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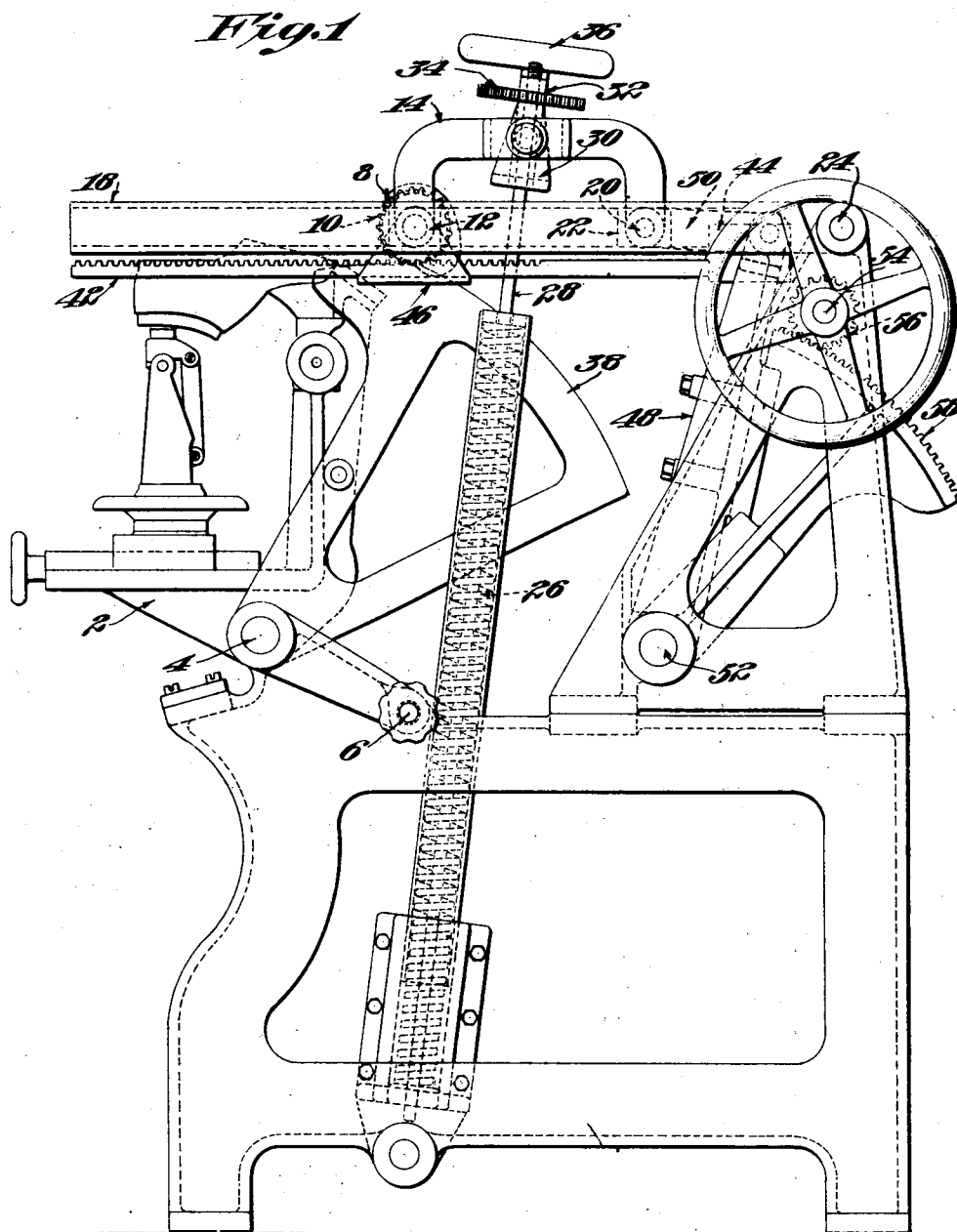
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E. E. WINKLEY

