J. J. HEYS.

METHOD OF MAKING SHOES.

APPLICATION FILED JAN. 18, 1917.

1,381,921.

Patented June 21, 1921.

4 SHEETS—SHEET 1.

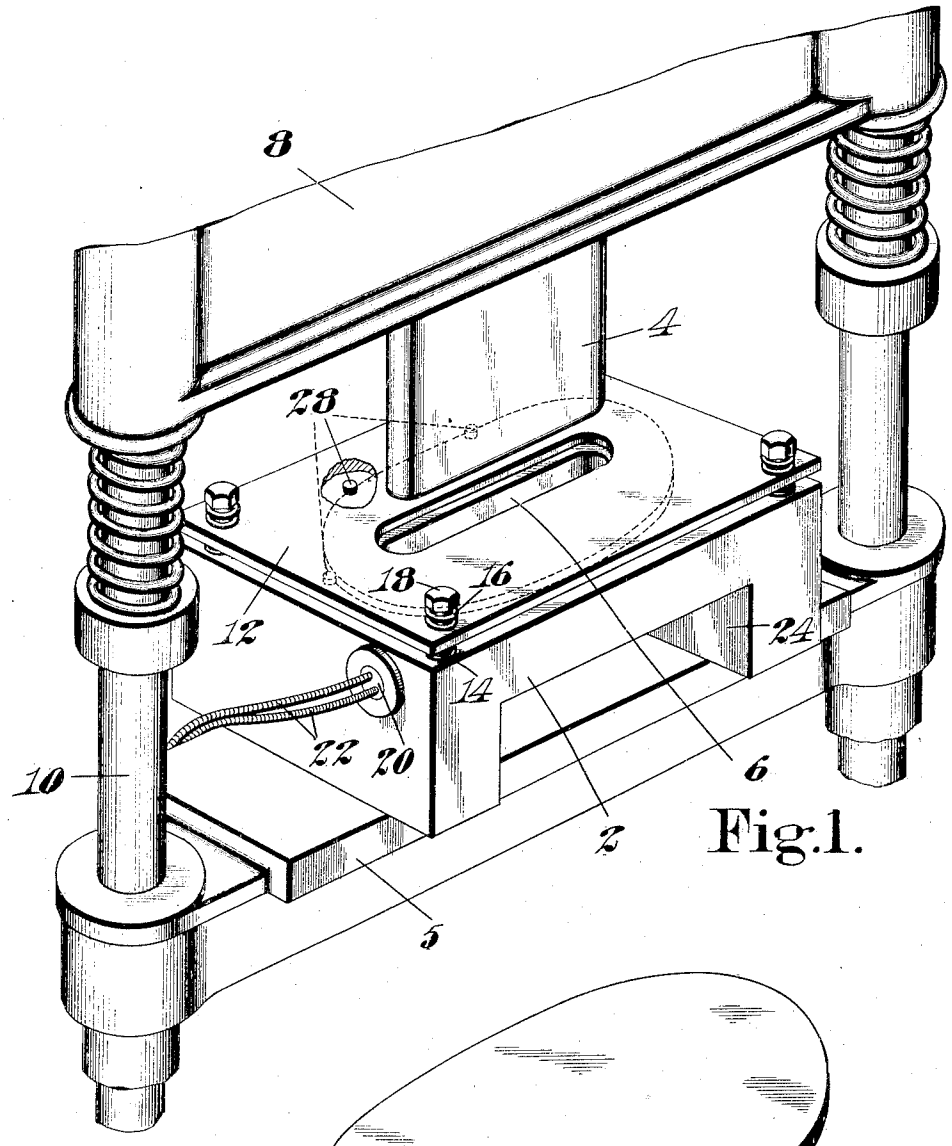

Fig. 1.

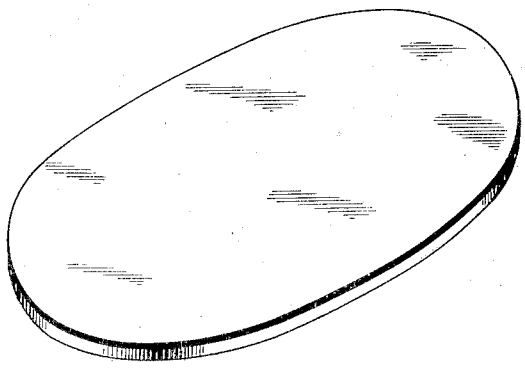

Fig. 2.

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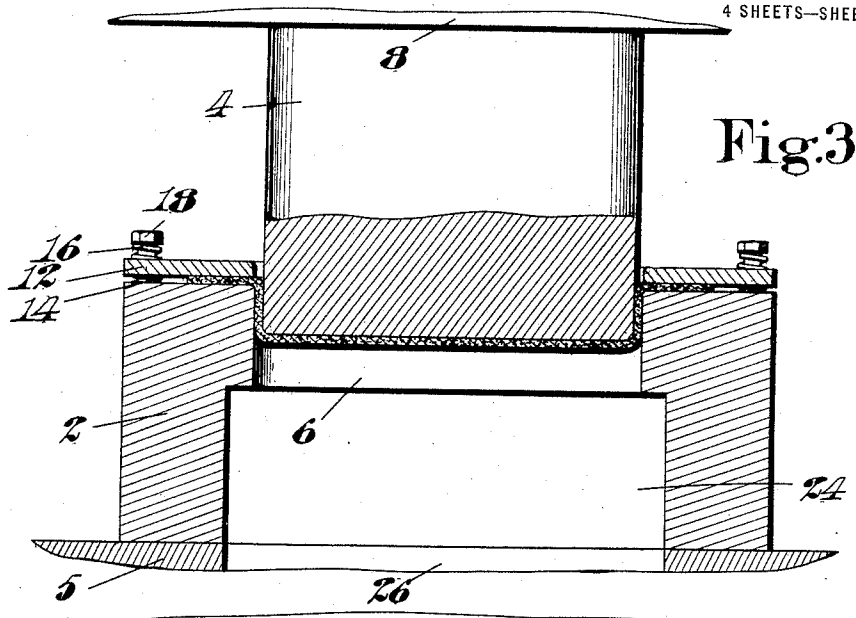

Fig.3.

