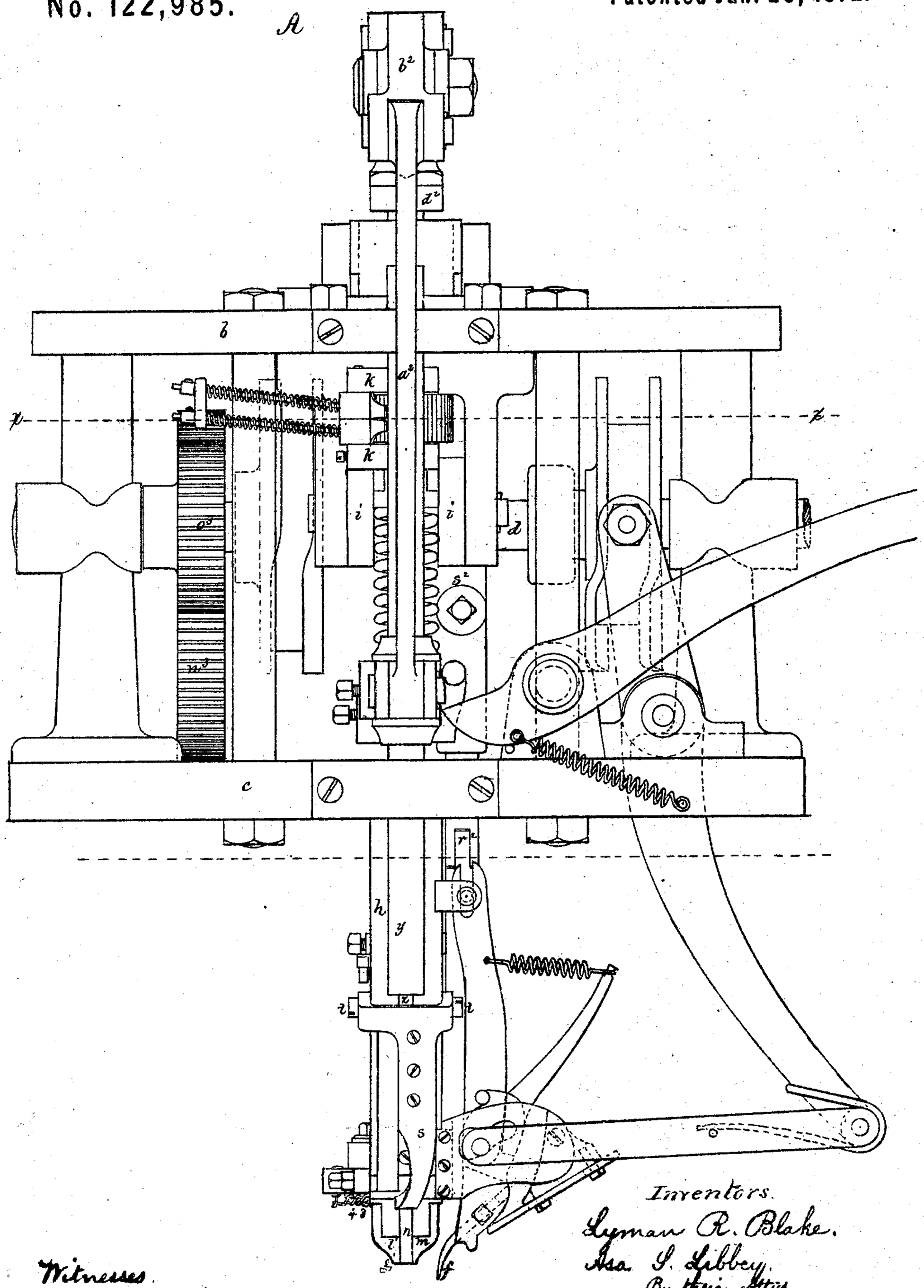
L. R. BLAKE & A. S. LIBBEY. 4 Sheets—Sheet 1.

Boot and Shoe Nailing Machine.

No. 122,985. Patented Jan. 23, 1872.



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L. R. BLAKE & A. S. LIBBEY. 4 Sheets--Sheet 2.

Boot and Shoe Nailing Machine.