LEVELING MACHINE

Filed Dec. 2, 1921

3 Sheets-Sheet 1



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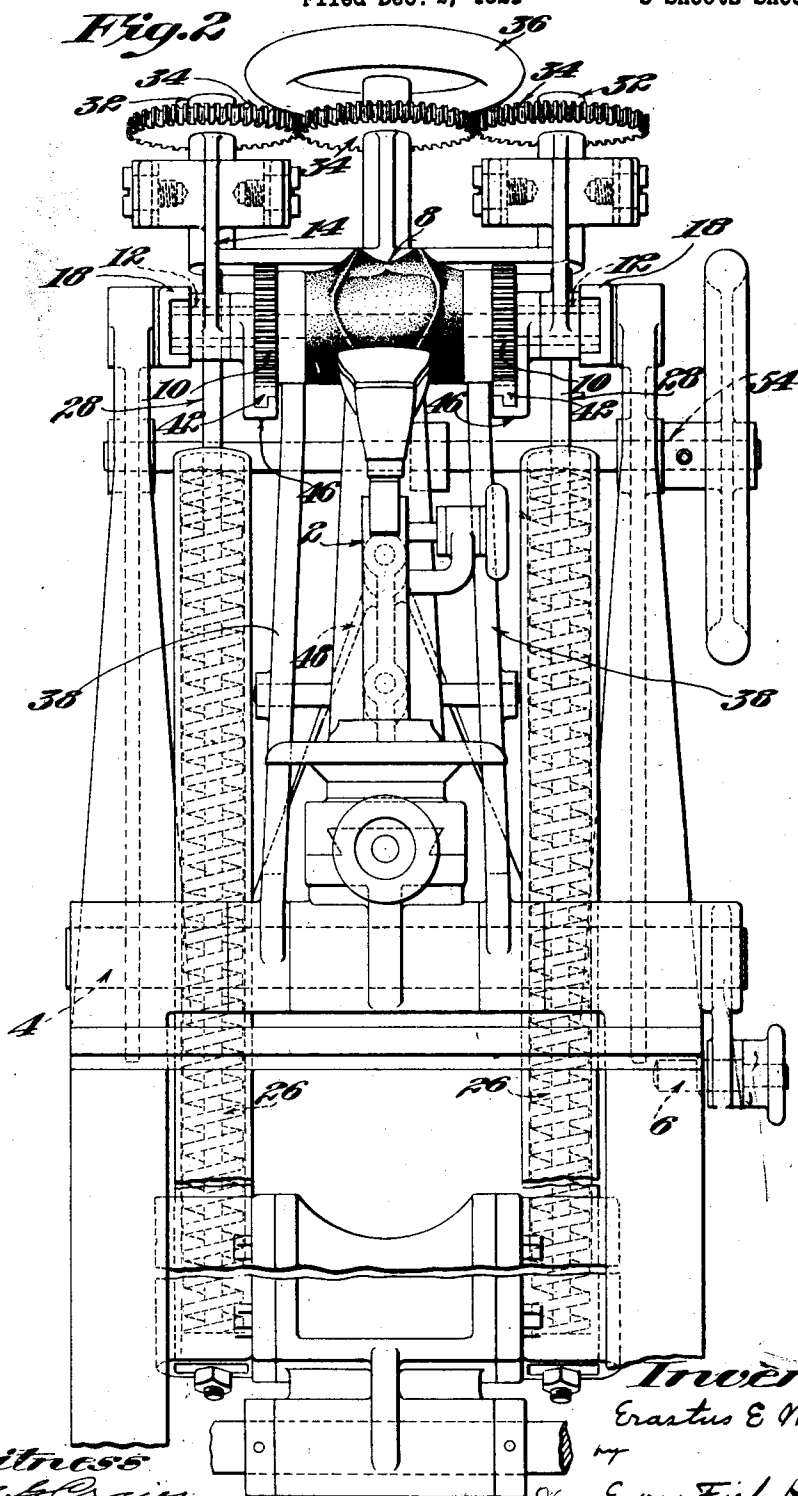
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Fig. 2