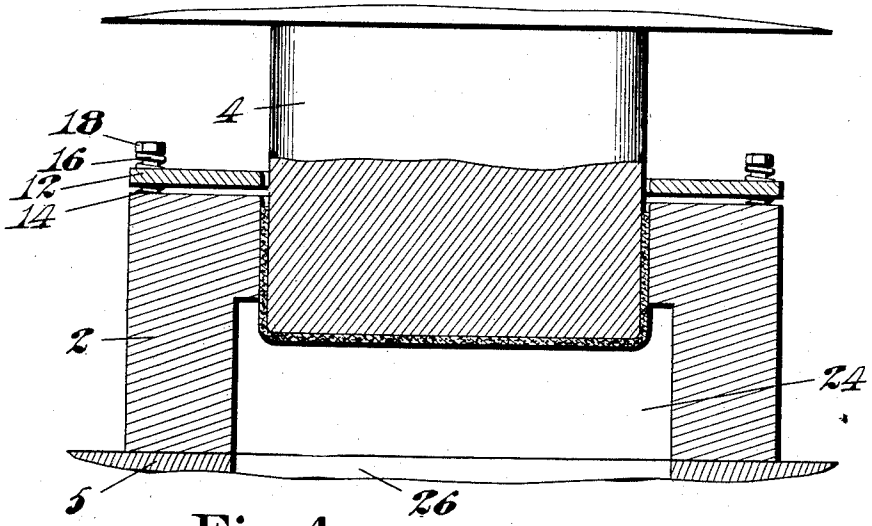

Fig.4.

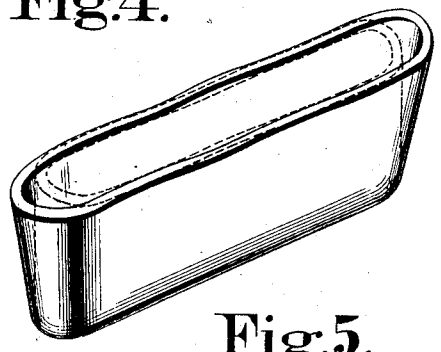

Fig.5.

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4 SHEETS—SHEET 3.

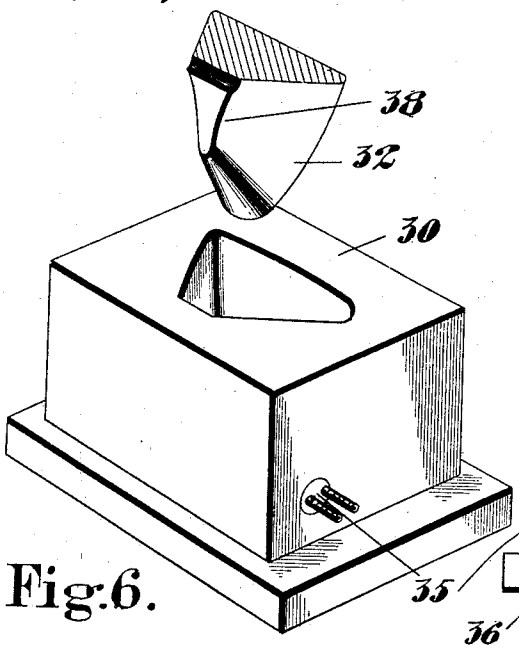

Fig:6.

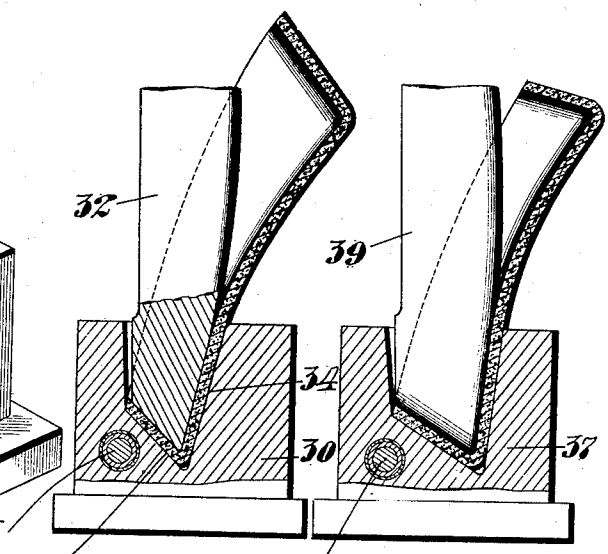

Fig:7. Fig:8.

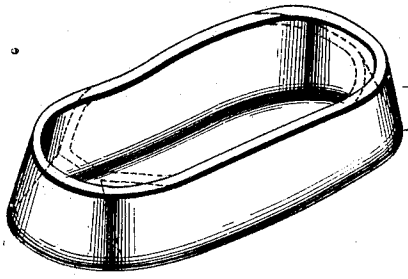

Fig:9.

