

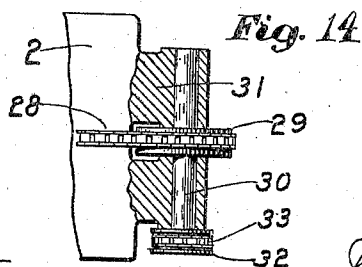
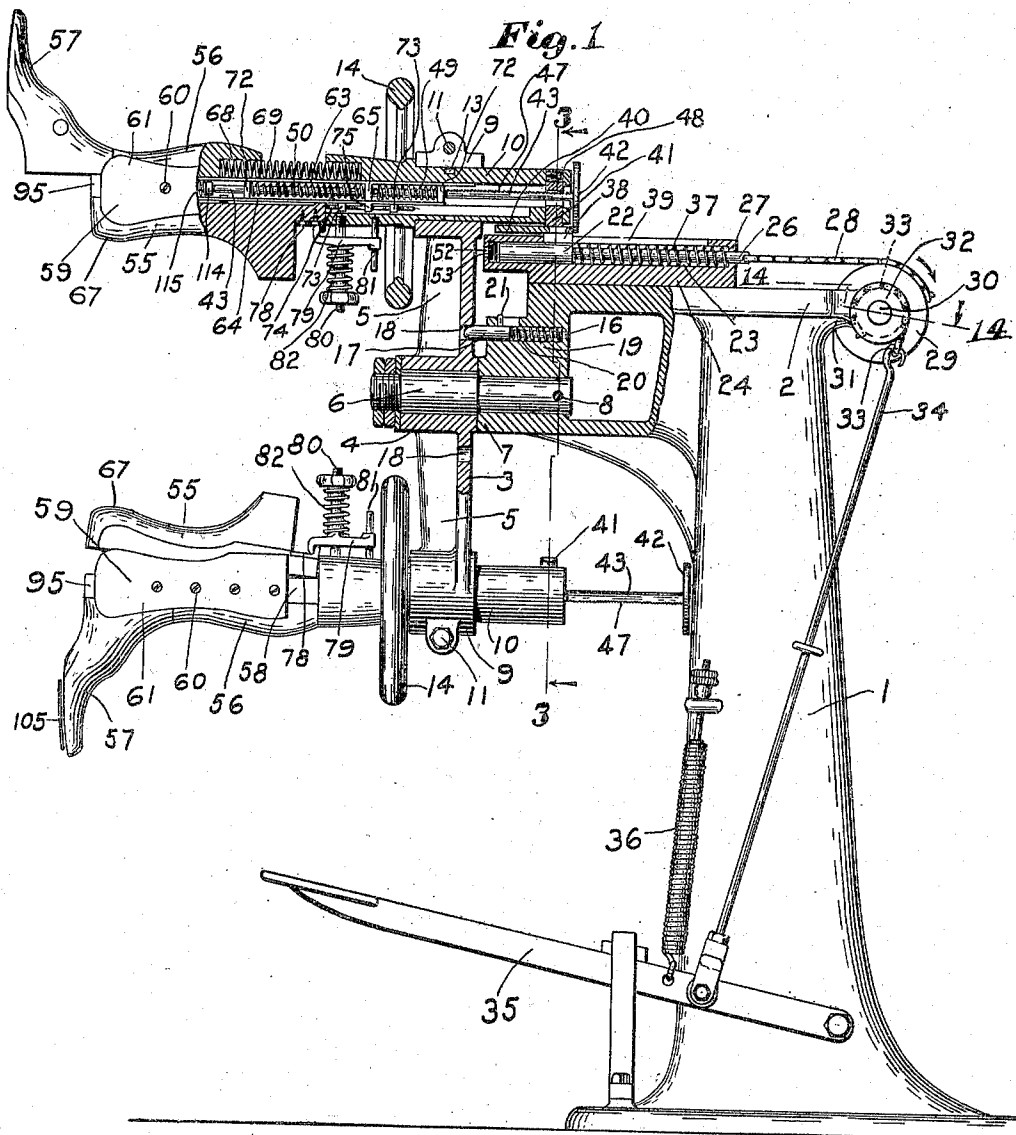
W. H. HOOPER.
BOOT TREERING MACHINE.

APPLICATION FILED JULY 2, 1906. RENEWED FEB. 19, 1910.

957,964.

Patented May 17, 1910.

8 SHEETS—SHEET 1.



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Fig. 2.

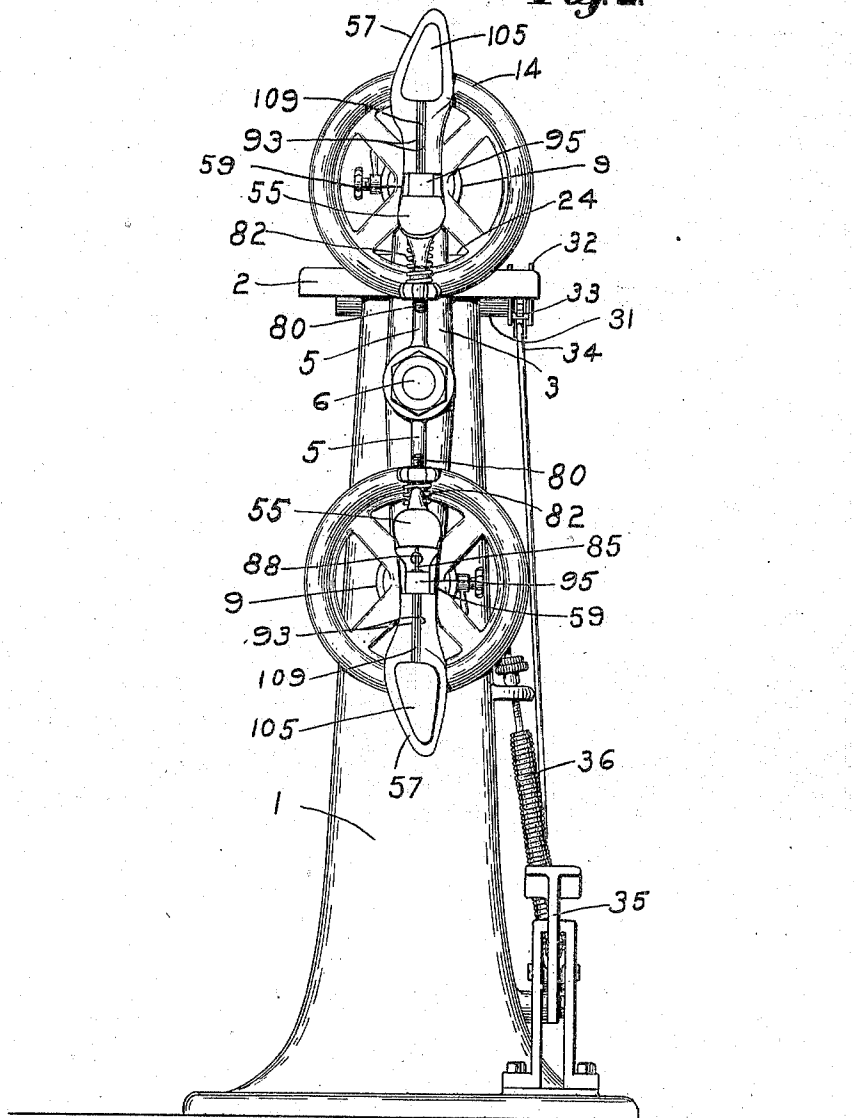
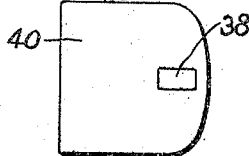


Fig. 17.



