back or panel secured to said legs, a door closing the front of the table, and corrugated shelves connecting and bracing and supported by said legs, substantially as set forth.

32. The support for the herein-described lasting-machine, comprising the table or bed

A, provided with the groove a^8 and flange a, legs A^2, a back plate secured thereto, a series of horizontal shelves connecting and supported by said legs, a door closing the front of the table and adapted to prevent access to said shelves, and a lock for said door, the whole constituting a safe for the protection of the removable and interchangeable side-lasting clamps and other parts of the machine, substantially as set forth.

33. In a lasting-machine, the combination of the plier-hangers having the eyes J, the sleeves H^7, supporting said eyes, shaft H^3, provided with a longitudinal groove and passing through said eyes, pins h^9, situated at the sides of the eyes, passing through the sleeves and engaging said groove, and means for supporting and raising the shaft, substantially as set forth.

34. In a lasting-machine, the combination, with a lasting-clamp lever, of an oscillating holder mounted upon and supported by the upper end thereof and adapted to receive and secure the lasting-clamp, a spring for pressing said holder in one direction, and a stop, whereby said holder is oscillated in the other direction as the lever advances to depress the clamp upon the upper, substantially as set forth.

35. In a lasting-machine, a lasting-clamp carrier mounted and adapted to rock upon an axis substantially parallel with the last, a support carrying said axis, a spring for turning the carrier in one direction to lift the fingers, means for moving said support toward the last, and a stop for positively turning the carrier in the other direction to depress the fingers, substantially as set forth.

36. In a lasting-machine, a lasting-clamp carrier or holder mounted and adapted to rock upon an axis substantially parallel with the last, a support carrying said axis, means for advancing the said support toward the last, and a stop adapted to engage a part connected with the holder and automatically turn the latter as it advances, substantially as set forth.

37. In a lasting-machine, the combination, with the inwardly-movable and oscillatory side-lasting-clamp holders, of the central frame having adjustable stops for arresting and turning said holders, substantially as set forth.

38. In a lasting-machine, the combination of the table having the recess a^{12}, undercut, as at a^{13}, a bearing-sleeve W^2, adapted to fit and be secured in said undercut portion of the table, and a revoluble frame mounted in said sleeve provided with adjustable stops and adapted to actuate the lasting-clamp holders, substantially as set forth.

39. In a lasting-machine, the combination, with the end-lasting jaws, of operating-links for the same, comprising a shank having at its ends right and left screw-threads, undercut flanges o^3, and hollow screw-caps O^2 O^3, adapted to fit said threads, having openings o^6 and adapted to engage said undercut flanges, substantially as set forth.

40. In a lasting-machine, the herein-described pliers consisting of jaw-pieces pivoted together and having between their legs an elbow or knee joint for actuating and locking the jaws, in combination with a supporting device which engages the jaw-hinge pin and is adapted to sustain the pliers thereby, substantially as set forth.

41. In a lasting-machine, the herein-described lasting piece or clamp comprising a thin flexible metallic blade provided with a supporting and adjusting shank at an angle to the blade, substantially as set forth.

42. In a lasting-machine, the combination, with the lasting devices, of an actuating-lever extending upward near the last, means for oscillating one of the ends of the lever toward and from the last, and a clamp-holder having a ball-and-socket joint comprising the socket u^2, hemispherical pieces U^3, and a clamp for the latter and carried upon and by the said end of the lever and adapted to receive the said lasting devices or clamps, substantially as set forth.

43. In a lasting-machine, the combination, with the lasting devices or clamps and their actuating-levers, of slide-nuts engaging or connected with said levers, a supporting bracket or bearing, and a two-part power-shaft S^4, divided at or near its middle, fitting said bearing and having right and left hand threads engaging said nuts, substantially as set forth.

44. In a lasting-machine, the combination, with the lasting-levers, adjusting clamp-holders carried directly upon and by said levers, and lasting devices secured in said holders, of actuating mechanism connected with the lever, and an adjustable fulcrum supporting the latter, substantially as set forth.

In testimony whereof I affix my signature in the presence of two witnesses.

ISAAC N. FORBES.

Witnesses:
H. N. LOW,
E. K. STURTEVANT.