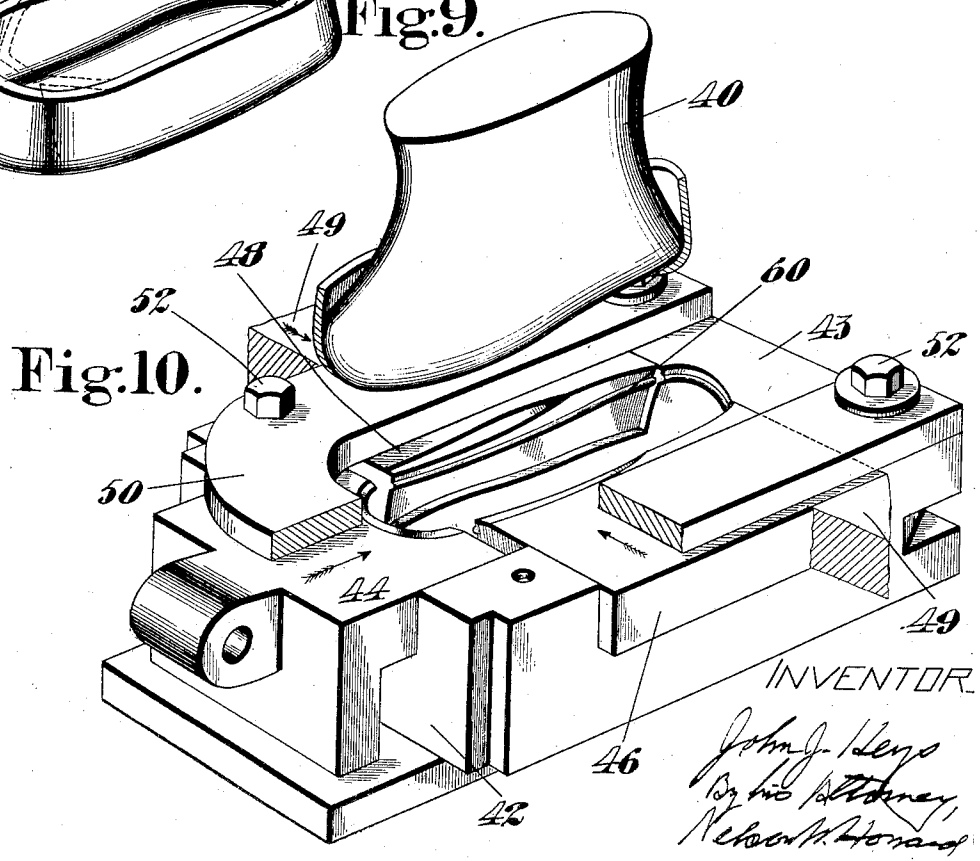

Fig:10.

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4 SHEETS—SHEET 4.

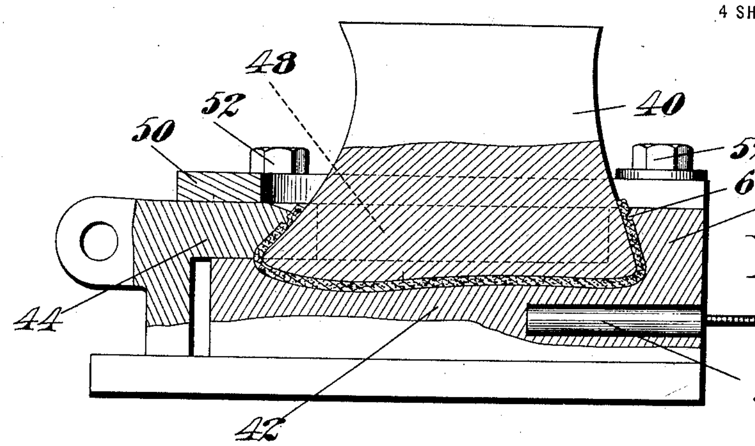

Fig.11.

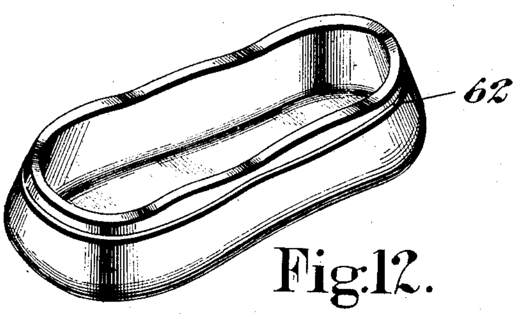

Fig.12.

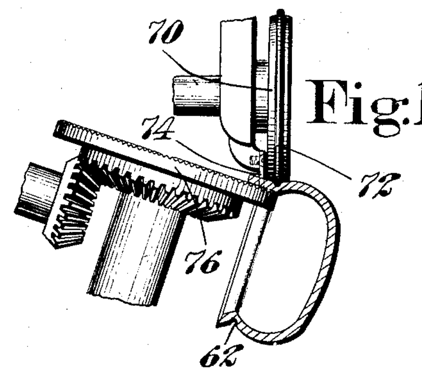

Fig.13.

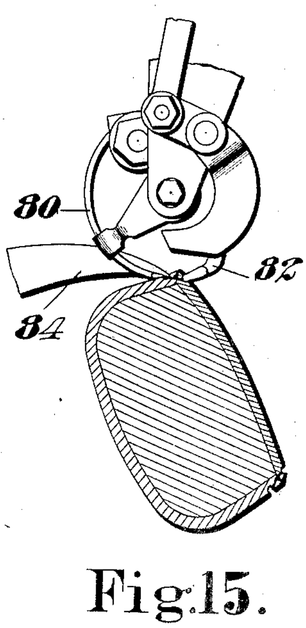

Fig.15.

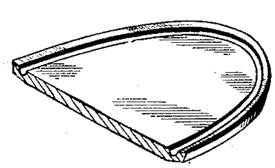
Fig.14.

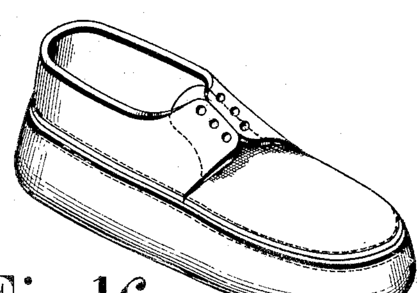
Fig.16.

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UNITED STATES PATENT OFFICE.

JOHN J. HEYS, OF LYNN, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

METHOD OF MAKING SHOES.

1,381,921. Specification of Letters Patent. Patented June 21, 1921.

Application filed January 18, 1917. Serial No. 143,087.

To all whom it may concern:

Be it known that I, JOHN J. HEYS, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented certain Improvements in Methods of Making Shoes, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to methods of making shoes and is herein described and illustrated in its application to the manufacture of shoes of the type commonly known as moccasins.

The term moccasin as used herein is to be understood as designating that form of foot covering in which the sole (or bottom), the sides and also the toe and heel portions, are formed from a single piece of material and in which an upper piece may be secured to the margin of the forepart to form a covering for the instep, whether or not the foot covering has other portions formed integral with it or sewed to its marginal edge to form a top or leg.

Shoes of this type have long been known in the art but their manufacture on a large scale has heretofore seldom been undertaken because the advantages to be gained by the simplicity of construction have been largely offset by the difficulties encountered in shaping to fit the foot the material from which the bottom and side portions of the moccasin are formed and by reason of the fact that it has been practically necessary to sew the margin of the forepart to the tip by a hand operation. The manufacturing cost of this type of shoe has, therefore, been relatively high heretofore and the manufacture has been largely confined to moccasins designed for special purposes, as, for instance, for the use of woodsmen and hunters, and all such moccasins have been devoid of the shapeliness and wearing qualities, as well as comparatively low cost, which are required to create a general demand.

