April 13, 1926. 1,580,893

R. L. HUBBARD

SHOEMAKING MACHINE

Filed Dec. 29, 1920 3 Sheets-Sheet 1

Fig. 2.

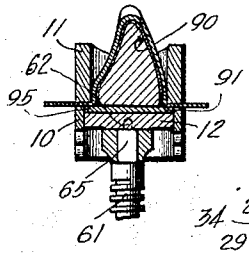


Fig. 1.

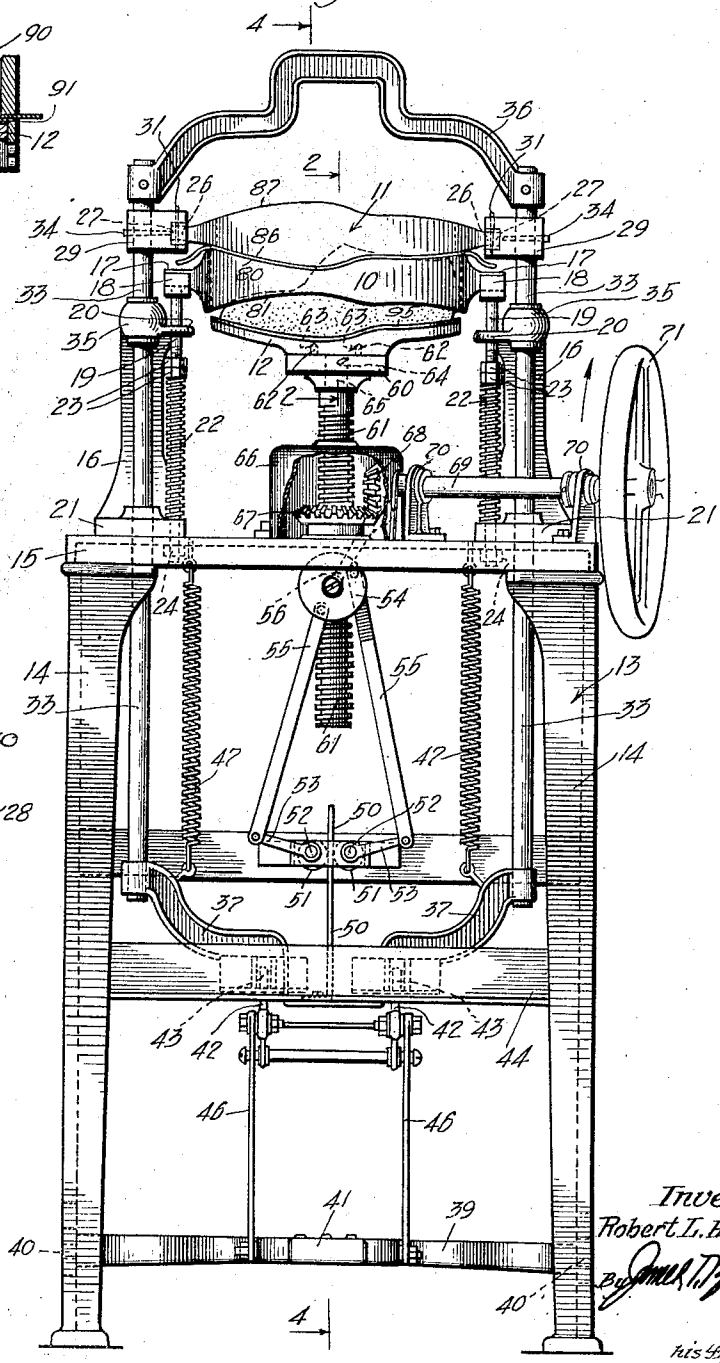
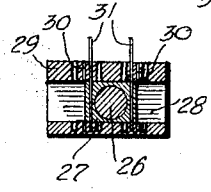


Fig. 3.



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SHOEMAKING MACHINE

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Fig. 5.

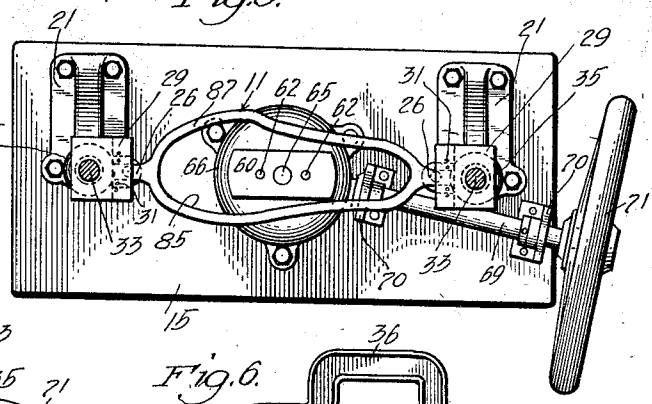


Fig. 4.