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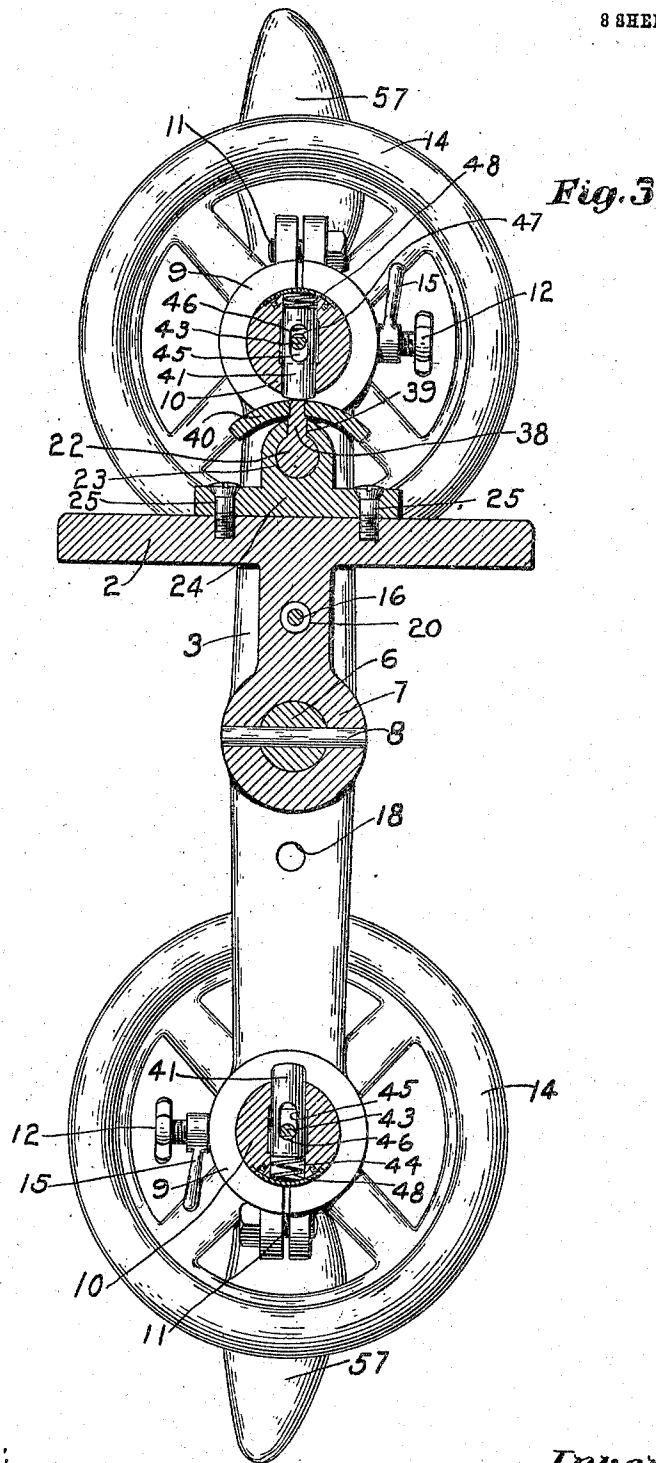
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8 SHEETS—SHEET 3.



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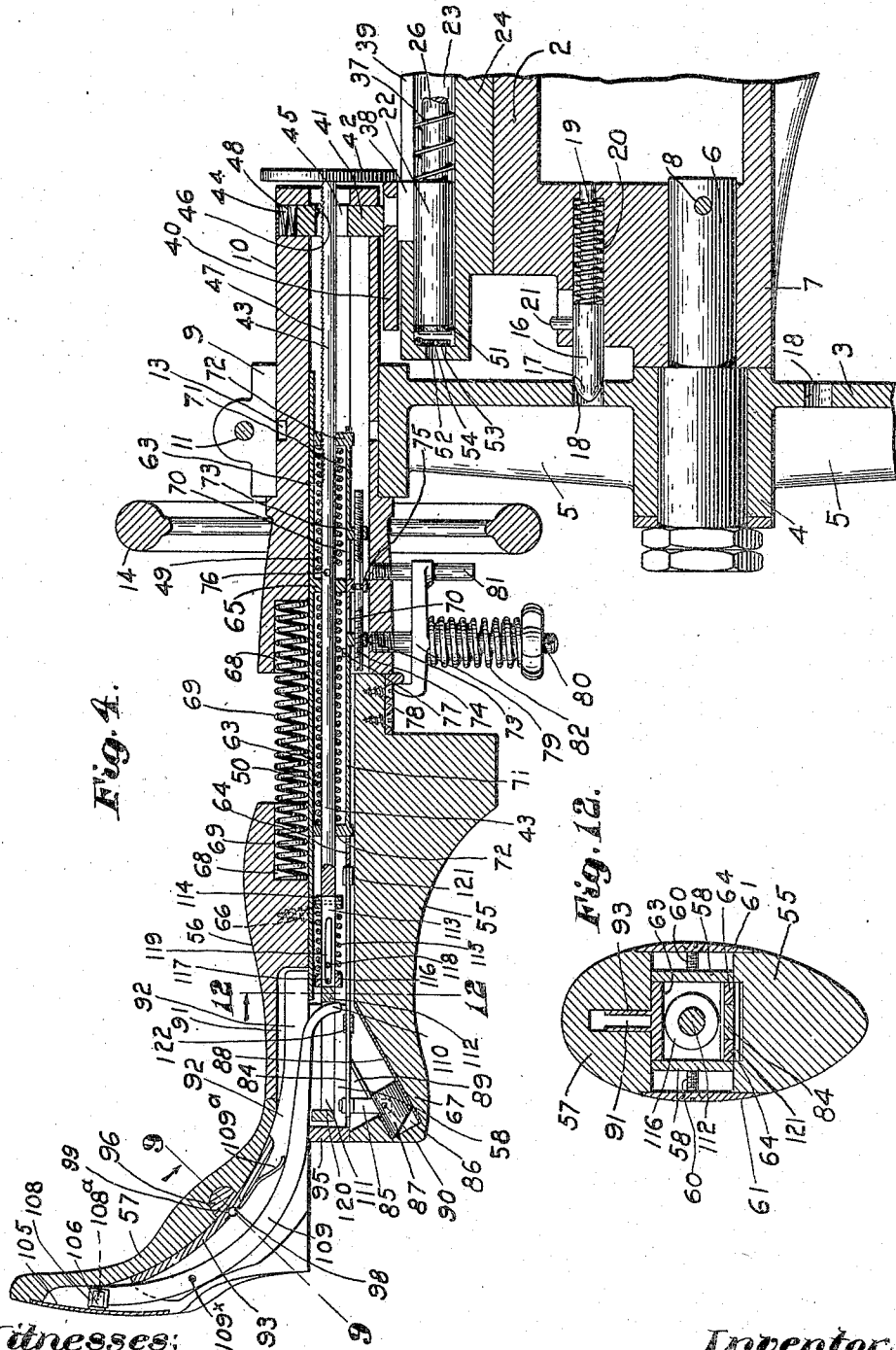
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8 SHEETS—SHEET 4.



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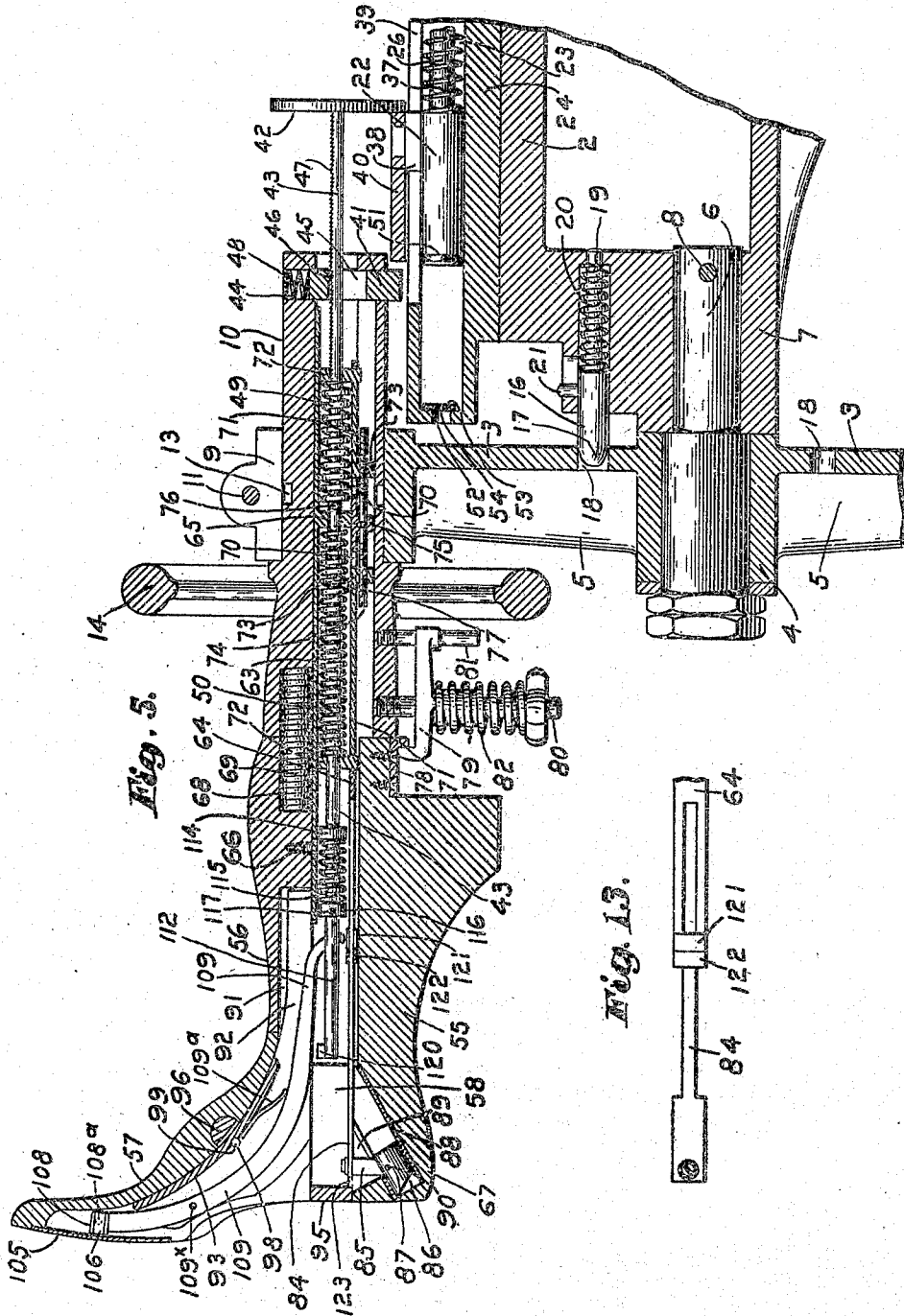
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8 SHEETS—SHEET 5.