In methods heretofore proposed or followed in the manufacture of shoes of this type, the shaping of the leather blank from which the bottom and the side portions or vamp of the moccasin are formed has usually consisted merely in folding up the side portions of the blank upon an inside former or last, the marginal portion about the toe being puckered and wrinkled to take care of the surplus stock. It has also been attempted to reduce the wrinkles thus formed by a tedious pounding and hammering operation in order to produce an edge which may be hand-sewed to the tip and other parts of the upper without leaving prominent wrinkles in the finished article. The drawing in or hammering operation to remove wrinkles merely flattens and thickens or plumps the material at the marginal portion without displacing any of the stock away from the edge.

The formation of the heel portion without seams is also sometimes attempted in the same manner as the toe portion, but the material which is gathered into wrinkles and flattened to form the sides of the heel portion has a tendency to return to its original position, causing the heel portion to "run over" and become unsightly and uncomfortable. It has hence been practically necessary heretofore to contract the heel portion by removing the surplus stock and uniting the remainder by seams. There is usually at the heel end a vertical seam, and a transverse seam near the sole portion. These seams tend to stiffen the heel portion and, although the seams are, of course, objectionable for various reasons, they are practically necessary in shoes of this type as heretofore made. One problem presented for solution, therefore, in order to render practicable the manufacture of moccasins on a large scale and at a low cost is to provide a method of molding the blank into the proper shape at the toe and heel portions without the formation of wrinkles.

It is well recognized in the art of shoemaking that all stretchy materials entering into the construction of a shoe should have the stretch removed from them as fully and uniformly as possible so that the shoe shall retain its shape and remain comfortable during use. In the manufacture of moccasins, as far as I am aware, this has never been done, but rather the gathering together of the material into wrinkles and the beating of them down has rendered the shoe more stretchy at those parts which particularly should be stretched. A further problem, therefore, is to remove the stretch from all

parts of the blank forming the sole and side portions of the moccasin and to reduce them as far as possible to such a condition that they will retain their size and shape during use.

In the solution of the problems above stated, in accordance with the method of this invention as preferably practised, the blank is first treated in such a manner as to reduce it in length along the line where the stitching is to be done, and this is effected, not by puckering the stock and then working or crushing down the wrinkles formed by the contraction of the marginal portion, but in a manner which prevents the formation of wrinkles and disposes of the excess of stock accumulating as the margin contracts by displacing it away from the margin toward the interior of the blank where it may be of use in forming toe and heel portions which project beyond the edge of the molded blank and beyond the sewing line. The blank, therefore, is first treated in such a manner as to stretch all parts of the blank substantially uniformly and to contract the marginal portions of the blank in their own plane, without forming wrinkles, by causing material to be displaced from the marginal portions by a flow of the material radially of the blank and causing a flow of the material lengthwise of the edge of the blank as the periphery contracts. More specifically, the blank is treated to what may be termed a preliminary molding or "breaking down" operation which, in the illustrated manner of carrying out the method, consists in forcing the blank by a plunger through an opening while the portions of the blank not at first engaged by the plunger are held temporarily in a plane substantially at right angles to the direction of movement of the plunger and by continued movement of the plunger the marginal portions of the blank are finally brought into positions at right angles to the central portion of the blank which is engaged by the end of the plunger. The best results are produced by a plunger having a cross section less than the area of the sole of the shoe to be made. The longest dimension of said section may, however, approximate the length of the sole portion of the shoe. As a result of the preliminary molding operation, the blank is given the form of a vessel having substantially vertical sides and a bottom narrower than the sole portion and of approximately the same length as the sole portion. During this operation all parts of the blank are subjected to stretching and the material is caused to flow in directions substantially perpendicular to the edge of the blank, that is, substantially radially of the blank, while the marginal portions of the blank are contracted lengthwise of the edge of the blank, the movement or flow of the material lengthwise of the edge compensating for the displacement of material from the edge by the radial stretching or flow of the material. The edge periphery of the blank is in this manner reduced to a length equal to, or less than, the periphery of the shoe or moccasin along the line where the sewing is to be done. The plunger or the block having the opening through which the blank is forced, or both the plunger and the block, may be heated, and this is found desirable in dealing with certain kinds of leather.

The toe and heel portions should project outwardly beyond the peripheral edge or the sewing line of the blank and should be given the shapes characteristic of the toe and heel ends of a shoe or last. The blank formed by the first molding operation, which may for convenience be termed the "vessel" blank, may be subjected to intermediate molding operations for giving shape to the end portions. As shown, one end of the vessel blank is treated in molds for shaping the toe, and the other end is treated in molds for shaping the heel, although fair results may be obtained by treating both ends in the same mold, the final molding, in that case, being relied upon for giving the characteristic toe and heel shapes to the blank. The molds for this operation may be heated if desired and such heating is advantageous for some kinds of work. This intermediate molding operation, while preferable when treating refractory materials, is not always essential and the blank may be treated directly by the final molding operation to be described.

After the intermediate molding of the end portion of the vessel blank, or, if desired, without such molding, the blank is treated to a final molding operation. In this operation the blank is preferably molded as a whole to form the heel, sides and ends into the shape required for the finished moccasin.

In this final molding operation it is only essential that either the interior or the exterior of the blank be pressed firmly against a form having the shape either of the interior or of the exterior of the finished shoe and that the blank be held in that position until the leather has "set" sufficiently to retain the form given to it. To expedite the setting of the leather, it is preferable to employ heat. As herein shown, an inside former and an outside former are provided, the inside former being solid and having an exterior contour the complement of the desired inside contour of the shoe, and the outside former being sectional and having an inside contour the complement of the desired exterior contour of the shoe. With this type of mold it is easier so to form the toe portion that it projects considerably beyond the marginal edge of the blank and to remove a blank so formed from the mold than is the case where a solid outside mold is provided and

an expansible inside former is employed to apply molding pressure to the material, although I contemplate also the use of this latter form of mold.