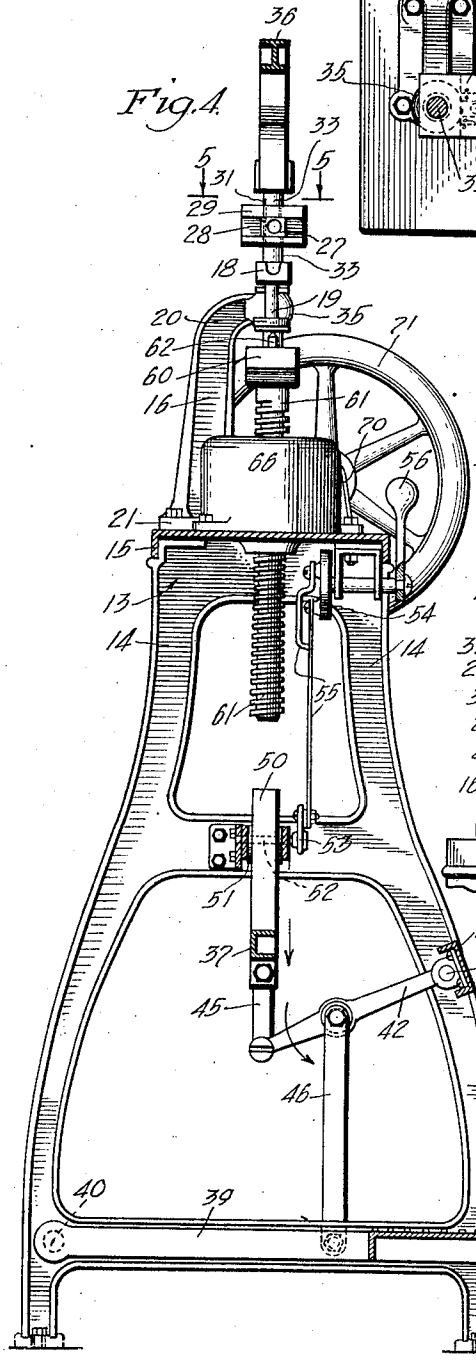
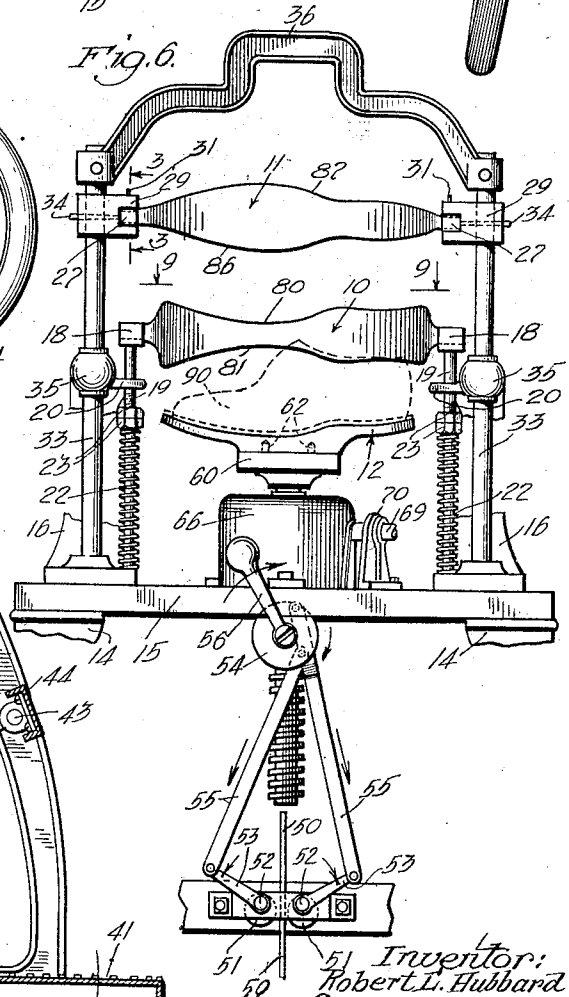


Fig. 6.



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April 13, 1926. 1,580,893

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SHOEMAKING MACHINE

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Fig. 7.

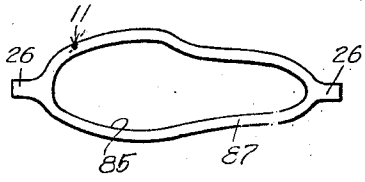


Fig. 8.