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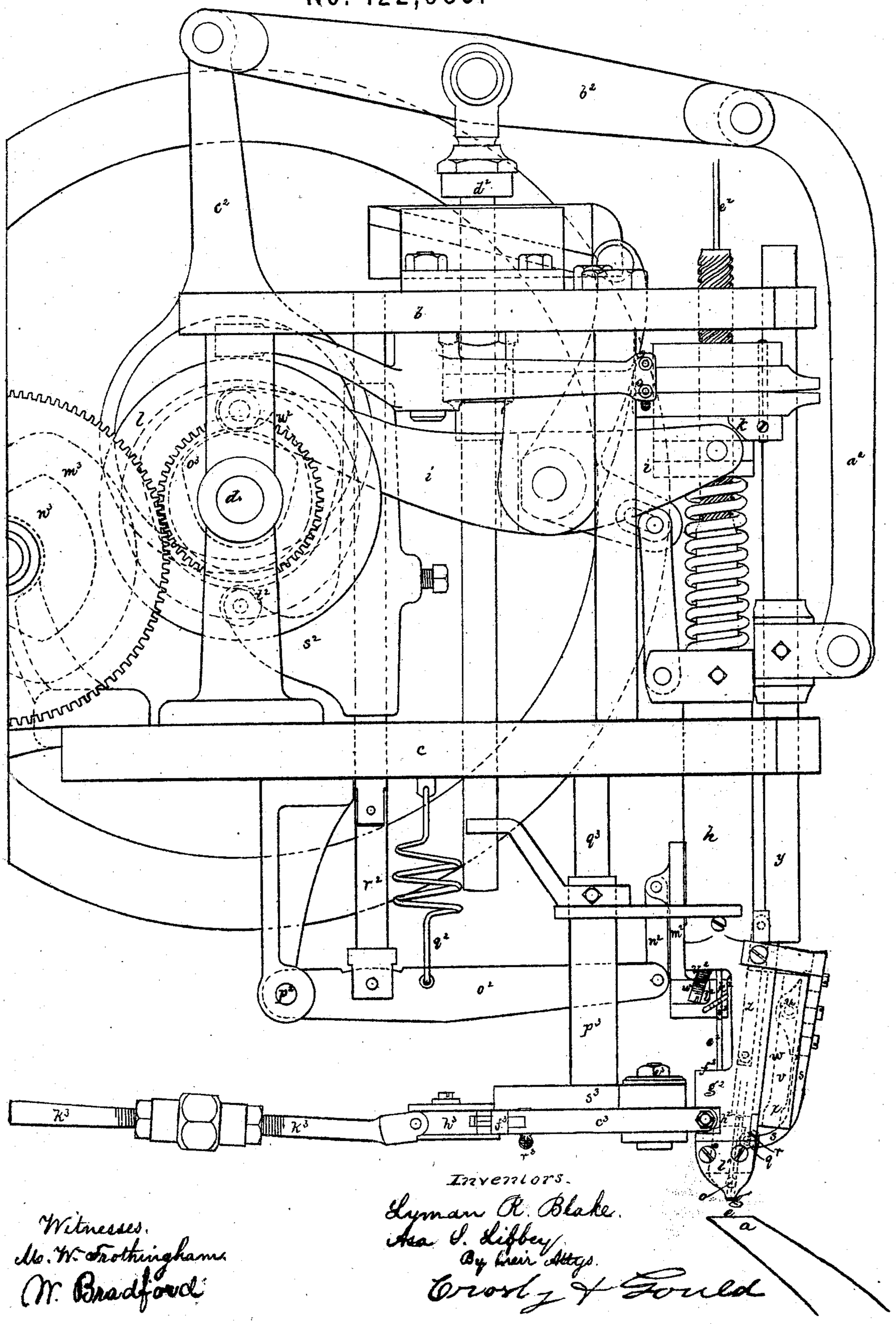

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4 Sheets—Sheet 3.

L. R. BLAKE & A. S. LIBBEY.

Boot and Shoe Nailing Machine.