The edges of the shoe part molded as described are necessarily more or less irregular owing to the fact that leather is not homogeneous and certain parts will give or stretch more than other parts. It is advantageous, therefore, to have on the molded shoe part an indication to determine the line with relation to which the peripheral margin should be trimmed and along which the subsequent sewing should be done. Accordingly, the final external mold in the illustrative apparatus is provided with a bead for forming about the molded shoe part a groove which constitutes a guide relatively to which the trimming may be done. Preferably the trimming is done at a predetermined distance beyond the groove and the stitches are located in the groove. It is desirable so to bevel the trimmed edge faces of the molded shoe part and the upper parts to be attached to the molded part that when the edge faces are drawn together in abutting relation by the stitches the outer edges of the faces will substantially coincide, whereby what may be termed a miter joint is formed. To facilitate the formation of such a seam, particularly on a machine, it is advantageous to form the marginal portions beyond the groove with an outward flare so that a curved needle may pass through from the groove in one part to the groove in the other part without danger of engaging the work elsewhere. It is preferable to flare outwardly the margin of the molded shoe parts beyond the groove and at the same time to trim off the edge at a predetermined distance from the groove and at a predetermined angle to the plane of the outwardly flared portion. The unmolded shoe parts also may be treated to form therein a groove and a flare and to trim their edges at an angle similar to that on the molded parts.

The sewing together by a machine of the beveled, grooved and flared marginal portions of the molded bottom part and the similarly beveled, grooved and flared marginal portions of the tip and other upper parts, when such other upper parts are employed, constitutes a final step in the method of making a moccasin illustrated in the accompanying drawings.

The novel characteristics of the invention will appear more fully from the following detailed description when read in connection with the accompanying drawings, which show an illustrative apparatus by the use of which the method may be practised, and will be pointed out in the appended claims. It is to be understood, moreover, that the apparatus shown is merely illustrative and that the method may be carried out in various ways irrespectively of any particular construction of apparatus.

In the drawings,

Figure 1 shows an apparatus for performing the preliminary molding or breaking down operation comprised in the method of the present invention;

Fig. 2 shows a form of blank which may be used in the practice of the method;

Fig. 3 is a view in vertical section of the apparatus shown in Fig. 1 illustrating an intermediate stage in the first operation upon the blank;

Fig. 4 is a view similar to Fig. 3 showing a later stage in the operation;

Fig. 5 shows the form the blank assumes after the first operation upon it, the dotted lines indicating the form the blank is made to assume during the operation;

Fig. 6 shows apparatus for performing the next operation upon an end of the blank of Fig. 5;

Fig. 7 is a sectional view of the apparatus of Fig. 6 acting upon the end of the blank which is to form the toe of the shoe;

Fig. 8 is a view similar to Fig. 7 showing molding apparatus especially designed for operation upon the heel end of the blank;

Fig. 9 shows the blank after having its ends operated upon by the apparatus shown in Figs. 7 and 8;

Fig. 10 shows an apparatus for performing the final molding operation upon the blank in which it is made to assume the final shape of a molded shoe part, the blank being about to be introduced into the mold;

Fig. 11 is a sectional view of the apparatus of Fig. 10 with the blank in molded condition;

Fig. 12 is a view of the completely molded blank;

Fig. 13 shows apparatus for trimming, beveling and flaring the margin of the molded shoe part shown in Fig. 12;

Fig. 14 shows a tip piece after being operated upon by the apparatus of Fig. 13 to trim, bevel, groove and flare its marginal portion;

Fig. 15 shows apparatus for sewing the tip piece of Fig. 14 to the molded shoe part; and

Fig. 16 is a view of a completed moccasin made by the method of the present invention.

In Fig. 1 is shown apparatus for performing the preliminary molding or "breaking down" operation. It consists of a block or table 2 through which a plunger 4 is arranged to pass upon relative movement of the block and plunger. An opening 6 in the block is enough larger than the plunger 4 to admit the thickness of the material to be molded all the way around the plunger. As shown, the block 2 rests on a rigid support 5 and the plunger 4 is carried by a

cross-head 8 which is reciprocated vertically by suitable mechanism connected with side rods 10 to which the cross-head is secured. Above the upper face of the block 2 and spaced from it a distance substantially equal to the thickness of the material is arranged a plate 12 which is held in spaced relation above the block by relatively light springs 14 and is prevented from rising higher than the thickness of the material by relatively stiff springs 16 arranged between the upper face of the plate 12 and the heads of bolts 18 by which the plate is held to the block 2. The springs 16 are of suitable strength to permit the plate 12 to yield under unusual stress and prevent injury to the material being molded. In the block 2 is inserted a heating means 20, shown as an electrical heating element the terminals of which are indicated at 22. The leather frequently used for moccasins contains considerable oil and the molds are preferably heated to a moderate temperature, such, for instance, as can be borne by a bare hand. When the molds are thus heated, some of the oil is tried out by the heat and acts as a lubricant during the breaking down process and the leather is also softened enough to prevent cracking or breaking. The blank, being only moderately warm when it leaves the mold, will quickly cool and therefore retain its shape better than if it left the mold in a more highly heated condition. Beneath the block 2 is a space or opening 24 large enough to receive the molded material forced through the opening 6 by the plunger, and the support 5 is preferably provided with an opening 26 through which the molded blank may drop when the plunger ascends after the molding operation.

A blank adapted for treatment by the mechanism described in performing the first step of the improved process is shown in Fig. 2. The blank is inserted between the top face of the block 2 and the lower face of the plate 12 and is positioned with its center beneath the plunger 4 by pins 28 arranged at the far side and at one end of the blank. The plunger is then moved downwardly and forces the material into the opening in the block 2, as shown in Fig. 3, the marginal portions of the blank being held flat and at right angles to the direction of movement of the plunger. The plunger being relatively narrow and having rounded corners, the strains set up in the blank during this molding operation are exerted in radial directions, that is, in directions extending from the periphery of the blank inwardly toward the plunger. These strains cause a flow of the material to take place progressively from the marginal portions of the blank toward the interior and as successive portions of the blank pass from the horizontal position determined by the upper face of the block 2 and the lower face of the plate 12 to the vertical position determined by the opening 6 and the plunger 4, the material is stretched in the direction of movement of the plunger, permitting the peripheral margin which is still in horizontal position to contract along the periphery where the bend occurs. In this manner the material in the peripheral margin of the blank, which in other processes has been disposed of by wrinkling and plumping the leather at the margin, is caused to flow toward the interior of the blank, thereby permitting the peripheral portions to contract lengthwise of the periphery and the length of the periphery to be reduced without the formation of wrinkles. In Fig. 4 a later stage of the molding operation is shown in which all of the marginal portions of the blank have been brought into the vertical position and the periphery of the blank has been reduced to equal the periphery of the plunger. The plunger is preferably moved farther than is shown in Fig. 4 to carry the blank into the opening 24 and when the plunger is withdrawn, the blank is stripped from the plunger and falls through the opening 26 in the support 5.