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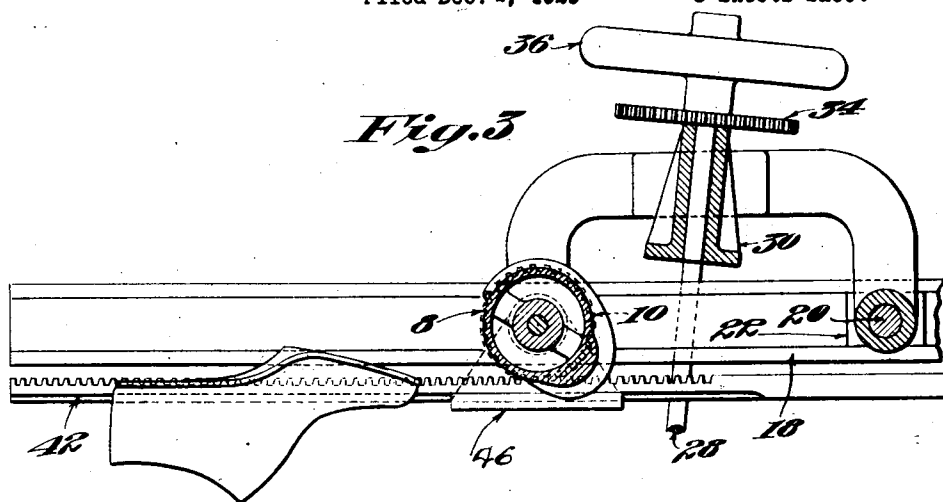
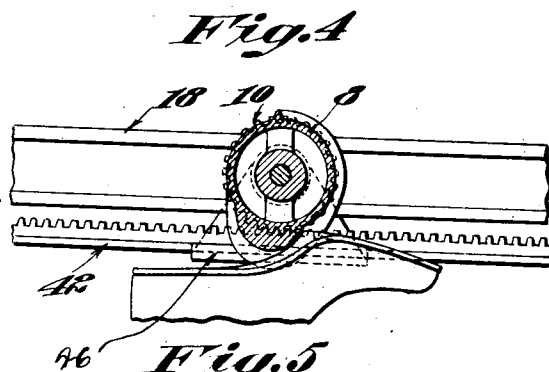
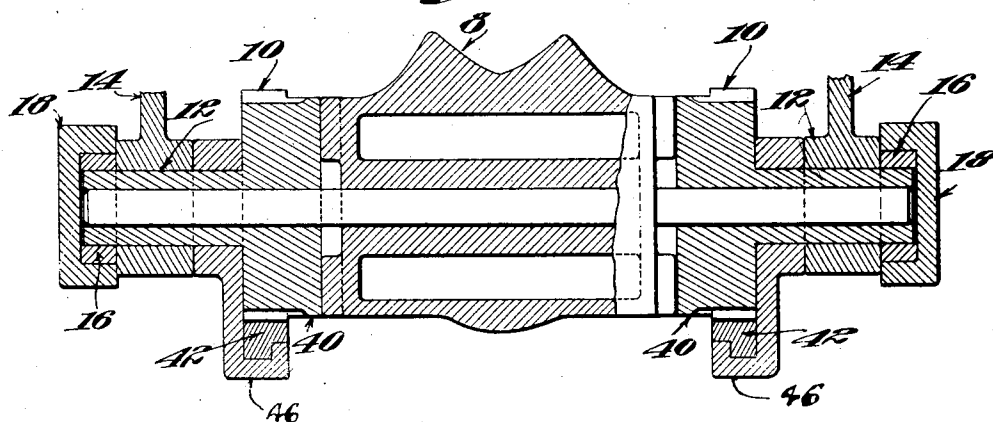
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

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LEVELING MACHINE.

Application filed December 2, 1921. Serial No. 519,395.

The invention relates to machines for leveling the soles of boots and shoes and more particularly to that type of machine in which the sole is acted on by a rotatable leveling tool or form, hereinafter termed a roll, which applies its pressure to different portions of the sole successively.

In machines of the above type which have heretofore gone into practical use the variations in the lateral curvature at different parts of the shoe sole have been secured by varying the relative lateral inclination of the roll and shoe supporting jack during the travel of the roll along first one side and then the other of the sole. While these machines give satisfactory results on certain classes of work, on some work their use is open to the disadvantage that the pressure of the roll along one side of the sole tends to disturb or modify the shape already given to the sole by the action of the roll along the other side, particularly through the shank where the lateral curvature is greatest and at the ball line where the change in lateral curvature is the sharpest. Difficulty also may sometimes arise in their use for leveling shoes in which there should be a well defined line of demarcation between two parts of the sole as between the shank and forepart in shoes having high arch shanks or between the shank and heel in spring heel shoes. It has heretofore been proposed to overcome these difficulties by utilizing a leveling roll which is provided on its periphery with a form or matrix corresponding both longitudinally and transversely to the shape to be given to the sole, and which is rotated during its travel along the sole to bring the transverse elements of the matrix or mold successively into engagement with the complementary portions of the sole. A principal object of the present invention is to preserve the advantages of this construction while minimizing any possibility which might arise with some kinds of work of distorting or injuring the shoe by any lengthwise slipping or rubbing of the surface of the mold over the shoe. Such slipping might injure shoes having high arched

shanks, since it might tend to prevent the formation of a well-defined line of demarcation between the shank and the forepart.