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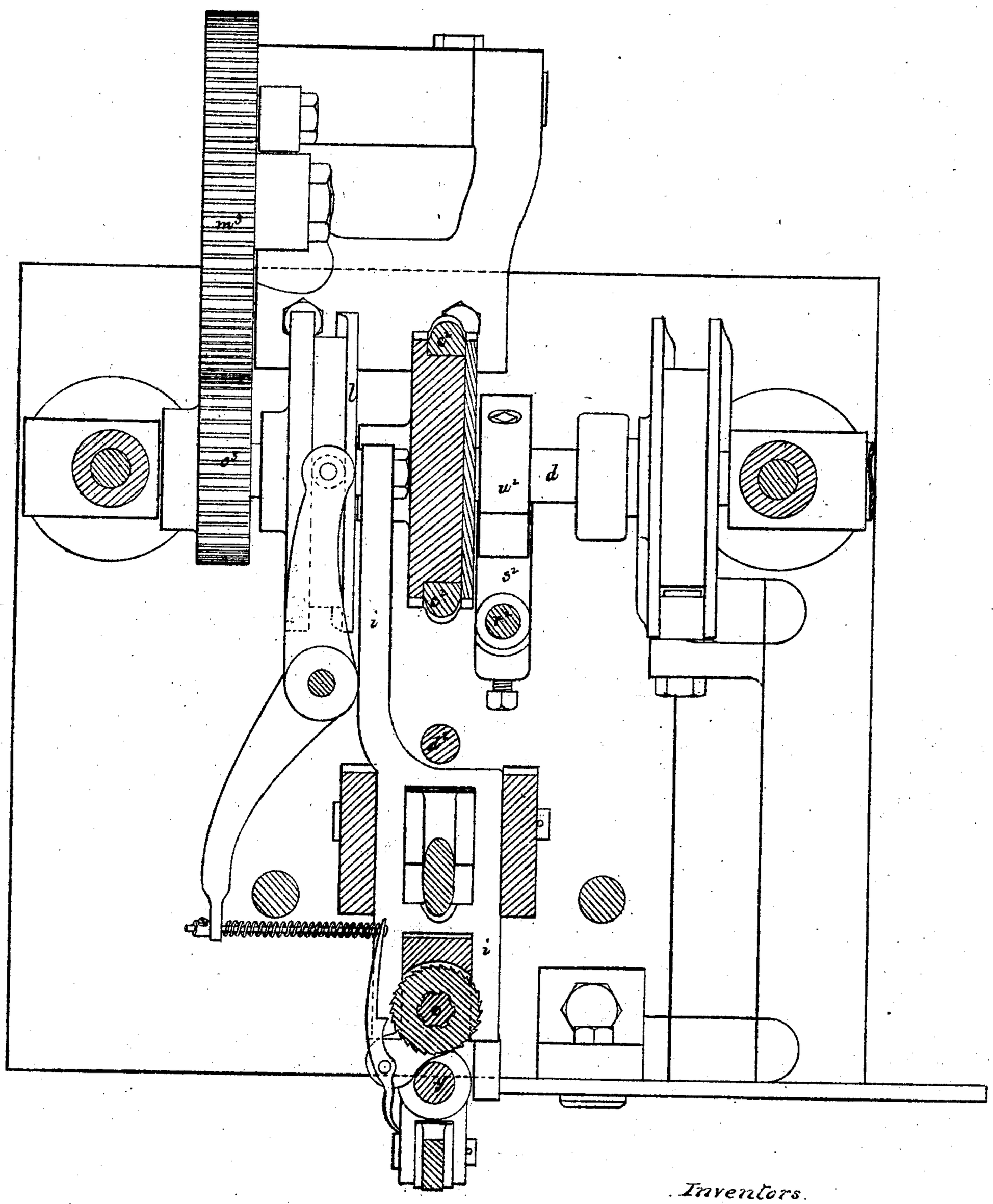

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4 Sheets--Sheet 4.

L. R. BLAKE & A. S. LIBBEY.

Boot and Shoe Nailing Machine.