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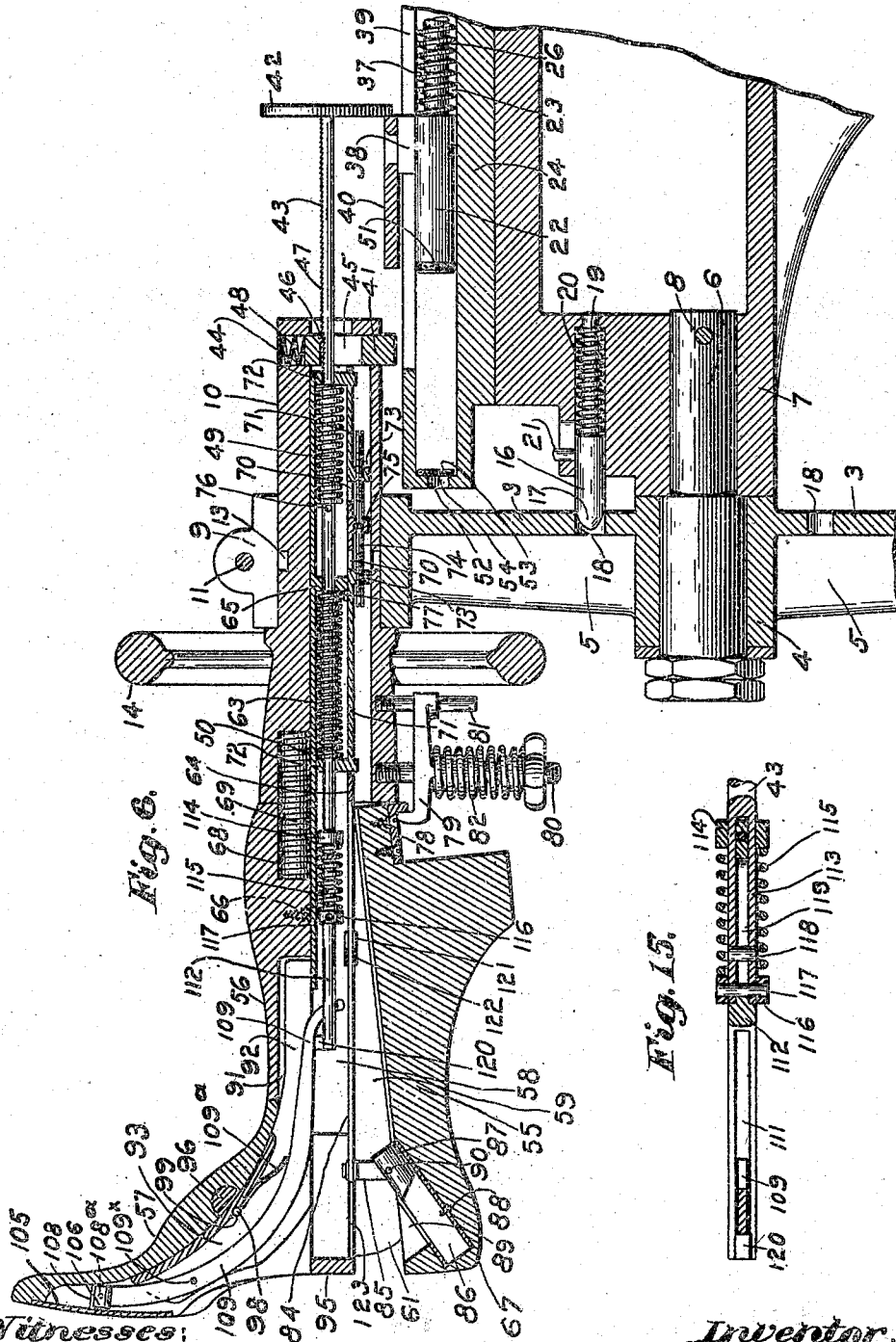
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8 SHEETS—SHEET 6.



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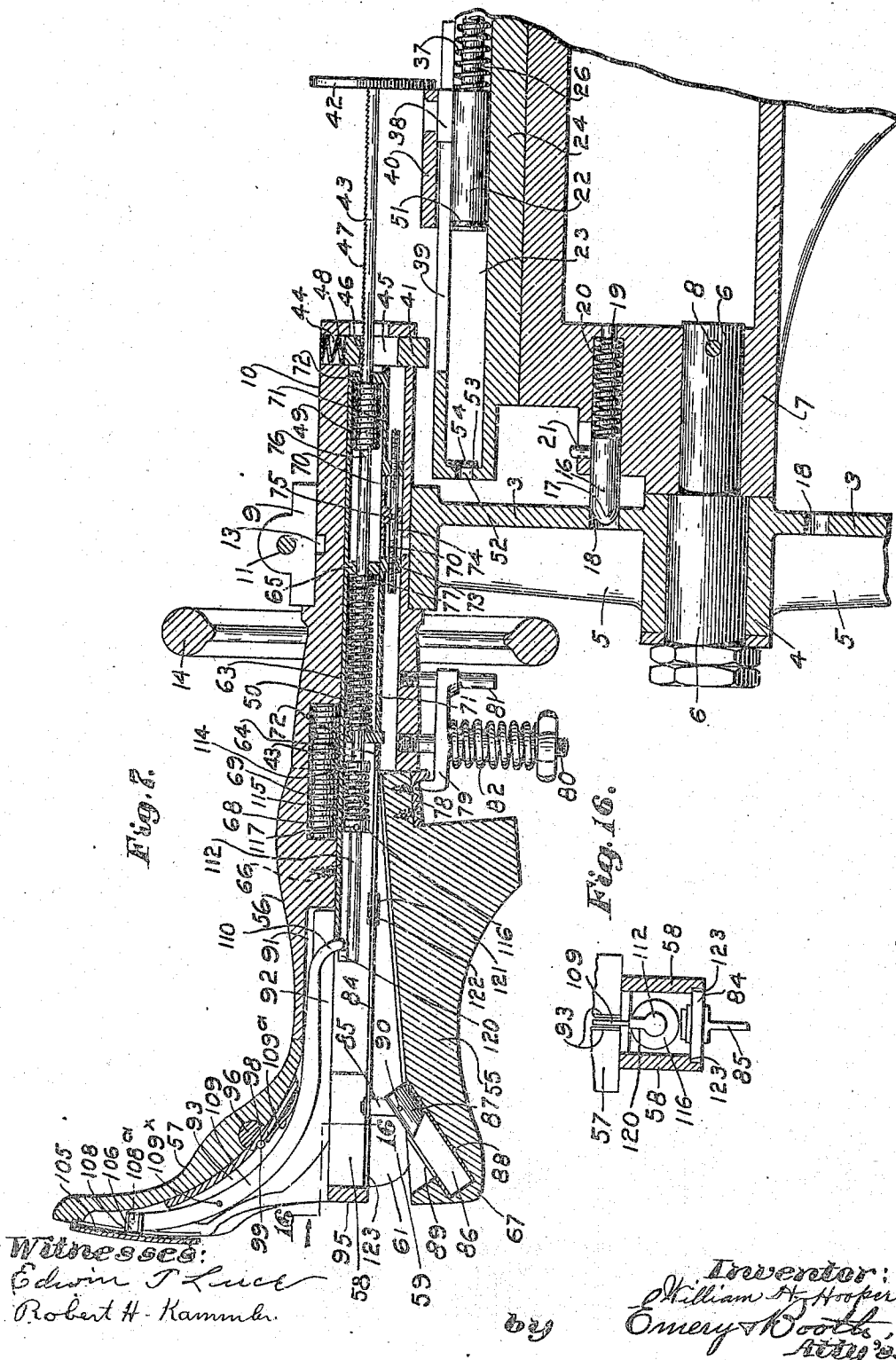
BOOT TREERING MACHINE.

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8 SHEETS—SHEET 7.