The present invention in its illustrative embodiment, retains the features of the prior machines which adapted them for successfully leveling many types of shoes supported on wooden lasts, such as the comparatively small leveling roll with its restricted sole engaging area acting progressively along the shoe, and eliminates the features found objectionable on some kinds of work by utilizing a matrix roll which is so shaped and actuated that it applies a rolling pressure on a narrow area which extends from side to side of the sole and progresses along the sole without subjecting it to objectionable lengthwise strain. The matrix or at least that part of it which corresponds to the forepart of the sole is preferably so developed that a portion thereof between its opposite sides, herein referred to as its medial line, is the arc of a circle having its center at the axis of the roll. With this form of matrix the central portion of its surface will thus lie in or approximately in a cylindrical surface which may be caused to roll over the sole without slip by properly rotating the roll as it travels lengthwise of the sole. The slight slip which may theoretically occur along the outer edges of the sole due to transverse curvature of the matrix is practically negligible and puts no appreciable or injurious lengthwise strain on the sole. The proper rotation of the roll to cause the surface of the matrix to roll on the surface of the sole may be and preferably is secured by one or more gears or pinions on the roll, the pitch surface of which is coincident with the cylindrical surface on which the above-mentioned intermediate portion of the matrix is developed, and cooperating racks which are maintained in engagement with the gears during the traverse of the roll along the sole. With this construction the pitch surface of the gears will coincide with the cylindrical surface on which the matrix is developed along its medial line and the pitch surface of the racks at the

points engaged by gears will have the same location heightwise of the shoe as the surface of the sole where the latter is engaged by the matrix, so that a rolling contact without slip between the matrix and sole will be insured during the action of all that part of the matrix which is developed on the cylindrical surface coinciding with the pitch surface of the gears.

Matrix rolls for leveling shoes in which there is no well defined line between the shank and forepart may have the shank shaping portion as well as the forepart shaping portion of the matrix developed on the cylindrical surface containing the pitch surface of the gears so that there will be no slip in operating on either the shank or the forepart. In operating on shoes having high arch shanks however the dwell of such a roll in rolling from the approximately horizontal forepart to the sharply inclined shank tends to prevent the production of a well defined ball line. The pressure of the roll when acting on the sharply inclined surface at the beginning of the shank is also at an acute angle to the surface of the sole and in a downward direction away from the forepart so that it tends to bend and draw the sole downward at the ball line instead of pressing it at right angles to its surface to give it the shape of the matrix and form a sharp bend at the ball line. Matrix rolls for this class of work are therefore preferably so formed that the forepart shaping portion is developed in the above-described relation to the pitch surface of the gears while the shank shaping portion is developed on a surface which rises sharply from the cylindrical surface containing the pitch surface of the gears at the ball line and gradually returns toward said cylindrical surface at the heel end of the shank so that an abrupt bulge beyond the pitch surface is formed in the matrix at that portion which acts on the shank adjacent to the ball line. As the gears roll along the racks this bulging portion of the matrix, which projects beyond the pitch surface of the gears and rotates in a direction opposed to the travel of the roll and at a greater surface speed, will quickly crowd against the inclined surface of the shank close to the ball line and will apply an approximately normal pressure thereto and at the same time will slip thereon in a direction toward the ball line. This pressure and slip of the matrix surface on the shank will effectively mould the sole while crowding it toward the ball line, thereby tending to produce and maintain a well defined bend in the sole along the ball line. The slip and drawing of the sole toward the ball line will decrease as the surface of the bulge approaches the pitch surface of the gears so that the rolling

pressure will be resumed on the rearward part of the shank where its surface is approximately horizontal.

The invention further provides a novel organization of means for controlling the matrix roll in the relative movement of the roll and the jack lengthwise of the shoe, the construction shown comprising positive means for rotating the roll in response to that relative movement in such manner as to insure that the roll will operate in proper relation to the different portions of the sole. As herein illustrated, also, the construction is such that the roll may move heightwise of the shoe in response to variations in the lengthwise contour of the shoe bottom without disturbing its operative relation to the means for rotating it.