In Fig. 5 is shown the form the blank assumes after the preliminary molding operation described. It will be noted that the sides and ends of the blank have flared slightly due to the natural tendency of the material to return more or less to its original position after the molding operation. The form which the blank was made to assume in the molds is indicated in this figure in dotted lines. The blank now has the form of a long narrow vessel with slightly flaring sides and a narrow rounded bottom and may for convenience be referred to as the vessel blank. The flaring of the sides of the blank after passing through the opening 6 in the table 2 prevents the blank from passing backwardly through the opening when the plunger returns and causes it to be stripped from the plunger.

The vessel blank may now be subjected to the final molding operations to be later described. It is preferred, however, to employ intermediate molding steps, as illustrated in Figs. 6, 7 and 8, these steps being particularly useful when the toe or heel portion, or both, are to be so molded that the ends project materially beyond the edge of the molded material. In Figs. 6 and 7 is shown apparatus designed particularly for the molding of the toe end of the blank. This comprises an outer mold 30 and an inner mold or plunger 32. The mold 30 has a slightly inclined side wall 34 which is engaged by the bottom of the toe portion of the blank and a bottom portion 36 which is inclined upwardly to form the overhanging end portion of the toe. The angle between

the faces 34 and 36 is less than that desired between the bottom and end portions of the toe so that the toe portion is overmolded to provide for a certain amount of return movement of the material toward its original form after it is removed from the mold. The side portions 38 of the plunger 32, Fig. 6, may be somewhat hollowed or relieved so that the upper molding strain will come at the point of the toe and more effectively produce the bulging desired at the toe next to the bottom portion. In effecting this toe molding operation one end corner of the vessel blank is placed over the opening in the mold 30 and the plunger 32 is brought down into the corner of the blank, forcing it into the mold. The molds are shaped to broaden the blank laterally while holding the periphery from expanding and to bulge out the material in the region adjacent to the sole portion properly to shape the toe portion of the blank. In Fig. 8 are shown similar molds 37, 39 for treating the heel portion of the blank. The action of these molds is much the same as that of the toe molds, but preferably they mold the heel with higher sides than the toe and with less projection adjacent to the sole. While it is preferable to employ specially designed molds for the toe and heel ends, respectively, fair results may be obtained by using the same molding means for both the toe and the heel, the final mold being relied upon, in that case, for giving the characteristic shapes to the toe and heel ends. Either or both parts of the molds may be heated, and an electrical heating means 35 is shown as applied to each of the outer molds 30, 37. Heating of the molds tends to prevent substantial return of the material from the position in which it is molded and overcomes any tendency of the material to crack or break during the molding operation.

Fig. 9 shows the blank after it has been operated upon by the molding means of Figs. 7 and 8 and has "gone back" slightly from the shape given it by the molds, which shape is shown in dotted lines.

The partially molded blank next passes to a molding machine equipped with the molds or dies shown in Figs. 10 and 11, comprising a solid last-shaped inner mold or male member 40, and a four-part female or outer member. The female mold comprises a bottom part 42 including also a heel end portion 43, a toe part 44 movable longitudinally of the mold, and two side parts 46, 48 movable laterally of the mold in the direction of the arrows by suitable pressure blocks 49. The side and toe end parts are held in place on the bottom member 42 by means of U-shaped straps 50 secured at 52 to the part 42.

The molded blank of Fig. 9 is placed on the male mold or inner die member 40 which is carried by suitable mechanism down into the female mold or die, the side parts 46, 48 are closed in at the sides by the pressure blocks 49 and the toe end part 44 is moved inwardly toward the heel by pressure acting at right angles to that of the pressure blocks 49 until the material is firmly pressed on all sides against the last or male member 40. Means may be provided for heating either the male mold, the female mold, or both, the part 42 being shown in Fig. 11 as provided with an electrical heating unit 56. The application of heat at this juncture acts to set the material in its molded shape so that it will not "go back" or tend to return materially to its former shape after removal from the mold.

The external mold is preferably provided with a bead 60 which forms in the outer face of the margin of the blank a groove 62, Fig. 12, located along the line where the stitching is to be done. To facilitate the sewing operation, whether it be done by hand or by machine, it is desirable to have the margin beyond the groove flared outwardly and to have the edge of the material trimmed away at a predetermined distance from the groove. In order to form a neat and tight joint between the edge of the molded part and the edge of the tip or other parts which are sewed to the molded part to form the completed shoe or moccasin, it is desirable that the edge be trimmed at an acute angle to the outer face of the flared marginal portion. An exemplary mechanism for performing the operations of flaring the margin and trimming the edge at the required distance from the groove and at the required angle is shown in Fig. 13. This mechanism comprises a rotatable wheel 70 having a rib 72 to engage the molded groove 62. A stationary knife 74 is arranged at a predetermined distance from the rib 72 and, as the work is passed under the wheel with the rib 72 engaging the groove 62, the edge is trimmed off by the knife 74 at a predetermined distance from the groove. Beneath the work is an inclined table 76, shown as rotatable, and having a roughened face to engage the work. Either the table 76 or the wheel 70 or both may be connected through suitable gearing with means for rotating them to effect feeding of the work, and the inclined table 76 acts upon the marginal portion of the work to bend it on the line of engagement of the rib 72 therewith to form an outward flare of the marginal portion relatively to the body portion of the work. The knife 74 is suitably arranged relatively to the table so that it trims the edge at an acute angle to the outer face of the flared portion.

The mechanism described is also adapted not only for flaring, trimming and beveling the tip and other parts to be sewed to the molded part but also for forming therein a

groove corresponding to the groove 62 described as formed in the mold by the bead 60. The tip and other upper parts of the shoe may be treated by the mechanism shown in Fig. 13, the table 76 forming a flare, the knife 74 trimming the edge at a bevel, and the rib 72 forming a groove at the proper distance from the edge being trimmed. If desired, the groove in the molded part may be formed by the rib 72 during the trimming operation instead of being previously formed in the mold by the bead 60.