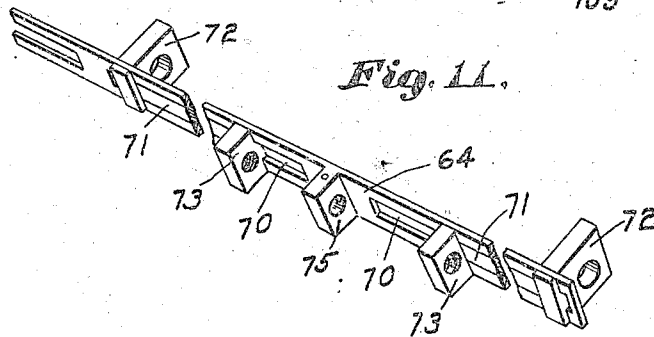
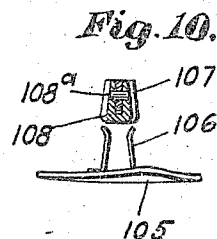
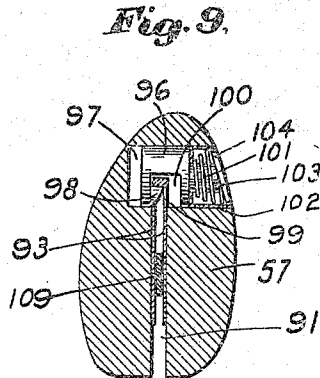
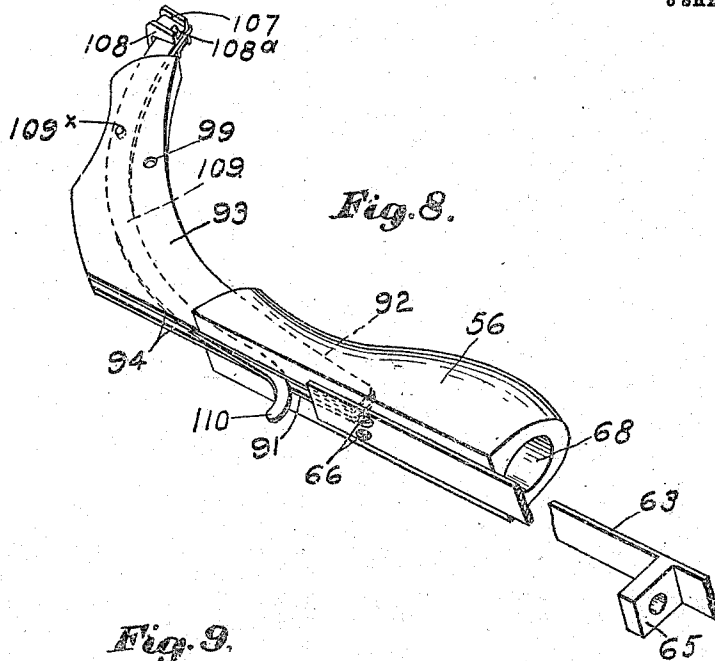
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957,964.

Patented May 17, 1910.

8 SHEETS—SHEET 8.



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UNITED STATES PATENT OFFICE.

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BOOT-TREEING MACHINE.

957,964.

Specification of Letters Patent.

Patented May 17, 1910.

Application filed July 2, 1906, Serial No. 324,314. Renewed February 19, 1910. Serial No. 544,898.

To all whom it may concern:

Be it known that I, WILLIAM H. HOOPER, a citizen of the United States, residing at Swampscott, in the county of Essex and State of Massachusetts, have invented an Improvement in Boot-Treeing Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to a boot and shoe treeing machine having one or more expandible boot trees, said trees being movably mounted to permit them to be brought into working position relative to the operative as may be desired.

One of the features of the invention is the provision of suitable and novel means for expanding each tree and to permit the expanded tree to be moved without substantial change in its alinement into a lower position while bringing another into an elevated position, thereby to present one tree and its shoe to the operative for work thereon or for manipulating the shoe carrier, thereby contradistinguished from swinging said tree in a horizontal plane as heretofore generally practiced.

My invention also contemplates a novel construction of boot tree, also of a boot tree foot, provided with a separable fore part and sole which preferably are separated by the expansion of the tree, thereby to expand the foot or toe of a shoe in a direction from top to bottom thereof or perpendicularly to the sole face.

I furthermore provide for a gradual contraction of the expanded tree, thereby preventing distortion or wrinkling of the dressed surface of a shoe or boot mounted thereon and avoiding injurious effects upon the tree or its mechanism, incident to a sudden collapse or recovery of the tree parts as in previous machines. This result may be conveniently attained by means of a retarding device, preferably a dash pot connected with the expanding devices of the tree and adapted to control the movements thereof as desired. All of the above, however, with other features and objects of my invention, will be best understood and appreciated from the following description and accompanying drawings of a machine selected for the purpose of illustration and embodying one form of my invention, the

scope of the latter being more particularly pointed out in the appended claims.

Referring to the drawings: Figure 1 is an elevation of the right side of a machine selected as illustrating one embodiment of my invention; Fig. 2 is a front elevation of the same; Fig. 3 is a vertical section taken from the rear on the line 3—3 of Fig. 1; Figs. 4 to 7 are enlarged vertical and longitudinal sections, taken through the axis of the tree, to show the successive movements of its parts in expanding a shoe; Figs. 8 to 10 are details to be referred to, illustrating the construction of the fore part, foot-piece and sole expanding mechanism; Fig. 11 is a perspective of the lower slide member, to show the adjusting slide plates mounted thereon; Fig. 12, a vertical transverse section on line 12—12 of Fig. 4; Fig. 13, a plan view of a detail showing the front end of the lower slide member and the movable plate, 84, carried thereby; Fig. 14 a section on the line 14—14 of Fig. 1; Fig. 15 is an enlarged plan and partial section of a detail showing the front end of the expander bar and the sole expanding member carried thereby; Fig. 16 is a vertical sectional detail to be referred to taken on the line 16—16, Fig. 7, to show the arrangement of guide-way 123 in which the controlling member, 84, is arranged to slide; and Fig. 17, a plan of a detail to show the curved rear edge of the cam plate, 40.

While any suitable means may be employed for supporting the various parts of the machine, that herein shown (see Figs. 1 and 2) comprises a column, 1, having a head, 2, upon which the actuating devices for expanding the trees are arranged.

In the machine shown the boot trees are carried by a rotary frame, 3, comprising a hub, 4, and arms, 5, extending radially in opposite directions therefrom, said hub, 4, being journaled upon a horizontal pivot stud 6, projecting from the foot of the column and suitably retained with a boss, 7, of said column. The outer ends of said arm, 5 (Fig. 3), are each provided with a split tubular bearing, 9, for the journal or barrel, 10 (Figs. 1 to 4) of a boot tree. Each of said bearings is provided with a friction bolt, 11, and a barrel retaining screw, 12, the latter extending inwardly into a circumferential groove, 13, (Fig. 4), of the tree barrel, and being held in adjusted position

by a lock nut, 15, so that longitudinal displacement of the tree is prevented, while permitting the tree to be rotated to present any desired portion of the surface of a boot or shoe mounted thereon into such convenient treeing position as may be desired by the operative. To facilitate rotating the trees in their bearings each is provided with a suitable hand wheel, 14 (Fig. 3).

By the pivotal arrangement of the tree carrying frame, herein shown, the boot tree may be rotated to bring either tree into its upper position in which it may be expanded and contracted, said arms, 5, being normally maintained in vertical position by a horizontal locking pin, 16 (Fig. 4), socketed into the front of said head, 2. This pin has a rounded or cam end, 17, adapted to slide into a socket or recess, 18, formed at the back of each arm as the latter reaches its upper vertical position, a coil spring, 19, interposed between the rear end of said pin and the bottom of the socket, 20, in which the pin is mounted, normally acting to project the pin forward into locking position. A stop, 21, on the pin, 16, is provided to limit the spring actuated movement, the rounded end of the pin causing the latter to slide rearwardly when the frame is forcibly rotated, yet furnishing a sufficient stop for the frame at the end of a semirotation when a new tree is brought into position.

A plurality of arms and trees are employed, two being shown in the present instance, though obviously any number could be employed, to permit a boot or shoe to be mounted upon the upper tree expanded, treed or dressed and then turned out of position to dry, while the operative applies a boot to the other tree brought into its upper position or may remove one already in place thereon, and after applying a fresh boot or shoe, the expanding and treeing operation is repeated; this arrangement avoiding the loss of time incident to the use of different machines.

Heretofore in treeing machines employing a plurality of trees it has been customary to swing the same horizontally from side to side, but this arrangement requires so much space in which to swing the trees first to one and then to the opposite side of the machine, that a great waste of floor space results together with an unnecessary effort on the part of the operative in swinging the trees. It has also been attempted to provide boot treeing machines with radially mounted boot trees arranged to swing like the spokes of a wheel, both horizontally and vertically, but such arrangements also are obviously objectionable. All these objections are avoided by the arrangements shown, whereby a minimum floor space is covered and whereby also the tree may be brought into position by slight physical ef-

fort expended to the best advantage by the operative.