A preferred form of the invention is shown in the drawings in which Fig. 1 is a side elevation showing as much of a sole leveling machine as is necessary to illustrate the application of the present invention thereto, Fig. 2 is a front elevation, Fig. 3 is a sectional elevation, Fig. 4 is a similar view showing the leveling roll in a different position and Fig. 5 is a sectional view through the axis of the leveling roll.

In the machine of the drawings the shoe to be leveled is supported on a jack 2 which is pivotally supported at 4 so that it may be swung from a position where the shoe may be readily applied thereto into the position shown in the drawings in which the shoe is presented in position to be acted upon by the leveling roll. The jack is held in operative position by a locking pin 6 adapted to enter a recess in the machine frame, and in this position it is unyieldingly supported on the frame. The shoe is leveled by a leveling roll 8 on the periphery of which is formed a matrix or form having a shape or contour complementary to that which is to be given to the sole. The roll is provided at its ends with gears 10 which are provided with trunnions 12 journaled in the forward arms of a carriage 14. The ends of the trunnions also engage bearings in guide blocks 16 mounted to slide in guideways formed in the guide bars 18. The rear arms of the carriage 14 are journaled on a transverse rod 20, the ends of which are supported in guide blocks 22 also mounted to slide in the guide bars 18. The rear ends of the guide bars are pivotally supported at 24 on the frame of the machine so that the leveling roll may rest upon the shoe sole and rise and fall during its travel in accordance with the longitudinal curvature of the sole. The roll is pressed against the sole by springs 26 acting upon rods 28, the upper ends of which pass through blocks 30 pivoted to the roll carriage. The upper ends of the rods carry nuts 32 which may

be simultaneously adjusted to adjust the tension of the springs through gears 34 and a hand wheel 36.

curing a sharper ball line than would otherwise be secured.

The roll is supported when out of engagement with the shoe and also when the jack is swung out for the purpose of removing or applying a shoe by segments 38 secured to the jack and arranged to underlie cylindrical bearing surfaces 40 on the roll which are located between the gears 10 and the sole shaping matrix. These segments are thus offset lengthwise of the roll from its sole-engaging face so that they are out of alignment with the shoe and do not contact with that face. The roll is positively rotated during its travel by racks 42 which are secured to the guide bars 18 by plates 44 and are held in engagement with the gears by guide stirrups 46 which are hung upon the trunnions of the roll and through which the racks slide as the roll travels so that the gears roll along the racks. The roll is moved over the shoe through an arm 48, the upper end of which is connected by a link 50 with the cross rod 20 of the roll carriage and the lower end of which is secured upon a rock shaft 52. The rock shaft is oscillated from the driving shaft 54 through a pinion 56 engaging a gear segment 58 on the rock shaft.

In order that the forepart of the shoe and the heel, in case the heel as well as the forepart is subjected to a leveling operation, may be leveled and shaped by a rolling pressure applied across the entire sole simultaneously, the matrix, or that part of it which operates upon the forepart or upon the forepart and heel, is generated with the medial line of the matrix lying in a cylindrical surface containing the pitch surface of the gears 10. In the drawings a form of matrix roll adapted for leveling the foreparts and shanks of high arch shanked shoes is shown. The forepart shaping portion of the matrix of this roll is developed on a cylindrical surface containing the pitch surface of the gears so that the surface of this part of the matrix will apply a rolling pressure to the forepart with the advantages already fully set forth. The shank shaping portion of the matrix is developed on a bulge which rises abruptly from the surface of the forepart shaping portion along the ball line and gradually returns to the above-mentioned cylindrical surface at or near the heel breast line of the sole. As the roll reaches the ball line the bulging shank shaping portion of the roll will swing rapidly toward the right in Fig. 4 owing to the rolling of the gears along the racks and will apply its pressure substantially normally to the downwardly sloping surface of the shank and at the same time will tend to crowd the shank and heel portion of the sole toward the ball line with a wiping action thereon, thus se-

While the invention has been shown and described as applied to the leveling of high arch shanked shoes it will be understood that it is not limited in its application to the leveling of such shoes and that it may be utilized with advantage in leveling shoes having low shanks, or of such style that the shank shaping portion as well as the forepart shaping portion of the matrix may advantageously be developed upon a cylindrical surface or upon a surface bearing the same relation to the axis of the roll as the pitch surface of gears at the ends of the roll, or may be utilized for leveling shoes having other abrupt changes in the surface contour of the sole, such, for instance, as spring heel shoes.