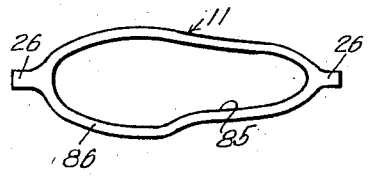


Fig. 9.

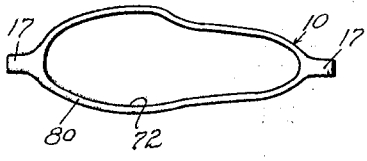


Fig. 10.

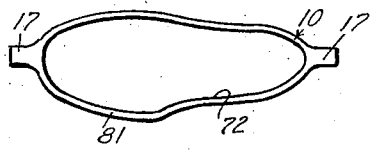


Fig. 11.

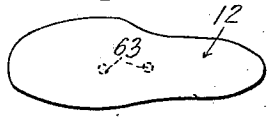


Fig. 12.

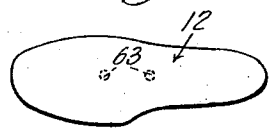


Fig. 13.

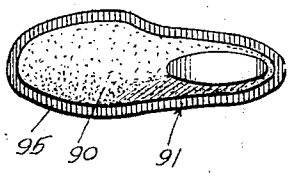
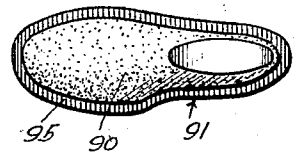


Fig. 14.



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Patented Apr. 13, 1926. 1,580,893

UNITED STATES PATENT OFFICE.

ROBERT L. HUBBARD, OF LOS ANGELES, CALIFORNIA.

SHOEMAKING MACHINE.

Application filed December 29, 1920. Serial No. 433,932.

To all whom it may concern:

Be it known that I, ROBERT L. HUBBARD, a citizen of the United States, residing in Los Angeles, county of Los Angeles, State of California, have invented new and useful Improvements in Shoemaking Machines, of which the following is a specification.

This invention has to do with a shoe making machine, and more specifically to a shoe forming or lasting machine, and an object of the invention is to provide an improved mechanism of this character which is simple, effective and easily operated.

A particular object of this invention is to provide a shoe forming machine which is easily and quickly reversible to form either lefts or rights, that is, a machine which may be easily and quickly adapted to form shoes for either the right or the left foot. In accordance with a typical form of the invention, this object is carried out by constructing and arranging a machine to be reversible by changing one part and adjusting or reversing two other parts. These parts are all easily accessible, making it possible to easily and quickly effect the above-mentioned operation. By carrying out this object of the invention, an extremely simple and inexpensive machine is provided, and, further, numerous parts and operations heretofore necessary are eliminated.

A noteworthy feature of the invention is the manner of mounting or supporting the parts which clamp and hold parts of the shoe so that the shoe parts are evenly held. The mountings cause the clamping parts to be self-centering and to compensate for variations in thickness of leather so that no parts are unduly strained. This feature is important as it minimizes the care necessary in operating the machine and the breakage or waste of material due to imperfect operation of the machine.

The various objects and features of the invention will be best and more fully understood from the following detailed description of a typical preferred form of the invention throughout which reference is had to the accompanying drawings in which—

Fig. 1 is a front elevation of the machine showing a piece of leather arranged in it and a last in position to be moved into engagement with the leather; Fig. 2 is a detail sectional view taken as indicated by line 2—2 on Fig. 1, showing the various parts in position where the leather is stretched or formed over the last; Fig. 3 is an enlarged detail sectional view taken as indicated by line 3—3 on Fig. 6; Fig. 4 is a vertical sectional view of the machine, taken as indicated by line 4—4 on Fig. 1; Fig. 5 is a plan section taken as indicated by line 5—5 on Fig. 4; Fig. 6 is a fragmentary view of the machine showing the principal operating parts completely separated or in released position; Fig. 7 is a plan view of the clamping form showing it in position to form a right shoe; Fig. 8 is a plan view of the clamping form showing it in position to form a left shoe; Fig. 9 is a plan view of the base form showing it in position to form a right shoe and to cooperate with the clamping form when in the position shown in Fig. 7; Fig. 10 is a plan view of the base form showing it in position to form a left shoe and to cooperate with the clamping form when in the position shown in Fig. 8; Fig. 11 is a plan view of a right plate adapted to cooperate with the forms when they are in the positions shown in Figs. 7 and 9; Fig. 12 is a left sole plate adapted to cooperate with the forms when they are in the positions shown in Figs. 8 and 10; Fig. 13 is a plan view of a right last with a lining formed on it and attached to an inner sole; and Fig. 14 is a view similar to Fig. 13 of a left last.