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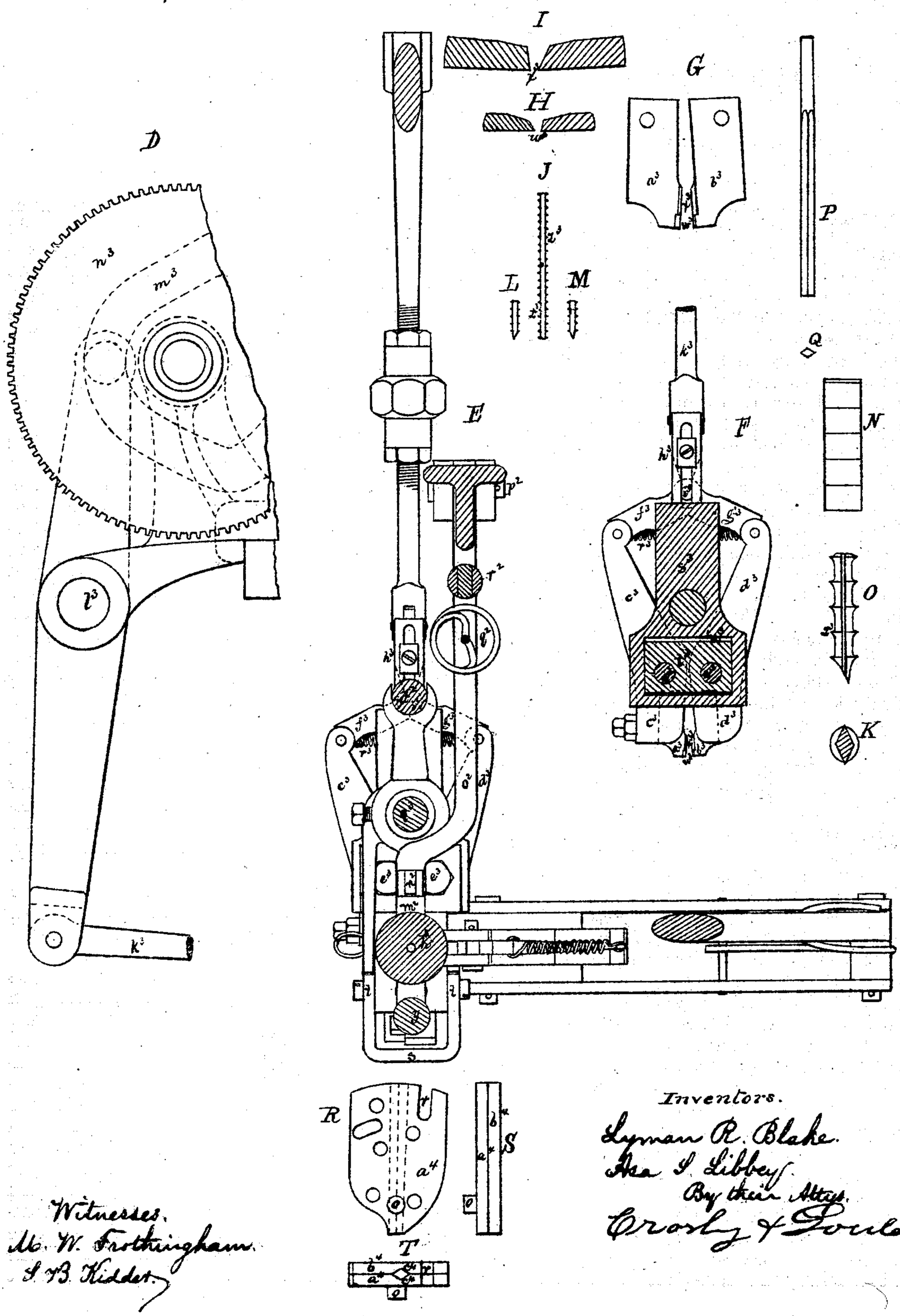

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122,985

UNITED STATES PATENT OFFICE.

LYMAN R. BLAKE, OF FORT WAYNE, INDIANA, AND ASA S. LIBBY, OF LAWRENCE, MASSACHUSETTS.

IMPROVEMENT IN BOOT AND SHOE NAILING-MACHINES.

Specification forming part of Letters Patent No. 122,985, dated January 23, 1872.