A molded part and a tip, having been prepared for sewing by the means described or otherwise, are assembled upon a last and held thereon in any suitable manner, for example, by tacks partially driven, or by the hands only, and the parts to be united are presented to a sewing machine, as shown in Fig. 15, in such manner that the needle 80 will enter the groove in one part and emerge in the groove in the other part, the stitches, therefore, lying in the grooves in each part and acting when they are tightened to draw together the beveled edges of the flared margins to form a miter joint with the outer edges of the abutting edge faces substantially coincident. The sewing machine is provided with guides 82, 84, one of which enters the groove in the molded part and the other the groove in the tip piece or other upper part, the guides serving to position and hold the parts for the operation of the sewing mechanism and to guide the work as it is fed.

Having explained the nature of my invention and set forth fully how it may be practised, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. That improvement in the art of making shoes which comprises molding a substantially flat blank to produce a blank having smooth unwrinkled sides upstanding from the central portion, and then subjecting portions of the blank thus formed to molding pressure to cause them to assume the contour of the bottom and sides of a finished shoe part.

2. That improvement in the art of making shoes which comprises forcing a substantially flat blank through an opening of less area than the bottom of the shoe to produce a blank having substantially straight sides upstanding from the central portion, and subjecting the blank thus formed to a molding pressure to cause the sides to assume the contour of a finished shoe part.

3. That improvement in the art of making shoes which comprises confining the marginal portion of a substantially flat blank, effecting relative movement of the confined and the unconfined portions of the blank in a direction transverse to the plane of said confined portion to shape the blank with upturned sides, permitting the marginal portion of the blank to be withdrawn from its confined position by such relative movement and to assume an upturned relation to the central portion of the blank, and then molding the blank thus formed into final shape to form the bottom and sides of a shoe.

4. That improvement in the art of making shoes which comprises confining the marginal portion of a substantially flat blank, moving the unconfined portion of the blank in a direction transverse to the plane of said confined margin to shape the blank with upturned sides, permitting the marginal portion of the blank to be withdrawn from its confined position in response to the pull of the unconfined portion and to assume an upturned relation to the central portion, and then molding the blank thus formed into final shape to form the bottom and sides of a shoe.

5. That improvement in the art of making shoes which comprises confining the marginal portion of a blank, effecting relative movement of the confined and the unconfined portions of the blank in a direction transverse to the plane of said confined portion to shape the blank with upturned sides, opposing yielding resistance to withdrawal of the marginal portion of the blank from its confined position in response to the pull of the unconfined portion to cause portions of the blank to be stretched and the margin to be contracted as the margin assumes an upturned relation to the central portion of the blank, and then molding the blank thus formed into final shape to form the bottom and sides of a shoe.

6. That improvement in the art of making shoes which consists in preliminarily molding a blank of sheet material having characteristics of leather into a vessel shape with no reëntrant portions and having an edge periphery of a length substantially equal to that of the final shape of a shoe part which is to be formed, and then molding the vessel shaped blank into the final shape between dies having the desired contour of the finished shoe part.

7. That improvement in the art of making shoes which consists in preliminarily molding a blank of sheet material having characteristics of leather into a vessel shape having an edge periphery of a length substantially equal to that of the final shape of the shoe part which is to be formed, subjecting the end portions of the vessel shaped blank so formed to a molding operation to give these portions approximately the shape of the end portions of the shoe, and then molding the blank as a whole into final shape between dies having the desired contour of the sole and side portions of a shoe.

8. That improvement in the art of making shoes which consists in preparing a blank, forcing the blank through an opening of less area than the blank and narrower than the article to be formed from the blank, further molding the end portions of the blank to widen them and cause the material to project beyond the peripheral edge of the blank, and then molding the blank as a whole between dies having the shape of the finished article.

9. That improvement in the art of making shoes which consists in molding a blank into an elongated vessel, molding the end portions of the vessel approximately to the shape of the end portions of the finished shoe, and then molding the blank as a whole to the shape required for the finished shoe.

10. That improvement in the art of making shoes which consists in reducing the periphery of an oval blank while displacing material away from the peripheral edge, molding the end portions of the blank to correspond approximately to the respective shapes of the heel and toe ends of the finished shoe, and then molding the blank as a whole between male and female dies having the shape required by the finished shoe.

11. That improvement in the art of making shoes which consists in forcing a blank through an opening in a die by a plunger while holding the marginal portions of the blank against the entering face of the die in such manner as to cause the marginal portions to assume a position perpendicular to said entering face whereby a vessel blank of uniform cross-section is formed, and then further molding the blank so formed between dies having the shape of the finished shoe.

12. The method of making shoes which consists in molding a flat blank into an elongated vessel, no portion of the sides of which extends beyond the peripheral edge, then molding the end portions to form projections between the edge and bottom portions, and then shaping the blank as a whole into the form of the sole and side portions of a shoe.

13. The method of making shoes which consists in molding a flat blank into an elongated vessel, no portion of the sides of which extends beyond the peripheral edge and the bottom of which is of less area than that of the sole of the shoe to be formed, and then shaping the blank as a whole into the form of the sole and side portions of the shoe.

14. That improvement in the art of making shoes which consists in subjecting a blank to radial stretching in such manner as to cause a flow of material away from the peripheral margin and simultaneously contracting the periphery to compensate for such flow of material, whereby the peripheral length of the blank is reduced without the formation of wrinkles, and then subjecting the blank to a further shaping operation to form therefrom the bottom and sides of a shoe.

15. That improvement in the art of making shoes which comprises providing an oval blank, reducing the peripheral extent of the blank by forcing the blank by means of a plunger through an opening smaller than the area of the sole of the shoe to be formed while holding the portions of the blank not engaged by the plunger at right angles to the direction of movement of the plunger, and then molding the blank between dies having the shape required for the finished shoe.

16. That improvement in the art of making shoes which consists in subjecting a blank to a breaking down operation to reduce the peripheral extent of the blank without the formation of wrinkles, and then subjecting the blank thus formed, no part of which has its final form, to further shaping operations to produce a shoe part comprising sole, side and end portions of the contour of the finished shoe.

17. That improvement in the art of making shoes which consists in subjecting a blank to a breaking down operation to reduce the peripheral length of the blank without the formation of wrinkles, subjecting the blank to further shaping operations to produce a shoe part comprising sole and side portions of the contour of the finished shoe and having a groove adjacent to its edge, and then securing a tip piece to the margin of the forepart of the molded shoe part to form a moccasin by a seam located in the groove.