The machine of the present invention comprises generally three principal operating parts, namely, a base form 10, a clamping form 11, and a sole plate 12. These parts are mounted in suitable manners on a main frame 13 which comprises, generally, end standards 14, a top plate 15, supported by the standards 14, and brackets 16, mounted on the top plate 15. The base form 10, the form and operation of which is hereinafter described; is formed at its ends with trunnions 17. The trunnions 17 are co-axial and are rotatably carried in bearing blocks 18, mounted on the upper ends of rods 19. The trunnions fit into notches or openings in the bearing blocks which allow endwise tilting of the form, as hereinafter described. The rods 19 are slidably carried in bores formed in projections 20, extending from the upper end portions of the brackets 16, and bosses 21 on the top plate 15, to be vertically movable. Compression springs 22 are arranged in connection with the rods 19 between the bosses 21 on the plate 15 and nuts 23 screw-threaded on the rods 19 between

the projections 20 and the bosses 21. Stop nuts 24 are arranged on the lower ends of the rods 19 to limit upward movement. It will be obvious, of course, how the stop nuts 24 can be adjusted so that the bearing blocks 18 will normally assume the proper level and how the nuts 23 can be adjusted to regulate or vary the pressure on the springs 22 and therefore the force with which the rods 19 are forced upwardly. In practice, under ordinary circumstances, the stop nuts 24 are adjusted so that the bearing blocks 18 are at substantially the same level, and the nuts 23 are so adjusted and the springs 22 are equally compressed and so that the rods 19 are pressed upwardly with considerable force. It will be understood how the construction above set forth allows the base form 10 to tilt or swing about its longitudinal axis, that is, about the axis of the trunnions 17, and how it may also tilt endwise or have movement about a transverse axis. The pivotal mounting of the trunnions 17 in the bearing blocks 18, allows tilting or swinging of the form about its longitudinal axis, while the two rods 19, being independently supported and capable of independent operation, allow endwise tilting. For instance, by unequal movement of the two rods 19, or by movement of one of the rods and not the other, the form moves more or less endwise.

The clamping form 11, the details and operation of which are hereinafter set forth, is formed at its end with coaxial trunnions 26 which are rotatably carried in bearing blocks 27 adjustably carried in guide-ways 28 formed in brackets 29. The guide-ways 28 are horizontally disposed and the adjustability of the bearing blocks 27 is effected by forming holes through the bearing blocks and a plurality of holes 30 in the brackets 29 to receive pins 31 in the manner clearly shown in Fig. 3 of the drawings. It will be understood how the bearing blocks 27 may be adjusted to various positions in the guide-ways 28 by arranging the pins 31 through various holes 30, and thence through the holes in the bearing blocks 27. This particular manner of adjusting the bearing blocks 27 in the guideways 28 is, of course, only typical of the various ways in which this adjustability may be carried out. The brackets 29 are secured opposite each other on the upper end portions of rods 33 by pins 34. The rods 33 are slidably carried in bearings 35, formed at the upper ends of the brackets 16, and in the bases 21 of the bracket 16 to be vertically movable. The upper ends of the rods 33 above the bracket 29 are connected or braced by a frame member 36, while the lower ends of the rods 33 below the top plate 15 are connected and braced by a frame structure 37. With this construction the rods 33, frame member 36 and frame structure 37, form a unitary structure which is vertically movable, and is capable of being moved downwardly until the clamping form 11 engages and cooperates with the base form 10.

As far as the present invention is concerned, any suitable means or mechanism may be provided for actuating, or raising and lowering, the rods 33. For instance, as shown in the drawings, pedal actuated lever mechanism may be provided for this purpose. This particular mechanism comprises a treadle or pedal 39 pivotally mounted at 40 on the standards 14, and formed at its outer end with a foot piece 41. A pair of levers 42 are pivotally connected at 43 to a stationary frame member 44 and have their outer ends connected to the frame structure 37 by suitable links 45. Links 46 connect the pedal 39, at a point intermediate the pivotal mounting 40 and the foot piece 41, and the levers 42, intermediate their pivotal mountings 43 and their outer ends which connect to the links 45. With this arrangement of levers and links it will be obvious how downward movement or depression of the pedal 39, as indicated by the arrow in Fig. 4, will move the various parts of the mechanism in the direction indicated by the arrows in Fig. 4, and will cause downward movement of the rods 33. Although various means may be employed for returning the rods 33 to their upper positions, after having been moved downwardly by the action just described, I prefer to arrange tension springs 47 between the frame structure 37 and the top plate 15 in the manner clearly shown in the drawings. With this simple arrangement the rods 33 automatically assume their up or released position upon release of the treadle 39, and are normally held in this position.