To all whom it may concern:

Be it known that we, LYMAN R. BLAKE, of Fort Wayne, Allen county, Indiana, and ASA S. LIBBY, of Lawrence, Essex county, Massachusetts, have invented certain Improvements in the Manufacture of Boots and Shoes; and we do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of our invention sufficient to enable those skilled in the art to practice it.

United States Letters Patent No. 76,150 were granted to us on the 31st day of March, 1868, for a machine for uniting soles and uppers of boots and shoes by means of nails automatically cut from a continuous wire, and driven by suitable mechanism.

Our present invention relates particularly to a machine having a construction, an organization, and a method of operation similar in many respects to the machine described and claimed in such patent. In such machine the boot or shoe is supported upon what is technically known as a "horn," or a salient inclined arm, the top of which enters the boot or shoe and serves as a work-supporting anvil, upon which the inner surface of the sole is supported directly under the point where the nail is to be driven, and the varying thickness through which nails are to pass (in nailing around the sole) is calipered between the top of the horn; and a presser-foot mechanism, in such manner that the rise of the presser-foot (to permit feed of the shoe) is uniform, or to a uniform distance above the upper surface of the sole, whatever may be the thickness of the parts to be nailed. By means of this variable rise, (in accordance with the thickness of the assembled parts to be united,) each nail is automatically cut from the wire to a length in accordance with the particular thickness of the parts such nail is to unite; and the throw of the nail-driver is also varied, as required by the thickness of the parts, so as to bring the point of the driver always to the same position, with reference to the upper surface of the sole at the point where the nail is driven. All these changes are effected in such patented machine automatically; and in the machine embracing our present improvements the same results are effected by means substantially the same, our invention, so far as relates to these features in the operation of nailing the shoe, being confined to the specific construction and arrangement of the mechanism. In the patent referred to the nails are driven in inclined directions and with alternately-opposite inclinations in the line of the fastening, for which purpose the nail tube-foot and the driver are brought into positions corresponding to the inclinations to be given to the driven nails, first in one direction and then in the opposite. In our present invention neither the nail-tube foot nor the driver has such an inclination, each being perpendicular to the line of the seam, and only inclined in the opposite direction to the extent required by swinging the nail-tube foot from position to receive the nail to position under the driver; and yet the nails when driven stand in inclined directions, (all the nails having the same inclination, or alternate nails having reverse inclinations,) and this inclination is effected by pointing each nail upon one side, so that as it enters it turns. It is in this method of uniting vamps and soles and of securing the inclinations of the nails, either in the same or alternately-reverse directions, that our present invention primarily consists, as also in the construction and arrangement of the devices by which the pointing upon opposite sides of successive nails is effected.

The drawing represents a machine embodying the invention.

A shows the machine in front elevation. B is a side elevation of it. C is a sectional plan on the line *x x*. D shows that part of one side of the machine, not shown at B. E is a plan of the cutting mechanism. F is a plan of the cutter-levers and the slide-block or bearing in which they are pivoted. G is a plan of the cutters. H I show in section (enlarged) the respective cutting-edges. J shows the nail-forming wire; K, a section of the same enlarged. L and M, two successively-formed nails. N O are side and edge views of one of the nails, enlarged. P Q show inside and end view of the nail-driver. *a* denotes the upper part of the horn or work-supporting arm; said horn being shown only at B, as in its construction and arrangement it may be precisely like the horn shown in our aforesaid patent. The working parts of the machine are shown as