What is claimed is:

1. A sole leveling machine having, in combination, a shoe supporting jack, a leveling roll provided on its periphery with a sole shaping matrix having its longitudinal medial line for a material part of its length the arc of a circle with its center at the axis of the roll, means for relatively moving the roll and jack, and means for rotating the roll by the relative movement of the roll and jack, during its travel over the sole at a speed to roll said medial line along the sole.

2. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll provided on its periphery with a sole-shaping matrix having the longitudinal medial line of its forepart-shaping portion the arc of a circle with its center at the axis of the roll and the corresponding line of another portion thereof of materially different curvature, means for effecting relative movement of the jack and the roll lengthwise of the shoe to cause the roll to traverse the sole, and means for rotating the roll at such a speed in its travel over the sole as to cause the longitudinal medial line of its forepart-shaping portion to roll along the sole without slipping substantially thereon.

3. A sole leveling machine having, in combination, a shoe supporting jack, a leveling roll provided on its periphery with a sole shaping matrix having its longitudinal medial line for a material part of its length the arc of a circle with its center at the axis of the roll and having an abrupt bulge beyond the arc-shaped part, means for effecting relative movement of the jack and the roll lengthwise of the shoe to cause the roll to traverse the sole, and means for rotating the roll during its travel over the sole at a speed to roll said medial line along the sole and to give the bulge a surface speed greater than that of the travel of the roll and in the opposite direction when engaging the sole.

4. A sole leveling machine having, in combination, a shoe supporting jack, a leveling roll provided on its periphery with a sole shaping matrix having the longitudinal medial line of its forepart shaping portion the arc of a circle with its center at the axis of the roll and having a bulging shank shaping portion, means for effecting relative movement of the jack and the roll lengthwise of the shoe to cause the roll to traverse the sole, and means for rotating the roll during its travel over the sole at a speed to roll the forepart shaping portion of the matrix along the sole and give the shank bulge a surface speed greater than that of the travel of the roll and in the opposite direction when engaging the sole.

5. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll having a gear coaxial therewith for turning it and provided on its periphery with a sole-shaping matrix developed for a material portion of the length thereof on a surface bearing the same relation to the axis of the roll as the pitch surface of the gear, means for effecting relative movement of the jack and the roll lengthwise of the shoe, and a rack for engaging said gear to turn the roll in response to said relative movement of the jack and the roll.

6. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll having a gear coaxial therewith for turning it and provided on its periphery with a sole-shaping matrix developed for a material portion of the length thereof on a surface bearing the same relation to the axis of the roll as the pitch surface of the gear, said roll having also an abrupt bulge projecting beyond said surface for operating upon the sole in a predetermined location lengthwise thereof, means for effecting relative movement of the jack and the roll lengthwise of the shoe, and a rack for engaging said gear to turn the roll in response to said relative movement of the jack and the roll.

7. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll having at its opposite ends gears coaxial therewith for turning it and provided on its periphery with a sole-shaping matrix having a forepart-shaping portion developed on a surface bearing the same relation to the axis of the roll as the pitch surface of the gears and also a bulging shank-shaping portion projecting beyond said surface, means for effecting relative movement of the jack and the roll lengthwise of the shoe, and racks for engaging said gears to turn the roll during said relative movement of the jack and the roll.

8. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll having its periphery shaped to serve

as a mold or matrix for the forepart of the sole with a portion between the opposite sides of said matrix developed on a cylindrical surface about a center at the axis of the roll, said roll having also a shank-shaping portion developed on a surface different from said cylindrical surface, and means for effecting relative movement of the shoe and the roll lengthwise of the sole and for simultaneously turning the roll at such a speed as to cause said first-named portion to roll along the sole without slipping substantially thereon.

9. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll having its periphery differently shaped in different locations about its axis to serve as a matrix for differently shaping in a predetermined manner different portions of the length of the sole and having about a substantial portion of its periphery a sole-engaging surface formed on an arc with its center at the axis of the roll, means for effecting relative movement of the jack and the roll lengthwise of the shoe, and means for turning the roll during said relative movement at such a speed as to cause its arc-shaped portion to roll along the sole without any substantial rubbing action thereon.

10. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll, means for effecting relative movement of said jack and roll lengthwise of the shoe, and mechanism for imparting to said roll turning movement in co-ordinate relation to said relative movement, said roll having a sole-shaping periphery so formed relatively to the rate of its turning movement as to cause it to subject a portion of the sole to rolling pressure without any substantial rubbing action thereon and another portion of the sole to wiping pressure.

11. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll, means for effecting relative movement of the jack and the roll lengthwise of the shoe to cause the roll to traverse the shoe continuously from its toe end rearwardly, and mechanism for turning the roll at a speed bearing a definite relation to the speed of said relative movement, said roll having on its periphery a projecting portion arranged to engage the shank portion of the sole and so formed relatively to the speed of rotation of the roll and the speed of the relative movement of the roll and the jack as to cause it to subject the shank portion of the sole to rubbing pressure forwardly toward the ball-line as it traverses that portion of the sole.

12. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll, means for effecting relative

movement of the jack and the roll lengthwise of the shoe to cause the roll to traverse the shoe from its toe end rearwardly, and mechanism for turning the roll at such a speed in relation to the speed of said relative movement as to cause it to subject the forepart of the sole substantially to rolling pressure, said roll having on its periphery a projection arranged to engage the rearwardly sloping surface of the sole at the rear of the ball-line and by reason of its relatively greater surface speed to apply to that portion of the sole pressure substantially normal to its sloping surface.

13. A sole-leveling machine, having, in combination, a shoe-supporting jack, a leveling roll having its periphery differently shaped in different locations about its axis to serve as a matrix for differently shaping in a predetermined manner different portions of the length of the sole, means for effecting relative movement of the jack and the roll lengthwise of the shoe, the roll being mounted for movement heightwise of the shoe in response to variations in the lengthwise contour of the shoe bottom, and mechanism operative in response to said relative movement of the jack and the roll to turn the roll at such a speed as to bring the appropriate portions of the roll into engagement with the corresponding portions of the sole.

14. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll having its periphery differently shaped in different locations about its axis to serve as a matrix for differently shaping in a predetermined manner different portions of the length of the sole, means for effecting relative movement of the jack and the roll lengthwise of the shoe, the roll being mounted for movement heightwise of the shoe in response to variations in the lengthwise contour of the shoe bottom, and rack and pinion mechanism movable with the roll heightwise of the shoe and arranged to impart to the roll turning movement in response to the relative movement of the jack and the roll lengthwise of the shoe.

15. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll having its periphery differently shaped in different locations about its axis to serve as a matrix for differently shaping different

portions of the length of the sole, means for moving the roll lengthwise of the shoe, the roll being mounted for movement heightwise of the shoe in response to variations in the lengthwise contour of the shoe bottom, a pinion carried by the roll, and a rack extending lengthwise of the shoe and arranged to engage said pinion for turning the roll in response to the movement of the roll lengthwise of the shoe, said rack being mounted to move with the roll heightwise of the shoe.

16. A sole-leveling machine having, in combination, a shoe-supporting jack, a leveling roll, means for effecting relative movement of the jack and the roll lengthwise of a shoe on the jack to level the sole, and a device on the jack out of alignment with the shoe for supporting the roll when it passes off the shoe.

17. A sole-leveling machine having, in combination, a leveling roll, a shoe-supporting jack movable from a shoe receiving position into position to present a shoe for the operation of the roll thereon, means for effecting relative movement of the jack and the roll lengthwise of the shoe to level the sole, and a device carried by the jack and provided with a roll-supporting face offset lengthwise of the roll from the sole-engaging surface of the roll for supporting the roll when it passes off the toe of the shoe and for also supporting it when the jack is in its shoe-receiving position between operations on different shoes.

18. A sole-leveling machine having, in combination, an unyieldingly supported shoe-holding jack, a leveling roll having on its periphery a sole-shaping matrix which extends approximately around the roll, means for effecting relative movement of the roll and the jack lengthwise of the shoe, and means for positively rotating the roll by the relative movement of the roll and jack lengthwise of the shoe to apply a rolling pressure to the shoe sole, the jack and the means for rotating the roll being so constructed and arranged in relation to each other as to insure proper engagement of the different portions of the matrix surface of the roll with the corresponding portions of the sole.

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