In the preferred form of machine I provide means for positively clamping or setting the rods 33 in any desired position. The advantage of this will be understood from the description to follow. In the particular machine shown in the drawings the clamping or setting device comprises a vertically disposed member 50 arranged between two cams 51 which are adapted to be actuated to clamp and positively grip said member. The cams 51 are carried on shafts 52 which also carry arms 53. The arms 53 are connected with a rotatable disk 54 by links 55. From inspection of the drawings, particularly from inspection of Figs. 1 and 6 of the drawings, it will be noted that the links 55 connect to the disk 54 in such manner that rotation of the disk, in the direction indicated by the arrow in Fig. 6, will cause downward movement of the links 55, as indicated by the arrows in Fig. 6. The arms 53 are oppositely arranged so that downward movement of the links 55 causes rotation of

the shafts 52 in opposite directions and thereby moves the cams 51 into clamping engagement with the member 50. It will be understood, of course, how the disk 54 may be easily and conveniently operated by a suitable hand lever 56. With the above described mechanism the rods can be positively set in any desired position.

The sole plate 12 is removably mounted on a head 60 carried on the upper end of a screw 61. The head 60 has pins 62 extending from it to extend into suitable holes or openings 63 formed in the bottom of the sole plate 12. The head 60 is pivotally mounted on the upper end of the screw 61, being formed with a bore 64 to receive a trunnion 65 formed on the upper end of the screw 61. The screw 61 is arranged to extend vertically downwardly through a housing 66, mounted on the top plate 15, and through the top plate 15, as shown in the drawings. A bevel gear 67 is screw-threaded on the screw 61 within the housing 66 and is adapted to seat against the top plate 15 in the manner clearly shown in Fig. 1 of the drawings. The bevel gear 67 is engaged by a bevel pinion 68 carried on the inner end of a horizontally disposed shaft 69 which is carried in bearing brackets 70 mounted on the top plate 15. A hand wheel 71 is mounted on the outer end of shaft 69 in the manner clearly shown in the drawings. It will be obvious how rotation of the hand wheel 71 will cause rotation of the shaft 69 and thence rotation of the gear 67 through the pinion 68. Rotation of the gear 67 causes longitudinal movement of the screw 51 due to the screw-threaded engagement between the gear 67 and the screw 61. From the drawings it will be seen that the various parts are arranged and proportioned so that the sole plate 12 can be moved upwardly through the base form 10 and into engagement with the clamping form 11 upon proper rotation of the hand wheel 70.

The base form 10 has an opening 72 extending vertically through it. The configuration or shape of the opening 72 conforms with the plan outline of configuration of the shoe to be formed by the machine. When the base form 10 is turned, or in position, so that its rim or face 80 faces upwardly and its opposite rim or face 81 faces downwardly, as shown in Figs. 1 and 6 of the drawings, the opening 72 corresponds, when viewed as indicated by line 9—9 on Fig. 6, to the plan configuration of a shoe to be worn on the right foot. This is clearly shown in Fig. 9 of the drawings. Upon turning of the form 10 through 180°, or by turning the form 10 half-way around, so that the face 81 faces upwardly and the face 80 faces downwardly, the opening 72, when viewed or indicated by line 9—9 on Fig. 6, corresponds to the plan outline of a shoe to be worn on the left foot. The form is shown in this position and is viewed in the manner shown in Fig. 10 of the drawings. In general, it may be said that the base form 10 is reversible to form either left or right shoe. It is to be particularly noted that the form 10 can be reversed very quickly and easily, and that it is unnecessary to release or change any parts of the mechanism in performing this operation.

The face 80 of the form 10 is transversely curved to conform with the transverse curvature desired in the sole or soles of the finished shoe. When the form 10 is in the position shown in Figs. 1, 6 and 9 of the drawings, or is in position to form a shoe for the right foot, the face 80 faces upwardly. The relation between opening 72 and the face 80, or more specifically between the configuration of the opening 72 and the transverse curvature of the face 80, is such that the toe end of the opening 72 and the toe end of the face 80 are at the same end of the form and correspond with each other while the heel end of the face 80 are at the other end of the form and likewise correspond with each other. The face 81 of the form 10 is like, but opposite to that of the face 80, so that when the form 10 is turned 180° from the position shown in Figs. 1, 6 and 9, the opening 72 corresponds to the outline of the shoe for the left foot. The transverse curvature of the face 81 corresponds to the transverse curvature of the sole of a shoe for the left foot.