mounted in, upon, and beneath a frame, composed of pillar-plates *b c* and their supporting-posts. Mounted in bearings upon the rear pillars is the driving-shaft *d*, upon which are shown as located all the cams (except the cutter-cam) that directly and indirectly actuate the various parts of the mechanism. The boot or shoe, drawn over the horn and having its inner sole resting upon the anvil top or face *e* thereof, is fed, at proper times, by a feed-foot or pin, *f*, and at other times is griped between the top of the horn and the presser-foot *g*. This presser-foot is at the bottom of a vertical bar, rod, or shaft, *h*, which extends through and has a sliding bearing in the plates *b c*, and has vertical reciprocating movements imparted to it (to cause the presser-foot to descend and gripe the sole and to rise to permit the shoe to be fed) by means of a rocker-lever, *i*, a pin projecting from one end of which extends into a slot in a frame, *k*, that encircles the rod *h*, while a pin projecting from its opposite end extends into a cam-slot in the side of a cam-wheel, *l*, on the driving-shaft. The frame *k* has a slot in which is located a nut, the thread of which extends into a quick screw-thread on the upper part of the presser-foot rod, the nut locking the presser-foot rod and frame *k* together, and the presser-foot being brought more or less distant from the frame by turning the nut. This nut has ratchet-teeth upon its outer surface into which lock spring-detainer pawls, which pawls, when the presser-foot descends, are drawn out from the ratchet by a suitable cam upon the cam-shaft, thereby disengaging the nut, which is then free to turn when the presser-foot descends, and in accordance with the position of the upper surface of the work toward which the presser-foot descends. The manner in which, by means of the screw-threaded presser-rod, the ratchet-nut, the spring-detainer pawls, and the co-operative mechanism, the presser-foot descends with a uniform pressure upon the stock, however variable in thickness, and rises to a uniform distance from the upper surface of the stock, thus varying in position, is fully set forth in our patent No. 76,150 and need not be herein more particularly described. The presser-foot is composed of two cheeks, *l' m*, having a vertical slot or space between them, in which is located the nail-tube foot *n*, fitting between the cheeks, hung near its bottom by means of a pin, *o*, projecting from the side of the foot into one of the cheeks, and rocking freely upon this pin to carry the nail-tube first into position for the upper end of the tube to receive the nail cut off from the wire, and next into position to enable the driver to enter the tube and drive the nail. The bottom of the nail-tube foot and the bottom of the presser-foot on each side of it are of substantially the same form, and when the nail is driven they set or press upon the stock as one piece. The cheek *l'* is made as a cap-piece, and by removing the screws, by which it is fixed to the presser-foot bar, the nail-tube foot may be removed.

The nail-tube foot is swung into its respective positions as follows: A pin, *q*, extends into a slot, *r*, in the top of the foot, this pin being at the lower end of a lever, *s*, hung, as seen at *t*, to the presser-foot bar. On the inner side of this lever is a pin, *u*, extending into a slot, *v*, in the driver-stock *w;* this slot being straight except at or near its lower end, where it is inclined, as seen at *x*. As the driver-stock ascends, after having driven a nail, and when the driver has risen from the tube in the nail-tube foot, the incline *x* strikes the pin *u* and swings the lever inward, carrying the nail-tube foot into position to receive the nail to be cut. During the latter part of the upward motion of the driver-stock, the pin *u* travels in a straight part of the slot *v* and the nail-tube foot is stationary in relation to the presser-foot. Just before or during the first part of the descent of the presser-foot the nail-tube foot is thus stationary, and the lower end of the wire having been fed down into the nail-tube foot, and the nail being severed from the wire, the presser-foot descends, and then the driver descends, bringing the pin *u* again into the slot incline *x*, and thereby swinging the nail-tube foot outward and bringing its nail-charged tube into position for the entrance and driving action of the driver. The driver-stock is connected to a vertically-sliding rod, *y*, by a link, *z*, and this rod by a link, a^2, to one end of a rocker-lever, b^2, whose other end is jointed to the arm of an eccentric strap, c^2, encircling an eccentric on the main shaft. The lever b^2 is fulcrumed in a bearing at the top of a slide-rod or post, d^2, and although the throw of the driver, effected by the lever and eccentric, is positive and constant in extent, yet the driving point of the driver is made to descend to a point in accordance with the varying position of the surface of the stock, (contingent upon the thickness of the stock;) this being effected by making the fulcrum of the lever movable vertically and positioning it in accordance with the thickness of the stock or the distance to which the point of the driver is to descend. This position is automatically effected by means of a wedge slide, which, at each rise of the presser-foot, is slid back by a connection with the presser-foot bar, and to an extent dependent upon the position of the presser-foot bar as to height. When thus slid back a collar fixed to the fulcrum-rod rests on the top of the slide, and the height of the fulcrum for the next throw of the driver is thereby determined in accordance with the height of the surface of the slide, which height is regulated from the presser-foot-bar, the varying throw of the driver being effected in the same or substantially the same manner, and by the same or substantially the same mechanism, as described and shown in our patent above named. The feed of the nail-wire and the cutting of the nails to lengths to correspond to the thickness of the parts to be united are effected and determined by mechanism varying from that shown in said patent. The presser-foot bar or rod for most of its