18. The method of making shoes which comprises molding a flat blank into a shoe part comprising sole, side and end portions of the shoe, forming a groove adjacent to the peripheral margin of the shoe part, trimming away the margin at a predetermined distance from the groove, and then sewing a tip piece to the margin of the forepart on a machine in which the work is guided by the groove and the stitches are located in the groove.

19. The method of making shoes which comprises molding a blank into a shoe part comprising the sole, side and end portions of a shoe, forming during the molding operation a groove extending around the peripheral margin of the shoe part, trimming away the margin at a predetermined distance from the groove by using the groove as a guide for the trimming operation, preparing a tip piece with a similar groove, and sewing the tip piece to the margin of the forepart while using the grooves as guides in sewing through from one groove to the other groove.

20. The method of making shoes which comprises molding a blank as a whole into

the shape of a vessel without allowing wrinkles to form in the margin, individually molding the ends of the vessel into the approximate shape of the toe and heel ends of the shoe, and then molding the blank as a whole into the final shape of the shoe part comprising sole, side and end portions.

21. The method of making shoes which comprises breaking down a flat blank into an elongated vessel blank having substantially vertical side and end walls, molding the end portions of the vessel to form extensions at the toe and heel portions with inwardly inclined walls, then molding the blank as a whole to the final shape of a shoe part comprising the sole, sides and ends, and then completing the shoe by securing a tip piece to the margin of the forepart of the blank.

22. The method of making shoes which comprises breaking down a flat blank into an elongated vessel blank having substantially vertical side and end walls which may react to flare outwardly, molding the end portions of the vessel to form extensions at the toe and heel portions with inwardly inclined walls, and then molding the blank as a whole to the final shape of a shoe part comprising the sole, sides and ends.

23. The method of making shoes which comprises subjecting a flat blank to pressure applied on one side only at the central portion, causing the portions adjacent to the central portion to be turned up in consequence of such application of pressure, holding the marginal portion of the blank yieldingly in its original flat condition while permitting such portion to be turned up progressively as the pressure is applied, and then molding the blank thus formed to the shape of a finished shoe part.

24. The method of making shoes which comprises subjecting a flat blank to pressure applied on one side only at its central portion, causing successive portions outside the area of pressure to assume positions substantially parallel to the direction of pressure as the pressure is applied, yieldingly restraining the marginal portion of the blank from movement in response to the pull from the central portion to cause portions of the blank to be stretched in the direction of the pull and the marginal portion to be contracted transversely of the direction of the pull, and then shaping the blank thus formed to the contour of a finished shoe part.

25. The method of making shoes which consists in subjecting a blank to a preliminary shaping operation including confinement of the margin of the blank to contract the peripheral margin of the blank to a length substantially equal to the length of the edge of the finished shoe part, shaping the blank over an inside former to give the final molded shape to the blank, and then securing another shoe part to the part thus formed to complete the shoe.

26. That improvement in the art of making shoes which comprises molding a flat blank to produce a blank with sides substantially vertically upstanding from the central portion and with a bottom of less area than the sole of the shoe to be formed, and subjecting portions of the blank thus formed to molding pressure to cause them to assume the shape of the sides and sole of a finished shoe.

27. That improvement in the art of making shoes which comprises softening a substantially flat blank by the application of moderate heat, forcing the blank thus softened through an opening of less area than the sole of the shoe to be formed to produce a blank having substantially straight sides upstanding from the central portion, and subjecting the blank thus formed while still warm and in a softened condition to molding pressure to cause the sides to assume the contour of the sides of a finished shoe.

28. That improvement in the art of making shoes which comprises confining the marginal portion of a substantially flat blank, effecting relative movement of the confined and the unconfined portions of the blank in a direction transverse to the plane of the confined portion to shape the blank with upturned sides, causing the marginal portion of the blank to be withdrawn while under the influence of moderate heat from its confined position by such relative movement and to assume an upturned relation to the central portion of the blank, and then molding the blank thus formed into final shape under the influence of increased heat to form the bottom and sides of a finished shoe and set them in final shape.

29. That improvement in the art of making shoes which comprises preliminarily molding a blank of sole leather into a vessel shape having an edge periphery of a length substantially equal to that of the finished shoe upper which is to be formed, subjecting the end portions of the vessel shaped blank so formed to a molding operation under the influence of heat to give these portions approximately the shape of the end portions of the shoe, and then molding the blank as a whole into final shape between dies having the contour of the sole and side portions of a shoe while subjecting the molded shoe to heat sufficient to set the shoe substantially in the shape to which it has been molded.

30. That improvement in the art of making shoes which comprises molding a blank and forcing the blank through an opening of less area than the blank and narrower than the article to be formed from the blank, and then molding the blank as a whole be-

tween heated dies having the shape of a finished shoe.

31. That improvement in the art of making shoes which comprises molding a flat blank of sole leather into a vessel shape no part of which has the form which it is finally to assume, and the periphery of which has been contracted without the formation of wrinkles, and then molding the vessel into the final shape between surfaces having the shape respectively of the interior and exterior of the sole and side portions of a shoe.

32. That improvement in the art of making shoes which comprises molding a flat blank of sole leather into a vessel shape, all portions of which differ in shape from the shape they are finally to assume, and then molding the vessel shaped blank into the shape of the sole and sides of a shoe.

33. That improvement in the art of making shoes which consists in molding a flat blank of sole leather into a vessel shape with smooth sides and bottom and having smaller cubic capacity than it is finally to have, and then subjecting the blank to molding operations to enlarge the vessel shaped blank to the size and shape of the sole and side portions of a shoe.

34. That improvement in the art of making shoes which consists in softening a blank of oiled sole leather by the application of heat, subjecting the blank while heated to a preliminary molding operation, and then remolding the blank to its final shape and size while subjecting the blank to a degree of heat adequate to set the leather in its final molded shape.

35. The improvement in the art of making shoes which comprises subjecting a substantially flat blank to moderate heat, forcing the blank through an opening of less area than the blank to produce a blank having substantially straight sides upstanding from the central portion, and subjecting the blank thus formed to molding pressure in the presenece of setting heat to cause the sides to assume the contour of the sides of a finished shoe and remain in molded position.

In testimony whereof I have signed my name to this specification.

JOHN J. HEYS.