The clamping form 11 is formed with an opening 85 similar to but slightly smaller than the opening 72 in the form 10. The opening 85 like the opening 72 corresponds, or is similar, to the plan outline of the shoe for the right foot when the face 86 of the form 11 faces downwardly and the opposite face 87 faces upwardly, and corresponds to the plan configuration of a shoe for the left foot when the face 86 faces upwardly and the face 87 faces downwardly. In the preferred form of the invention the outside walls of the forms 10 and 11 coincide, thus causing the wall of the clamping form to be somewhat thicker than the wall of the base form. The face 86 of the clamping form 11 is transversely curved to correspond with, or be like, the face 80 of the base form 10 when the base form 10 is in position so that the face 80 faces upwardly and when the clamping form 11 is in position so that the face 86 faces downwardly. With the face 86 facing downwardly and face 80 facing upwardly it would be obvious how the forms 10 and 11 will cooperate, as shown in Fig. 1, so that they seat or fit approximately together. In practice the forms or clamping surfaces are made so that they do not fit exactly or perfectly together but so that they fit more closely and tightly at certain parts and thus clamp or hold the upper leather more tightly

at said parts. The advantage of this will be obvious from the description to follow. The face 87 of the form 11 is transversely curved oppositely to the face 86 so that it will correspond to the curvature of the edge 81 of the form 10 when the forms are reversed from the positions shown in Figs. 1 and 6. In general it may be said that the faces 80 and 86 of the forms 10 and 11 respectively, cooperate or fit together when the forms are in position to form a shoe for the right foot while the faces 81 and 87 fit together or cooperate when the forms are in position to form the left foot. It will be obvious, of course, how the clamping form 11 may be easily reversed or turned in the same manner that the form 11 may be turned.

The sole plate 12 shown in Figs. 1, 6 and 11 is of such plan configuration as to correspond to, or with, the opening 72 when the base form 10 is in the position shown in Figs. 1, 6 and 9 of the drawings. Further the top surface of this sole plate is transversely curved to correspond to the transverse curvature of the edge 86 of clamping form 11 when the clamping form 11 is in the position shown in Figs. 1, 5, 6 and 7. In other words, this sole plate 12 is for use when a right shoe is to be formed. The sole plate is of such size as to slidably fit the opening 72 but is sufficiently large that it will not fit into the opening 85 of the form 11. In other words, when the forms 10 and 11 are in the positions shown in Figs. 1 and 6 of the drawings and are moved or arranged together the sole plate 12 may be moved upwardly through the clamping form 10 and into engagement with the edge 86 of the clamping form 11. When the forms are positioned for a shoe for the left foot, or are reversed from the positions shown in Figs. 1 and 6 of the drawings, a left sole plate, as shown in Fig. 12, is arranged on the head 60 in place of the sole plate shown in Figs. 1, 6 and 11. It will be readily understood how the sole plates may be very easily placed on and removed from the pins 62. The sole plates 12 are the only parts of the machine which must be changed or replaced in setting the machine for left shoes or right shoes. However, the sole plates 12 are comparatively simple, inexpensive and easily formed parts, and are provided with mountings which permit of them being very easily and quickly interchanged.

In operation the present machine may be used, either for forming a lining over a last or for forming an upper over a last. By upper or top I mean that portion of the shoe above the sole and not specifically the extreme upper portion of the shoe which ordinarily fits around the ankle of the wearer. For sake of example I will describe the manner of operation in forming an upper over a last which has already had a lining formed over it, which lining has been properly secured or stitched to the sole, either the inner sole or the inner and outer soles. In Fig. 13 of the drawings I show a last with a lining 90 formed over it and secured to a sole 91. The sole 91 extends from the last but is sufficiently small to pass through the opening 72 in the base form 10. This particular last, that is, the last shown in Fig. 13, is for a right shoe, and is therefore adapted to be used in connection with a right sole plate, and when the forms 10 and 11 are set in the position shown in Figs. 1 and 6 of the drawings.