length is made as a tube, through which tube the nail-wire e^2 passes. Toward the lower end of the rod it is cut out on its rear side, forming an opening, f^2, in which opening the feed mechanism plays. Below the opening is a throat or tube piece, g^2, in which is a slot, h^2, in which the cutters play, and below this slot are the presser-foot proper and the nail-tube foot. The wire passes down through the center of the presser-foot rod, into and through the opening f^2, (as seen at B,) in which opening the feed is effected; then into the throat piece g^2; thence across the slot h^2 into the tube of the nail-tube foot, the nail being severed at the slot h^2. i^2 denotes a feed-pawl, hung in a slot, k^2, of a foot-piece, l^2, at the bottom of a vertical slide, m^2, which slide is connected by a link, n^2, with one end of a lever, o^2, whose other end is pivoted, as seen at p^2. The lever is drawn up by a spring, q^2, and by being drawn up it carries the pawl into position to engage with or gripe upon and feed the wire as it next descends. The lever is jointed to a vertical slide-rod, r^2, upon which is fixed an arm, s^2, carrying a roll, t^2, that is struck by a cam, u^2, on the driving-shaft as the shaft rotates, the cam forcing down the roll and thereby effecting the descent of the lever and the feed of the wire. The lever is forced down by the cam to a fixed or constant position at each descent, but the rise of the lever being effected by the spring it may rise more or less, as may be required, and according to the extent of its rise will be the extent of feed of the wire, as will be readily understood. The presser-foot, as before set forth, rises in accordance with the height or position of the upper surface of the stock, and when the slide-foot rises it is arrested by the shoulder v^2 of the presser-foot bar, or a projection therefrom, and the pawl will bite upon the wire wherever the foot is thus arrested. The length of wire for each nail may be proportioned to the thickness of the parts to be united, or to a length just equal to such thickness, or a little less or a little greater than such thickness; and adjustment of the feed to insure this length may be made by varying the position of the arm s^2 upon the slide-rod. Small variations may also be effected by a set-screw, w^2, against which the slide-foot is arrested. When the wire is fed down the cutters are open, allowing the wire to pass freely through the slot h^2. As soon as the wire is thus fed the cutters are operated to sever the nail. The cutting mechanism is as follows: a^3 b^3 denote two horizontal cutter-blades. They are fastened, respectively, to two cutter-levers, c^3 d^3, which are pivoted, as seen at e^3. The outer ends of the levers diverge and are connected by toggle-links, f^3 g^3, which are jointed together at one end to a slide, h^3, as seen at i^3. The slide is connected, by a link, k^3, with the lower arm of a lever fulcrumed at l^3, and having on its upper arm a stud-pin projecting into a cam-groove, m^3, in the side of a cam-wheel, n^3, said wheel being geared to a pinion, o^3, on the driving-shaft. The cutter mechanism is hung upon the bottom of a sleeve, p^3, sliding freely on a rod or pin, q^3, and having a vertical movement in accordance with the movement of the presser-foot bar. After the wire has been fed the cam m^3 actuates the link k^3, (drawing it out or throwing it in, as the case may be,) and brings the toggle-links into line, thereby forcing the cutting-blades inward and severing the wire. Having done this the link either recedes and separates the blades or else continues its movement, carrying the toggle-links past the center, when the cutter-levers will be drawn inward by a spring, r^3. The cutters may be thus operated if their cutting-edges are alike, and cut a V-shaped point, or if they cut a point only on one side of the wire. We prefer, however, to arrange them to cut points alternately at opposide sides of successive nails, and for this purpose the specific arrangement shown in the drawing is preferred, this arrangement being as follows: The cutter-blades, instead of being directly fulcrumed in the plate s^3, are pivoted to a bearing-slide, t^3, placed in a rectangular opening, u^3, in the plate s^3, as seen at F, and being of the length of such opening and a little less in width, and being kept in position by a cap-plate, a bottom-plate, and the fulcrum-bolts or screws e^3. Each cutter is made with two cutting-edges, w^3 x^3, and the two opposite and co-operating edges w^3 cut the nail with a point at one side, while the two opposite and co-operating edges x^3 cut a nail with a point at the opposite side. When the link is thrown forward or toward the cutters the edges w^3 are in position with respect to the wire to sever the nail; or, in other words, the wire is between these two edges. The movement of the toggle-links brings them into line and effects the cut, and as they continue to move on and pass the center the spring r^3 draws the outer cutter lever-arms toward each other, and in doing so throws them outward, causing the bearing-slide to move back in the rectangular opening u^3, and bringing the cutting-edges x^3 into position to cut. When the blades are next thrown together by the outward movement of the link the edges x^3 sever the wire, and as the toggle-links f^3 g^3 again pass the center the spring r^3 again draws the arms inward and throws the bearing-slide forward, thus again bringing the edges w^3 w^3 into position to sever the wire; one pair of the cutters thus effecting the pointing upon one side, and the other pair the pointing at the opposite side of the nail.