Each tree is adapted to be expanded by suitable mechanism mounted upon the head of the column. In the present instance this mechanism comprises a horizontal plunger, 22, slidably mounted in a barrel, 23 (see Figs. 1 and 4), formed in a block or plate, 24, secured as by screws, 25 (Fig. 3), to the head of the column. The rod or stem, 26, of this plunger (Fig. 1) slides freely through a guide bearing, 27, formed at the rear end of said barrel and is connected by a chain or strap, 28, with the periphery of a short drum or disk, 29, mounted on a horizontal shaft, 30, suitably journaled in lugs, 31 (Fig. 14), formed upon and at the rear of said head, 2. Rotation of this shaft is herein effected by means of a grooved pulley or wheel, 32, fast upon the outer or right end of said shaft (Figs. 1 and 14) and having a chain or belt, 33, secured at one end in said groove and extending therein over the top of the pulley with its opposite end connected to the upper end of a link or rod, 34, secured at its lower end to a treadle, 35. This treadle is normally held elevated by a coil spring, 36, connecting said treadle with a lug on said column, the tread end of said treadle extending forward into a convenient position to be actuated by the operative's foot. By depressing the treadle, the downward movement of said link, 34, unwinds the chain on said pulley, 32, causing the latter and its shaft and the drum, 29, to rotate to the right, viewing Fig. 1, to wind the chain, 28, upon its drum and withdraw or move said plunger, 22, rearwardly to expand the tree. For retracting or moving the plunger into its forward position the plunger is surrounded by a coil spring, 37 (Figs. 1 and 4), interposed between the plunger and the rear end of the barrel, 23. That the boot tree expanding devices may be actuated by said plunger, the head of the latter is provided with a fin, 38 (Figs. 1, 3 and 4 to 7), extending vertically through and traveling in a longitudinal slot, 39, formed in said barrel, 23, said fin having rigidly secured thereto a curved cam plate, 40, adapted to engage the tree expanding bar, 43, and also to control the locking device, 41, thereof, as will be hereafter described. The rear end of the expander rod, 43, with which each tree is provided has a disk, 42, the edge of which projects into the path of the rear end of said plate, 40, whereby any rearward movement of said plate will cause like movement of said disk and its tree expander bar. By providing a disk, as described, with its periphery or circumferential portion extending across the path of said cam plate, 40, the tree may be rotated in its bearings at will and in any rotative position may be expanded without at-

tention being given to the plane occupied by the tree foot as would be required were a depending arm or projection substituted.

To maintain the trees expanded, each is provided with a suitable locking device herein shown as a spring controlled locking dog, 41, slidably mounted in a transverse bearing or socket, 44, formed in the rear end of said tree barrel, 10 (see Figs. 3 and 4). This locking dog, 41, has a slot, 45 (Fig. 3), to permit said expander bar, 43, to slide therethrough and the locking dog to move toward and from said bar. At its upper side, said slot has a depending tooth, 46 (Fig. 4), to engage the ratchet teeth, 47, formed upon the opposed edge of said expander bar, said teeth being shaped to permit the bar to slide rearward freely in expanding the tree but preventing movement in a reverse direction. The dog controlling spring, 48, is interposed between the bottom of said socket, 44, and the upper end of said dog, 41, and normally acts to depress the latter to engage or interlock with said ratchet teeth, 47, to prevent contraction of the tree. That the boot expanding device may be released automatically, the locking dog, 41, is arranged to be slid outwardly or upward (Fig. 1) as the arm or boot tree is swung or rotated into its upper position. To this end the lower end of said dog, 41, projects below the barrel of the tree and is rounded to ride freely onto the top of said cam plate, 40. The curve or active face of this plate is eccentric to the movement of the tree, or its shape is otherwise such that the dog is gradually lifted as the boot tree is swung to approach its upper position, until upon reaching said position the interlocking teeth of said dog and said rack are separated, thus permitting the retraction of the expander. This expander bar may be withdrawn to a greater or less extent to produce the desired expansion of the tree and the boot or shoe mounted thereon, hence the disk, 42, on the end of said bar will not always be moved into the same relative position, but the cam surface of said plate, 40, is extended forwardly to always be in position to be engaged by the lower end of said dog, 41. The rear edge of the cam plate will also, always be adjacent to and in the path of said disk, causing the latter to engage the same, as it is moved upon contraction of the tree by its springs, 49, 50. As herein shown (see Fig. 17) the rear edge of this cam plate is also curved laterally, so that as each tree is moved into the given position in which it is to be expanded or contracted, some portion of said curved edge will engage the disk, 42, to move the latter to a central position on said edge. This arrangement, obviously, always maintains the disk and plate in the same relative position one to another, so that one may be moved by the other in effecting an expansion or contraction of said tree.

It is obvious to those skilled in the art that a sudden collapse of the expanded tree would tend to effect a distortion or rumpling of the expanded and dressed surface of the shoe or boot and to injure the parts of the tree and its expanding devices. For preventing such collapse and the results ensuing therefrom, I have in the present instance provided for a gradual contraction of the tree, and to this end I have constituted the plunger, 22, referred to, a piston to cooperate with the end of its barrel to form a sort of dash pot to retard its movement as it approaches its forward limit, said plunger being moved by said disk, 42, as the latter is drawn forward by the retracting springs of the boot tree. As here shown (Figs. 4-7) the front end of this piston plunger, 22, is provided with a usual packing, 51, to effect an air tight joint with the bearing surface of the said barrel, the slot, 39, in which the pin, 38, moves not extending to this portion of the barrel. At its front end said barrel has an opening, 52, normally closed by the flap valve, 53, which is provided with a central vent, 54, to permit the gradual escape of air therefrom. In practice, the movement of the locking dog to release the tree permits the expander bar with its disk to spring forward under the action of its controlling spring, said disk, however, immediately engaging said cam plate for subsequent movement together sliding the piston plunger, 22, forward and causing or permitting the expander bar to thereafter move with it. As the piston plunger slides into the closed portion of its barrel, 23, the flap valve, 53, closes said opening, 52, and the air thereafter can only escape slowly through said vent, 54, which is small enough to effectually retard the movements of the plunger and the expander bar, thus producing the desired or gradual contraction of the boot tree. In expanding the tree, said flap valve, 53, swings inwardly to permit air to enter freely and without retarding the rearward slide of said piston plunger, 22.

Having described the machine which is capable of use with any type of tree, I will now describe a form of tree comprising also a part of my invention but which need not necessarily be used in connection with the particular machine or support described. This tree is best shown in Figs. 4-7, illustrating one embodiment of my invention, said tree comprising an outwardly swinging back, 55, a longitudinally slidable fore part, 56, having a foot-piece, 57, removably secured thereto and the stationary or intermediate two part arm, 58, (Fig. 12), extending forward from the journal or barrel, 10, of the tree and constituting a guide and support for the movable parts of said tree and its expanding members. This arm carries wing plates, 59 (Figs. 1 and 12), normally

extending or lapping over the adjacent sides of the fore part and back piece to cover the opening between them, to direct their movements in and out and to prevent displacement of the same. These wing plates are secured to said guide arm by adjusting screws, 60, which can be turned to spread or contract said plates to accommodate or adapt them to different sizes and shapes of backs and feet. The edges of these plates or wings are suitably thinned at 61 to make a smooth surface around the boot. The fore part and back are respectively secured to slide plates or members, 63, 64, mounted to slide on the guide arm or support, 58. The upper slide member, 63, is provided at a point slightly in advance of the hand wheel, (Fig. 4), with a central inwardly projecting vertical lug, 65, centrally drilled to slidably receive the tree expanding bar, 43, and constituting a guide therefor. For normally holding said fore part projected into an outer or forward position with its foot-piece, 57, in front of the heel of said back, 55 (see Fig. 4), to permit a boot or shoe to be readily placed thereon or removed, the opposed ends of the fore part and barrel, of the tree, are socketed to receive the ends of a coil spring, 69, interposed between them. This spring operates to slide or project the movable fore part forward into the position indicated in Fig. 4, but yields to permit the latter to be drawn to abut the barrel (Fig. 5) and the foot-piece to be alined with the heel, 67, before the expansion of the back or foot-piece as will presently be shown. The lower slide member, 64 (Figs. 4 and 11), is provided with a pair of longitudinal slots, 70 (Fig. 11), forming guideways to slidably receive a pair of plates, 71, each of which, at its outer end, is provided with an upwardly extending vertical lug or projection, 72, centrally apertured to receive and guide said expander bar, 43. This bar, 43, thus serves as a common guide for the upturned lugs, 72, on the slide plates, 71, and for the depending lug, 65, of the slide member, 63, which last mentioned lug stands between said upturned lugs. Surrounding said bar, 43, between said lug, 65, and the upturned lugs, 72, of the leading slide plate, 71, and seated against said lugs is a coil spring, 50, which tends to separate said lugs and their respective members. Also surrounding said bar, but between the other of said upturned lugs, 72, and a pin, 76, on said bar adjacent said lug, 65, is a second spring, 49. These springs govern the movements of the upper and lower slide members and also operate to retract the expander bar, 43, after it has been withdrawn in expanding the tree. To adjust the tensions of these springs the plates, 71, are provided at their opposite or inner ends with similar but depending lugs, 73 (Fig. 4), having threaded openings to re-

ceive the threaded ends of a differential screw, 74 (Fig. 4), rotatably mounted in a depending lug, 75, of said lower slide member, 64. By the rotation of this screw, said plates, 71, may be moved or adjusted toward or from one another more or less to compress or tension said springs, 49, 50, as required. The lower slide member at a point immediately in front of the lug, 65, has a stop, 77, which engages at a predetermined time with said lug, 65, which has already been moved away from said stop at an earlier point in the operation of the machine, and limits further movement thereof. In the returning or forward movement of said parts, said stop, 77, is returned by said lug, 65, as the latter is engaged by said pin, 76, when the expansion bar, 43, is released and removed by its spring, 49. By this arrangement said slide bars, 63, 64, will be moved forward to operate the foot-piece and back in contracting the tree as presently described. Before giving a detailed description, however, of the operation of the expander bar, 43, its slide bars, 63, 64, and its controlling springs, 49, 50, it will be advantageous to describe the construction and movements of the back and foot-piece in the order stated.