In forming an upper over the last shown in Fig. 13, the screw 51 is lowered to the position shown in Fig. 6 of the drawings, and a right sole plate 12 is arranged on the head 60. The rods 33 are allowed to be moved by the springs 47 to their uppermost positions, shown in Fig. 6. The base form 10 and clamping form 11 are both turned to form a right shoe whereupon the last is placed upon the sole plate 12, as indicated in Fig. 6 of the drawings, and a piece of leather, or like material, is arranged between the base form and the clamping form. The piece of leather just referred to may be, and preferably is, a single piece of leather. The clamping form 11 is then moved downwardly by suitable operation of the mechanism hereinabove described until the piece of leather is clamped between the face 80 of the base form and the face 86 of the clamping form. When the leather is clamped with the proper pressure, the rods 33, and therefore the clamping form 11, is set by the mechanism hereinabove described, so that the operator need not maintain pressure on the pedal 39. With the leather properly clamped between the base form and the clamping form, the hand wheel 70 is rotated to move the screw 61 upwardly and thereby move or force the last upwardly between the base form and the clamping form until the upward movement of the sole plate is stopped by the face 86 of the clamping form 11. During this action the leather is drawn or stretched over the last and is finally clamped between the sole plate and the face 86 of the clamping form in the manner clearly illustrated in Fig. 2 of the drawing. In practice the leather is clamped between the forms so that it pulls or slides between them more or less during the forcing of the last upwardly in the manner just described, it being held sufficiently tight however, that it stretches or draws tightly over the last. In practice the piece of leather is, or may be, treated prior to its being formed over the last, so that it will stretch and properly form without cracking or breaking. In practice when the leather needs treatment before use the particular treatment employed may vary with the char-

acter or conditions of the leather or with the practice or facilities of the operator. I will state for purpose of example only, that the leather may, if necessary, be staked or softened by kneading or manipulation in the hands, by application of standard leather softening preparations, by dipping in warm water or by treatment with steam, as in a steam box or over a steaming vessel. These methods are usually necessary only when the leather is unusually refractory, very stiff or very heavy. In accordance with the preferred form of the invention a suitable glue or cement is applied to the projecting portion 95 of the sole 91 so that the piece of leather is held in the position shown in Fig. 2 of the drawings after releasement of the machine and removal of the last. From inspection of Fig. 2 of the drawings it will be readily seen how the top leather is clamped tightly against the extending portion of the sole 91. When proper cement is used the top leather will set or adhere to the inner sole very quickly so that the machine may be released very soon after the top leather has been formed over the last without danger of the top leather and sole separating. In practice, of course, the sole and top leather are stitched together and properly trimmed upon removal of the last from the machine. Glue or cement applied as above set forth makes the joint between the upper and sole watertight. To remove the last the lining and piece of leather which have been formed over the last are cut, at the upper part of the last and down the front where the shoe is to be laced, and the last is then lifted out of the shoe.

When the clamping form 11 is brought down to clamp the piece of leather between the faces 86 and 80 the base form 10 is depressed or moved somewhat downwardly against the resistance of spring 22. The base form being independently mounted at its two ends is free to tilt endwise to properly conform or mesh with the clamping form. For instance, if for any reason the two forms are set so that they will engage at one end sooner than the other, the springs 22 will compensate for or take up any such inaccuracy and cause the leather to be properly held between the two forms. Again, if the piece of leather is slightly thicker at one end than at the other, the springs 22 will allow the base form to tilt more or less and compensate for such irregularity of the leather and thus cause the leather to be clamped with substantially uniform pressure at all parts. It will also be understood that the forms, being pivotally mounted about their longitudinal axis, are free to swing one way or the other during the clamping of the leather so that the leather is clamped uniformly at both sides of the forms. It may be said that the pivotal mountings of the forms and resilient or yielding mounting of the base form 10 cause the forms to be self centering and compensating so that the leather arranged between them is uniformly and evenly clamped or gripped at all parts. In fact, this manner of mounting and supporting the forms compensates for mechanical inaccuracies such as slight lack of alignment, etc., and also compensates for variations or unevenness in thickness of the leather used. In the practical operation of the machine it is found that the forms evenly and uniformly clamp the leather so that it draws between them uniformly at all parts when the last is forced upwardly. It will be obvious of course that the pressure with which the leather is clamped between the two forms depends upon the pressure put on the treadle 39. In practice an operator soon becomes skilled in clamping the leather so that it is held with the proper pressure. Further, in the practical operation of the machine, the operator can readily see if the leather is not properly drawing between the form, and if it is not he can cause it to draw properly by holding or retarding its movement at certain parts with his hands, thus causing other parts to increase in movement. In fact an operator very soon becomes able to perfectly regulate the drawing of the leather between the forms so that the upper of the shoe is prefectly formed.