The mechanism that effects the feed of the shoe is very similar to that shown and fully described in our patent No. 76,150, and need not be herein explained.

The nail-forming wire which we prefer to use is somewhat peculiar. It is formed from round wire, which is rolled in suitable roller-grooves into the shape shown at J, N, O, and K, or so that its form in section is lenticular or lozenge-shaped, but with barbs or sharp teeth or spurs formed or left upon two opposite sides,

the edges being smooth. Views of the nail enlarged are shown at K, N, and O. The shape of the wire in section enables it to bend readily in directions at right angles to its longest diameter, but renders it rigid in the opposite direction, while the barbs or spurs hold the nails in place and prevent them from working loose in the sole. As before observed, their one-sided points insure the turning of the nails as they enter the sole, and as these points reach the anvil-top of the horn they turn over and clinch upon the inner surface of the sole; but we do not in this application claim the nail-forming wire, nor the nails, as we intend to make a separate application therefor.

The nail-driver (shown at P Q) is formed of round steel wire, having its nail-driving end brought into a form lozenge-shape in section by means of rolls having V-shaped grooves, the surface of the driver being hardened, toughened, and rigidified by the operation of thus reducing it to form.

For the passage of the nails and the driver the nail-tube has to be or is preferably correspondingly formed, and for this purpose the nail-tube foot is made, as seen at R S T, of two plates, a^4 b^4, joined together by suitable pins, each plate having cut in its face an obtuse-angled groove, c^4, the two grooves of the two plates joining when the plates are brought together, and forming the lozenge-shaped nail-tube, as seen at T.

We claim—

1. The variable presser-foot bar h and wire-delivery tube, made as one, substantially as shown and described.

2. The nail-tube foot n, located and swinging between the presser-foot cheeks l' m, substantially as shown and described.

3. The combination and arrangement of the driver w and nail-tube foot n, substantially as shown and described.

4. As a means for swinging the nail-tube foot into its respective positions for entrance of the nail and entrance of the driver, we claim the lever s, operated by the driver, substantially as shown and described.

5. In combination with the wire-feed pawl i^2 the lever o^2, thrown downward by the cam and upward by the spring q^2, and having its upward movement determined and controlled substantially as described.

6. The cutter-blades a^3 b^3 fixed to the end of the levers c^3 d^3, which are operated by the toggle links f^3 g^3, substantially as described.

7. The cutter-blades, formed to cut the wire with a one-sided point, substantially as described.

8. The blades, made with two sets of cutting-edges to form points on opposite sides of the wire, substantially as described.

9. The cutter-levers c^3 d^3, carrying blades with the two sets of cutting edges, and made to intermittently move to bring the two sets of cutting-edges into position to sever the wire, substantially as described.

10. The bearing-slide t^3, moved in opposite directions by the action of the toggle-links f^3, g^3, and spring r^3, substantially as shown and described.

11. The nail-driver tube, formed of two grooved plates, a^4 b^4, substantially as described.

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