At its point of connection with the barrel, 10, the back, 55, is provided with a hook plate, 78 (Figs. 4-7) adapted to interlock with the hook of a spring pressed member, 79, slidably and yieldingly mounted on a pair of guide and holding pins, 80, 81, tapped into the back of the barrel, 10, the pin, 80, being surrounded by a coil spring, 82, interposed between the outer face of said member, 79, and a nut, 83, on said pin, so that the tension of the spring may be adjusted as desired thereby to provide a yielding pivot for said back. This construction permits the back to be swung toward and from the fore part to contract and expand the tree, and is similar to that usually employed in trees of this type, hence needs no further description.

To separate the back from the fore part in expanding the tree, the following mechanism is provided: The front end of the lower slide member, 64, is provided (see Fig. 13) with a slot in which a movable plate, 84, is arranged to reciprocate, the length of the slot exceeding that of the engaged part of said plate to permit of a considerable lost movement of the member, 64, in either direction before imparting any movement to said plate, 84. Suitable retaining and stop plates, 122, 121, being respectively provided at the front end of said member, 64, and the rear end of the plate, 84, to limit and guide the movement of the latter and to cause it to move with said member at a predetermined time, regulated by the length of said slot and the position of said stop plates. In the

withdrawal of expander bar, 43, and said lower slide, 64, the movable plate, 84, first remains stationary by its engagement with the heel of the back, 55, presently described in detail, until said plate is in its forward position, when the action of said stop plates, 121, 122, will cause said plate, 84, to move with said expander bar and its lower slide, 64. The two parts, 58, of the supporting arm, see Fig. 16, are provided at the lower inner corners with ways, 123, in which slides the movable plate, 84, referred to, and preventing vertical elevation thereof. The outer end of this plate, 84, carries a depending arm, 85, upon which is pivotally mounted a suitable back swinging device, comprising a slide piece shown as a short plug, 87, moving in an obliquely arranged sleeve or thimble, 88, inserted in a recess, 86, in the heel of said back said thimble having a slit, 89, along its upper inclined edge to permit said arm, 85, to move therein. As said movable plate, 84, is drawn rearwardly the movement of said plug, 87, up the inclined thimble, 88, will by its wedge or cam action, cause the back to swing downwardly about its pivot, 79 (Fig. 6), the pivotal connection, 90 of said plug, 87, permitting it to adapt itself to the varying inclination of the thimble or sleeve in which it slides. When moved in the reverse direction the cylinder positively raises the heel end of the back into its normally horizontal position, this movement being aided by the action of said spring, 82. The movable plate, 84, of course is reciprocated by the movements of the expander bar, 43, the provision for lost motion causing the heel to be expanded at a predetermined and later time than some of the other expansion movements as will be best understood in describing the operation of said springs, 49, 50, and of the machine.

An important feature of my invention resides in the novel construction of the foot-piece, the means by which it is attached to the leg or fore part, and the peculiar expanding movement therefor, all of which will now be described. As herein shown, the front of said fore part, 56 (Figs. 4 and 8) has a recess or slot, 91, opening at the back and bottom of said foot-piece to receive the rear end of a curved foot carrying member, 93, said end being rigidly secured as by brazing to the front end of the upper slide member, 63, so as to be moved thereby and with the fore part. The cross section of this carrying member, for the greater portion of its length, has the shape of an inverted U, the bottom edges, 94, of the inner portions of its sides being horizontal and being guided in the reciprocation of said foot-piece by a cross plate, 95 (Fig. 4), between the front ends of said guides, 58. The front end of this foot carrying member is curved upwardly (Figs. 8 and 9) or is bent trans-

versely to extend toward the toe portion of said foot-piece constituting a natural support therefor and to facilitate sliding the foot-piece thereon, the longitudinal groove, 91, being of converse shape to receive said carrying member. For locking the foot-piece in position, it has at one side a spring pressed latch or locking device, 96 (Fig. 9), mounted in a transverse recess or socket, 97, therein and provided with an inwardly extending tooth, 98, to enter an opening or aperture, 99, in the sides of said carrying member. At one side of this latching device is a recess, 100, to embrace the upper edge of said carrying member and to permit said latch to be moved into and out of locking engagement therewith. The latch or locking device slides in a thimble, 102, and has a stem, 101, extending through an opening in the end of said thimble, a coil spring, 103, surrounding said stem and interposed between said thimble end and a push button or plate, 104, at the side of the foot-piece, operating to move the tooth, 98, normally into the aperture, 99, of said retaining member to hold the foot in place. At its outer end said thimble is provided with inwardly turned edges for retaining said button, 104, in place, the latter forming the seat for said spring and being adapted to be pushed by the finger to unlock the foot-piece in removing the latter. The upward curve of the foot carrying member (see Figs. 8 and 9) approximates closely to the normal curve of the fore part or instep portion of the foot-piece which is itself provided with a conversely shaped longitudinal groove by which it naturally enters and slides upon its retaining member, 93. By this construction the foot-piece has a natural movement, both in being applied to and removed from its retaining member. Furthermore the locking device being arranged at the side of the foot-piece it is easy of access to the thumb or fore finger of the operative and may be operated by a natural movement in grasping the foot-piece to remove it from or apply it to said retaining member.

Reference has already been made to the fact that the foot is provided with a novel expanding movement. This movement is secured by providing for a transverse movement of the sole portion of the tree foot, which as here shown is a plate, 105 (Fig. 10), removably attached by means of inwardly extending spring fingers, 106 (Figs. 4 and 10), secured to its back, to a wedge shaped block, 108, grooved as at 107 (Fig. 8), to receive said fingers and pivoted at 108^a, on the end of the vertical arm of a curved actuating lever, 109 (Fig. 4), pivoted in the foot carrying member at 109^a, located within the body of or above the bottom of the foot-piece and by which said sole portion or plate is moved in and out

relative to and to vary the thickness of the body of the foot-piece. The other or horizontal arm of this lever (see Fig. 4) is normally held depressed by a spring, 109^a (Fig. 4) secured to said foot carrying member, 93, and interposed between the latter and said arm and by its action on the latter, holding said sole plate, 105, normally flush with the bottom of the foot-piece, which has a transverse recess shaped to receive said sole plate. The horizontal lever arm has a downwardly curved end, 110 (Fig. 4), which enters a slot or recess, 111 (Figs. 4 and 15), in a controlling member, 112, slidably and yieldingly mounted on and at the front end of said expander bar, 43. The rear end of this controlling member (Fig. 15) is adapted to slide in the forked end, 113, of the expander bar, 43. For yieldingly connecting this member with said bar, the former has a collar, 114, which surrounds said member and forms the seat for one end of a coil spring, 115, surrounding said bar, 43, with its opposite end bearing against a similar collar, 116, secured to the rear end of said bar and acting normally to slide said member, 112, into its forward or outer position. To prevent said member from turning, guide or cross pins, 117, 118, are employed, both secured to said bar, 43, said pin, 117, also constituting a stop to limit the forward slide of said member, 112. Said member, 112, has a longitudinal slot, 119 (Fig. 4), to permit it and said bar to slide one relative to the other. As the expander bar, 43, is withdrawn in expanding the tree, this sole expanding member, 112, will move with it through the spring, 115, between them, a cross plate or projection, 120, at the front end of said member acting at a predetermined time upon the curved end of the actuating lever, 109, to elevate the latter and move the sole plate, 105, to the left as shown in Fig. 7, out from the body of the foot-piece to fill the fore part of the shoe thereby to stretch the leather of the toe upper taut over the foot of the tree so that its surface may be conveniently presented for rubbing or dressing. The outward bodily movement of this plate being transverse or perpendicular to the sole face it obviously thickens the toe of the foot or that of a boot or shoe mounted thereon, hence it constitutes a sole thickening member for said foot, the term "thickening" being defined as that which increases the dimension of the foot in a direction perpendicular to the sole face. The amount of expansion produced is regulated by the tension of the coil spring, 115. This spring gradually yields as the sole plate, 105, is forced into positive contact with the inner soles of the different shoes or boots but still maintains sufficient pressure to produce the desired expansion while preventing injury

thereto, thus providing for a very efficient method of expanding the foot.

I will now describe the relative movements of the expander bar, its slide members and the operating or retracting springs carried thereby which cause the respective movements of the foot, the back, and the sole plate, referred to.