From the foregoing description it will be readily understood how the machine may be operated to form a shoe for the left foot by placing a left sole plate on the head 60 and reversing the forms so that the face 87 of the clamp form 11 faces downwardly and the face 81 of the base form 10 faces upwardly, whereupon a left last as shown in Fig. 14 can be placed upon the sole plate and forced upwardly between or through the forms in the manner hereinabove described.

Having set forth only a preferred embodiment of my invention, I do not wish to limit or restrict myself to the particular details hereinabove set forth, but wish to reserve to myself any changes or variations that may appear to those skilled in the art or that may fall within the scope of the following claims.

Having described a preferred form of my invention, I claim:

1. In shoe forming apparatus, a pivotally mounted form member having an opening through it transversely of the axis of pivotal mounting and having transversely curved clamping faces at the ends of the opening, said opening being shaped to correspond to the plan configuration of a shoe, and said faces being curved to correspond to the transverse curvature of a shoe sole.

2. In shoe forming apparatus, a form member having a pivotal mounting, having an opening through it at right angles to the axis of pivotal mounting and shaped to conform with the plan configuration of a shoe, and being formed at the ends of said opening with oppositely transversely curved clamping faces conforming in curvature to the transverse curvature of shoe soles.

3. In shoe forming apparatus, a pivotally mounted base form having an opening through it shaped to conform to the plan configuration of a shoe, and having oppositely transversely curved clamping faces at the ends of said opening, said surfaces conforming in curvature to the transverse curvature of a shoe sole, and a pivotally mounted clamping form adapted to cooperate with the base form and having an opening through it shaped to conform to the plan configuration of a shoe and having oppositely transversely curved clamping faces at the ends of said opening, said last mentioned surfaces conforming in curvature to the transverse curvature of a shoe sole.

4. In shoe forming apparatus, a pivotally mounted base form having an opening through it shaped to conform to the plan configuration of a shoe and having oppositely transversely curved clamping faces at the ends of said opening, said surfaces conforming in curvature to the transverse curvature of a shoe sole, and a pivotally mounted clamping form adapted to cooperate with the base form and having an opening through it smaller than the opening in the base form and shaped to conform to the plan configuration of a shoe and having oppositely transversely curved clamping faces at the ends of said opening, said last mentioned surfaces conforming in curvature to the transverse curvature of a shoe sole.

5. In shoe forming apparatus, a reversible base form, yielding pivotal support means for the base form, a reversible clamping form, movable pivotal support means for the clamping form, and means for moving said last mentioned supporting means to cause cooperative engagement between the forms.

6. In shoe forming apparatus, two forming parts cooperating to clamp leather along a line conforming in configuration to the transverse curvature of the lower edge and the complete plan outline of a shoe upper, and a last to cooperate with said forming parts to completely shape the leather into a shoe upper.

7. In shoe forming apparatus, a form member having an opening extending through it from opposite sides conforming in configuration to the plan outline of a shoe, said opposite sides of said member having faces oppositely transversely curved to correspond to the curvature of a shoe sole.

8. In shoe forming apparatus, a form member having an opening through it shaped to correspond to the plan configuration of a shoe and having clamping faces at the ends of the opening curved to correspond to the transverse curvature of a shoe sole, and a pivotal mounting carrying said member so that it can be reversed in position.

9. In shoe forming apparatus, a base form having an opening in it shaped to conform to the plan configuration of a shoe and having a transversely curved clamping face at the end of the opening, and a clamping form adapted to cooperate with the base form and having an opening in it smaller than the opening in the base form and shaped to conform to the plan configuration of a shoe and having a transversely curved clamping face at the end of the opening adapted to cooperate with the clamping face of the base form, the curvature of said faces conforming to the curvature of a shoe sole.

10. In shoe forming apparatus, two forms adapted to cooperate, means freely pivotally supporting one of the forms, means freely pivotally supporting the other form, one of said supporting means being yielding, and means for moving the supporting means relative to each other to bring the forms into cooperative engagement.

11. In shoe forming apparatus, two members adapted to clamp leather between them, the members having openings in them shaped to conform to the plan configuration of a shoe and having cooperating clamping surfaces curved transversely to conform to the curvature of a shoe sole the opening in one of the members being smaller than the opening in the other, a last carrying a shoe sole, and a last carrier adapted to carry the last into the openings in said members so that the leather held by said members is stretched over the last and so that the edge portion of the shoe sole is clamped between the carrier and the clamping surface of the member having the smallest opening.

In witness that I claim the foregoing I have hereunto subscribed my name this 15th day of December, 1920.

ROBERT L. HUBBARD.