The principal spring that governs or regulates the operation of the expanding devices is spring, 49, already referred to, and which as here shown (see Figs. 4-7), is not only of shorter length but is heavier, than the others, so that it overcomes their opposed force and causes their contraction prior to its own contraction, during the continuous movement of said expander bar, 43. As this bar is withdrawn by the depression of the treadle, the spring, 49, causes the upper and lower slide members to move with it, the fore part spring, 69, yielding to permit the fore part to move rearwardly against the barrel 10, and to bring the foot home. In reaching this position, obviously, further rearward motion of said slide member, 63, is prevented. During this movement the heel remains unmoved, because of the lost motion between the lower slide member, 64, and the movable slide plate, 84, which carries the back expanding plug, 87, until said slide plate has been moved into its extended position (Fig. 5). With the lost motion taken up, further withdrawal of the expander bar will then cause it to slide through the guide lug, 65, and to compress said spring, 50, which being weaker or lighter than the main spring, 49, readily yields to permit further rearward motion of the lower slide member and the adjusting plates against the lugs of which said springs are seated. By this movement the movable plate, 84, being at the forward limit of its position upon said lower member, 64, is compelled to move rearwardly with the latter, the back actuating plug, 87, sliding up the inclined thimble in the heel portion of said back and causing it to swing downwardly into the position shown in Fig. 6. By the inward movement of the foot just described a boot or shoe mounted thereon will be expanded only incidentally due if at all to the passage of the upper over and about the heel portion of the back in the direction from toe to heel as the foot is driven home, but a greater expansion in the same direction is produced by the subsequent movements or separation of the back. During this rearward motion of the expander bar, 43, and that of the lower slide member, 64, lost motion takes place between the slotted sole controlling member, 112, and the curved end of the foot actuating lever, 109. As the controlling member is slid into its inner or rear position, its rear cross plate, 120, meets the curved end, 110, of said lever, 109, and lifts

it to swing its vertical arm forward or outward more or less, into a position indicated by Fig. 7, or when a shoe is mounted on said foot until it has moved sufficiently to expand the toe portion of the shoe in a direction transversely to the length and width of the sole perpendicular to the sole face. To make this a yielding movement thereby to avoid the danger of rupturing the shoe or breaking the stitches as when a positive movement is employed, said expander bar and its controlling member are yieldingly connected by the spring, 115, as described, which yields to permit of lost motion between the two while still exerting sufficient pressure upon said sole plate, 105, to produce the required amount of expansion. Obviously the spring, 115, may be replaced by one of different strength or said collars, 114 and 116, may be adjusted toward or from one another, so that the expansive force applied or pressure produced by said spring may be varied within wide limits. In like manner the expansive force applied to the back may be varied by suitable springs of different weights or power for said springs, 49 and 50, or by the adjustment provided by the sliding plates, 71, and their adjusting screw, 74.

By providing the expanding mechanism with yielding members and springs to act as described, adequate provision is made to prevent undue stretching of the leather of the boot or shoe operated upon, an important feature being that the movable parts or expanding members, viz., the back and sole plate, have their motions limited by engagement with the parts of the boot or shoe, or to express it differently, the expansion is governed by the work. If, however, as may frequently be the case the springs are not needed they may be omitted and the successive movements obtained by positive contact of the parts one with another.

In releasing the expander bar, 43, a reverse operation to that already described takes place, the sole plate, 105, being first moved into its inner or rear position partly by the action of the leaf spring, 109^a, and by the engagement of the curved end of said lever with said controlling member, 112, as the latter is projected into its outer position by the expansion of said spring, 49, and best shown in Fig. 4. Immediately following this movement of the sole plate, 105, the expander bar, 43, by its continued movement, produced principally by the expansion of said spring, 49, and the engagement of its cross pin, 76, with the guide lug, 65, and of the latter with the lower slide stop, 77, moves the slide member, 64, forward until said movable plate, 84, is in its rear position and causing their further movement together. This movement of the plate, 84, elevates the back by the wedge action effected by the slide

of said plug or cylinder, 87, in the inclined thimble in the heel of said back. The final movement in the contraction of the tree is the forward slide of the foot and fore part which is effected by the expansion of said spring, 69, projecting said foot into the position indicated in Fig. 4. The inward movement of the foot is effected by a treadle means under the control of the operative and which is adapted by its continuous movement to also expand the tree with as much force as may be desired, the contraction of which and the upward movement of said foot being produced automatically. By this arrangement of a foot which is automatically projected out from and drawn back into engagement with the leg or barrel of the tree in respectively contracting and expanding the same a result is effected which so far as I am aware, I believe to be new and novel. This construction results in a considerable saving of the operator's time and a reduction in the expense of treeing.

In practice the machine is operated as follows: The parts of the tree being in the position indicated by Fig. 4, the operative places the boot or shoe upon the foot-piece and then draws it down over the foot-piece. He then depresses the treadle of the machine, which first causes the foot-piece and shoe to be drawn rearwardly the operative directing the counter of the shoe under the heel piece, 67, as the foot-piece is alined therewith, thus positively seating the shoe on said foot. By continued movement of the treadle the back is then swung outwardly causing a further and considerable expansion of the tree in a direction from toe to heel, and immediately thereafter the sole plate is thrown out as described to increase the depth of the toe of the boot, all the parts preferably operating yieldingly as referred to, to prevent unnecessary or injurious straining and avoiding any tendency to break the stitches of the boot or shoe. An important feature of my invention is the provision for adapting the expansion to the requirements of the work or to the particular boot or shoe operated upon, the back and the sole plate being moved by yielding means to produce an efficient expansion upon the shoe, but yielding when sufficient pressure is produced and by the engagement or contact of said parts upon the boot or shoe, so that injurious results are prevented. As the tree is thus expanded the locking dog, 41, locks it in expanded condition and under any desired amount of expansion while the spring pressed locking pin, 16, retains the frame with the boot tree in an upper and convenient position for treeing, dressing or otherwise finishing the surface of the boot or shoe. By means of the hand wheel the boot tree may be rotated to facilitate said operation, presenting each portion of the surface of

the boot into a desired position in which it may be conveniently operated upon. At the completion of the treeing and finishing operation, the carrying frame may be rotated
 5 freely to swing the boot tree into its lower position and to bring the lower tree into the upper position to receive a boot or shoe to be likewise treed, dressed and finished or for removal of one previously treed and to
 10 be replaced by a new one. The subsequent operations will be repetitions of what have just been described, the finished and dried boot or shoe being removed subsequently to the release of the expanding mechanism as
 15 the tree is moved into its upper position. The gradual contraction of the tree which is provided for by the employment of the dash pot prevents any material distortion or other defective action upon the dressed surface
 20 of the boot or shoe, the extended position into which the foot is projected facilitating its removal.

While I have described a specific construction of boot tree which is preferably
 25 employed in connection with the carrying frame and the actuating devices mounted upon the head of the machine, obviously any suitable boot tree may be employed, my invention not being limited in this respect.

30 By my invention, as herein described, a simple and efficient boot treeing machine is provided which is easily operated and which requires but little attention, no work being required of the operative other than to depress the treadle and to swing the tree into
 35 its upper position and to apply and remove the shoe or work therefrom, positioning of the foot and separating it from the tree being produced automatically. The treeing
 40 is produced by a single and continuous depression of the treadle, thus avoiding the necessity for the additional time and labor required to move said foot into and out of position as in machines hitherto constructed.

45 The independent locking mechanism of each tree operates automatically and is automatically released. By the employment of suitable means for automatically moving the foot and for producing a gradual and automatic contraction of the expanded tree, results are attained which so far as I am aware
 50 are new and novel, as is also the plurality of independent means for guarding against or preventing unnecessary stretching of the shoe.

My invention is not limited to the specific details of construction or to the precise arrangement of parts herein shown for purposes of illustration only, and it is obvious
 60 that either may be modified and varied within wide limits without departing from the spirit or scope of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:
 65

1. A boot tree foot piece, means for supporting said foot piece during the finishing operation and from which the foot piece is removable, a foot thickening sole member, and means for giving said sole member a
 70 bodily movement with respect to the supported foot piece to cause the upper to conform to the shape of the foot piece and prepare it for the finishing operation.

2. A boot tree foot piece having an interrupted fore part upper supporting surface, means for supporting said foot piece during the treeing or finishing operation and from which the foot piece is removable, a foot thickening fore part sole member, and
 80 means for moving the sole member bodily from the supported foot piece to cause the upper to conform to the shape of the uninterrupted supporting surface of the foot piece.

3. A boot tree foot-piece having a foot thickening sole member constructed and arranged with reference to the foot-piece to present its bottom surface within the plane of the sole line, a support connected to said
 90 foot-piece to sustain the same, and yieldingly acting means for moving said sole member bodily relative to the said foot-piece to draw the fore part of the upper into shaping contact with the fore part of the
 95 tree.

4. A boot tree foot piece having a foot thickening sole member, and yielding means for giving said sole member bodily movement of separation from the foot piece and against
 100 the sole of a shoe mounted thereon to draw the fore part of the upper with a yielding action into uniform shaping contact with the tree fore part.

5. A boot tree foot-piece having a foot thickening sole member, yielding means for giving said sole member bodily movement of separation from the tree foot-piece and against the sole of a shoe mounted thereon to draw the fore part of the upper into uniform shaping contact with the tree fore part, and provisions for adjusting the yielding character of said means.

6. A boot tree foot-piece, comprising a fore part, a fore part sole member, a support within the fore part on which the sole member is mounted, and means for moving said support to impart to the fore part sole member bodily movement of separation from the foot-piece fore part to draw the upper
 120 uniformly to the upper surface of the tree foot.

7. In a boot treeing machine, a foot piece movable to and from treeing position and comprising a fore part and a sole expanding member, and means for moving the foot piece into position and to separate the fore part and sole member to cause the upper of a shoe to conform to the surface of the fore
 130 part.

8. A boot treeing machine comprising a foot piece, a foot piece support to sustain the foot piece during the finishing operation, a sole expanding member, and means for moving the foot piece into position and to separate the foot piece and sole expanding member. 70
9. In a boot treeing machine, a movable foot-piece comprising a thickening fore part member, a support for said foot-piece, and means for moving said foot-piece and actuating said fore part member to expand said foot. 75
10. In a boot treeing machine, a tree leg, a movable foot-piece having a foot thickening sole member movable with the foot-piece toward and from the tree leg, and means for bodily moving the sole member toward and from the foot-piece. 80
11. In a boot treeing machine, an expandible foot comprising a foot-piece having an uninterrupted upper supporting surface to sustain the upper during the finishing operation, a foot thickening fore part member, and means to bodily move it from a position within to a position beyond the plane of the sole line to expand said foot and draw the fore part of the upper into finishing contact with the fore part of the foot. 85
12. In a boot treeing machine, a foot-piece having a foot thickening sole member, means to move the foot-piece and thickening sole member toward and from the tree leg, means for bodily moving the thickening sole member toward and from the foot-piece, and provisions to permit rotative movement of the foot. 90
13. In a boot treeing machine, a sliding leg front part, a foot-piece bodily movable into and out of position, a movable heel, and means for bodily moving said foot-piece and leg front part into position and for moving said heel to expand the tree. 95
14. A boot treeing machine comprising an expandible foot-piece movable into and out of position, a movable back, and means for moving said foot-piece into position and for imparting expanding movement to said back and foot-piece. 100
15. In a boot treeing machine, an expandible foot-piece movable into and out of position, a movable back, and treadle means adapted by a continuous movement to move said foot-piece into position to move said back and to expand said foot-piece. 105
16. In a boot treeing machine, a boot tree comprising a foot support, a foot sustained thereby and having a fore part and sole member constructed and arranged for bodily separation at the sole line in a direction transversely to said sole to uniformly draw the fore part of the upper to the shape of the foot fore part, and treadle means for separating the same to expand said foot. 110
17. In a boot treeing machine, a boot tree comprising a foot support, a foot sustained thereby and having a fore part and sole constructed and arranged for bodily separation at the bottom of the fore part in a direction perpendicular to the sole face and yielding means for separating them to expand said foot within limits imposed by a boot or shoe operated upon. 115
18. In a boot treeing machine, a boot tree having a longitudinally slidable foot-piece comprising a fore part and sole constructed and arranged for separation and a treadle and connections adapted by a continuous movement of said treadle to move said foot-piece and separate said fore part and sole to expand said foot-piece. 120
19. In a treeing machine, a detachable foot-piece having a continuous groove extending along the back and toward the toe thereof, and a foot carrying member having a portion constructed and arranged to extend along the groove in the back of said foot-piece and another portion to extend into the groove of the foot portion toward the toe. 125
20. A foot-piece for a boot tree having a groove extending from the top of the ankle portion of said foot-piece along the back, and being projected along the sole portion of the foot-piece toward the toe. 130
21. A foot-piece for a boot tree having extending inward from the back and sole surfaces a groove, the bottom of which follows substantially the direction of the median top surface of the foot. 135
22. A foot-piece for a boot tree having a portion of its sole surface countersunk, and provided with a groove extending along the back and toward the toe. 140
23. In a device of the general character described, a detachable foot member having a groove extending inwardly along the back and sole surfaces toward the toe, and means constructed and arranged to engage said groove to support the said foot. 145
24. In a boot treeing machine, a boot tree having an expandible foot-piece movable into and out of position and a movable back, means for moving said foot-piece, for subsequently expanding the same, and effecting a movement of said back. 150
25. In a boot treeing machine, a boot tree having a longitudinally slidable foot-piece comprising a separable fore part and sole and means for sliding said foot-piece and to yieldingly separate the parts thereof to adapt the expansion produced thereby to the requirements of the work. 155
26. In a machine of the type described, a boot tree having a fore part and sole element constructed and arranged for separation in a direction transversely to said sole, and means for bodily separating them at the plane of the sole line to expand the fore part of the foot of a boot or shoe mounted 160

on said tree and means for effecting a gradual contraction of said tree.

27. In a boot treeing machine, a boot tree having a longitudinally movable foot-piece comprising a separable fore part and sole, means for moving said foot-piece and for subsequently separating the parts thereof to expand said foot.

28. In a boot treeing machine, a boot tree having a longitudinally movable foot-piece comprising a fore part and sole constructed and arranged for separation in the same direction, a movable back, and means for moving said foot-piece and back and separating the parts of said foot-piece to expand the same subsequently to the movements of said foot-piece and back.

29. A boot treeing machine comprising in combination a foot having a separable fore part and sole, means for separating them to expand said foot, a locking device for holding them separated, and means for releasing said locking device.

30. In a machine of the type described, the combination of a boot tree comprising the following members, a foot having a foot thickening member bodily movable with respect to the foot, a movable back piece, means for producing relative motion between said members to expand the tree and to thereafter effect a gradual contraction thereof.

31. In a boot treeing machine, a boot tree comprising a foot having a foot thickening sole member constructed and arranged to present its outer surface within the plane of the sole line, and yielding means for bodily separating the foot and foot thickening member.

32. In a boot treeing machine, a boot tree comprising a foot having a separable fore part and sole, and yielding means for bodily moving the sole outwardly from the fore part.

33. In a boot treeing machine, an expandible boot tree provided with separable sole and heel parts and spring controlled operating means arranged to effect relative movement of said parts, one subsequent to the other, and means for adjusting said springs to vary the tension or expansive force produced thereby in operating said parts.

34. In a boot treeing machine, a boot tree having a movable foot-piece and back means for moving said foot-piece and for subsequently imparting expanding movements to said back and foot one relative to the other.

35. In a boot treeing machine, a boot tree having a movable foot-piece comprising a separable fore part and sole, a back, means for moving said foot-piece, back, and said fore part and sole to effect, first, a movement of said foot-piece, second, a movement of said back, and, finally, of said fore part and

sole, one relative to the other, thereby to expand said tree.

36. In a boot treeing machine, a boot tree having a movable foot-piece comprising a separable fore part and sole, a back and means for moving said foot-piece and for producing a movement of said back relative thereto and for separating said fore part and sole, said means having provisions for lost motion to effect, first, a movement of said foot-piece, second, a movement of said back, and, finally, a relative movement between said fore part and sole.

37. A boot treeing machine of the type described comprising in combination a boot tree having a movable foot-piece provided with a movable sole, and a movable back, and treadle means adapted by a continuous movement to move said foot-piece and to impart expanding movements to said back and sole to expand said tree.

38. A boot treeing machine of the type described comprising in combination a boot tree having a movable foot-piece provided with a movable sole, and a movable back, and means operating to move said foot-piece and to impart expanding movements to said back and sole in the order named to expand said tree.

39. A boot treeing machine of the type described comprising in combination a boot tree having a movable foot-piece provided with a movable sole, and a movable back, and means operating yieldingly to move said foot-piece and to impart expanding movements to said back and sole in the order named to expand said tree and to prevent undue stretching of the leather of the boot or shoe operated upon.

40. A boot treeing machine of the type described comprising in combination a foot having a foot thickening sole member bodily movable from the sole line of the foot, means for yieldingly producing relative bodily motion between said parts to expand said boot or shoe within limits imposed by the boot or shoe operated upon thereby to prevent undue stretching of the leather of said boot or shoe, and actuating mechanism for operating said expanding means to move said parts the desired amount, said movement being variable.

41. A boot treeing machine of the type described, comprising in combination a boot tree having a movable foot-piece a movable back, and means yieldingly to move said foot-piece and to produce a subsequent motion of said back to expand the tree, and to prevent undue stretching of the leather, said means being governed by the contact of said foot-piece and back with the boot or shoe operated upon.

42. In a boot treeing machine, a boot tree foot, a support therefor to sustain the

foot and shoe placed thereon during the finishing operation, a foot thickening sole member, a support for said sole member within the foot and on which the sole member is articulated to enable it to conform to the shape of the sole of a boot or shoe being treated, and means for moving the support in a direction toward and from the sole.

43. In a boot treeing machine, a boot tree foot, a foot thickening sole member, a support for said sole member on which it is articulated to conform to the shape of the sole of the boot or shoe being treated, and yielding means for moving the support in a direction toward and from the sole.

44. In a boot treeing machine, a tree foot, a foot carrying and supporting member therefor extending into said foot to sustain the same and the shoe thereon during the finishing operation, a foot thickening sole member, an independent support therefor, and means for moving said support to bodily separate the tree foot and sole member.

45. In a device of the character described, the combination of a leg portion, a foot-

piece having a bodily movable sole expanding member, a heel portion, and a slide for operating the sole expanding member and the heel portion in expanding the tree.

46. A boot tree foot piece, means for supporting it during the finishing operation, a foot enlarging sole member supported independently of the foot piece, and means for bodily separating the foot piece and sole member to cause the upper to conform to the shape of the foot piece.

47. A boot tree foot piece, means for supporting the foot piece during the finishing operation, a foot enlarging sole member supported independently of the foot piece, and means independent of the foot piece for bodily moving the sole member from the foot piece to cause the shoe upper to conform to the foot piece.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WILLIAM H. HOOPER.

Witnesses:

THOMAS A. TIRRELL,
SIDNEY F. SMITH.