

C. C. SMALL.
SOLE FOR BOOTS OR SHOES.
APPLICATION FILED NOV. 21, 1912.

1,061,415.

Patented May 13, 1913.
3 SHEETS—SHEET 1.

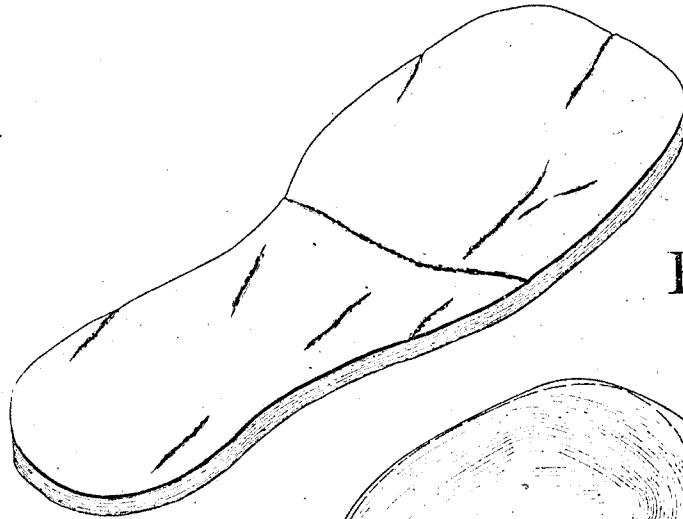


Fig. 1.

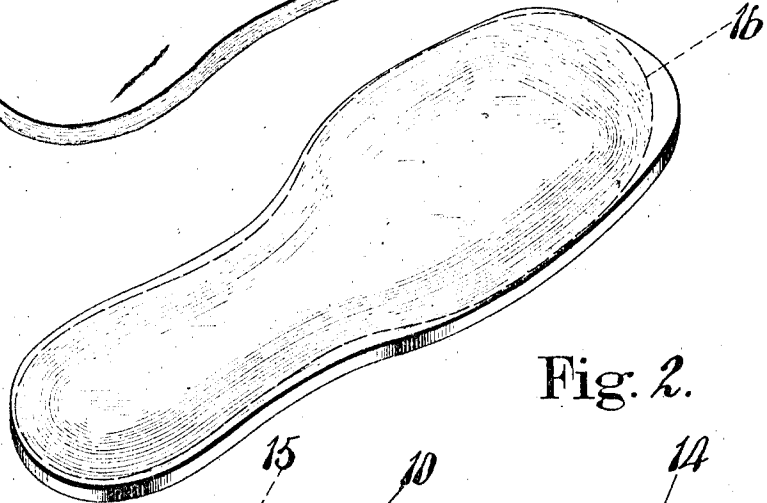


Fig. 2.

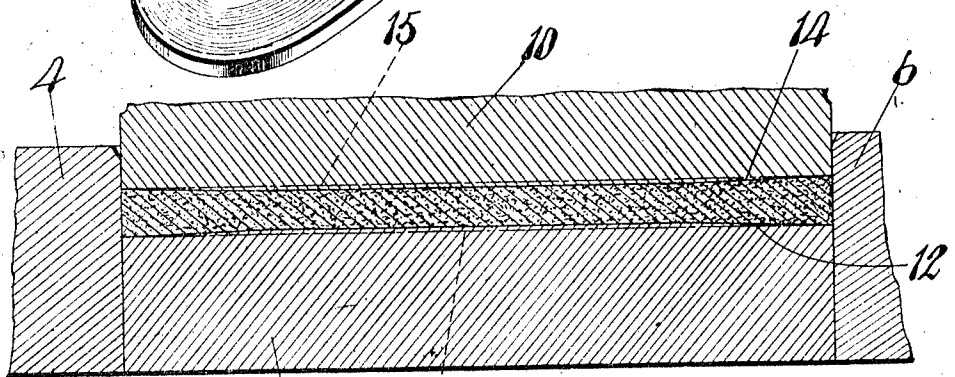


Fig. 4.

WITNESSES.

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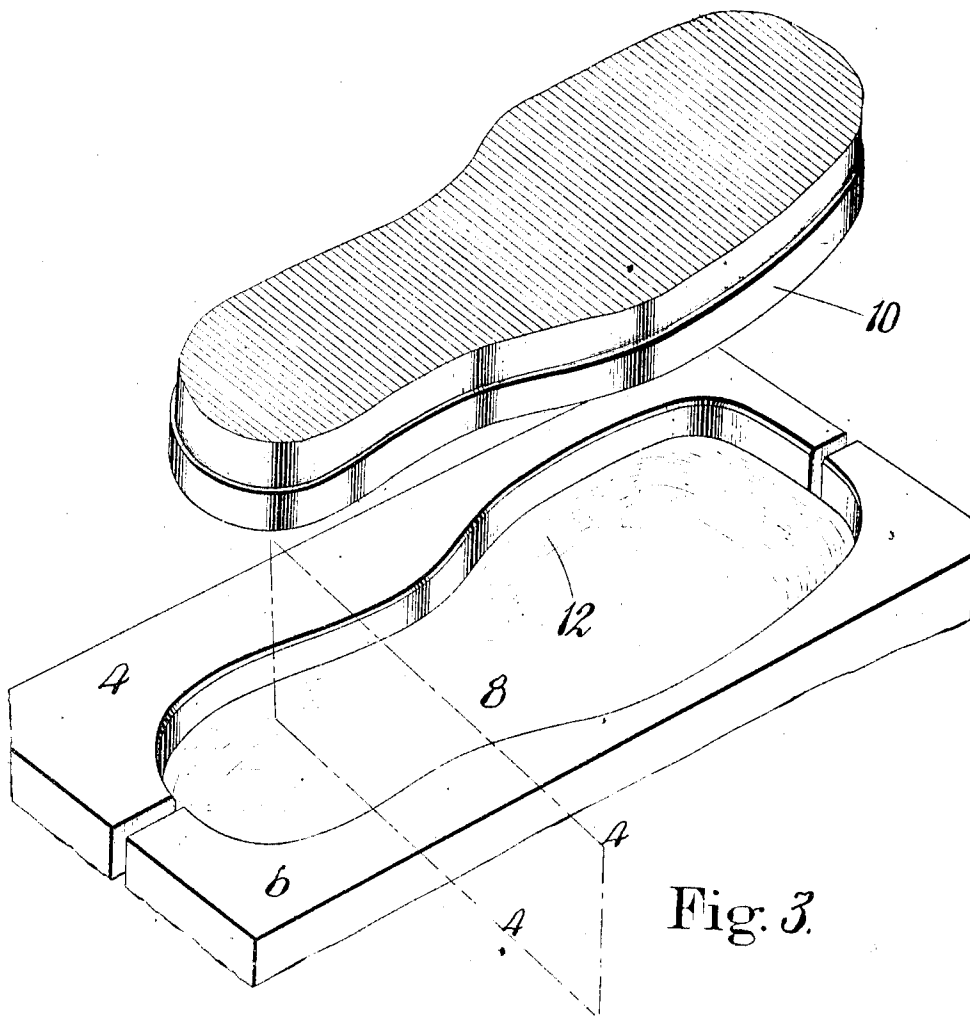


Fig. 3.

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3 SHEETS-SHEET 3.

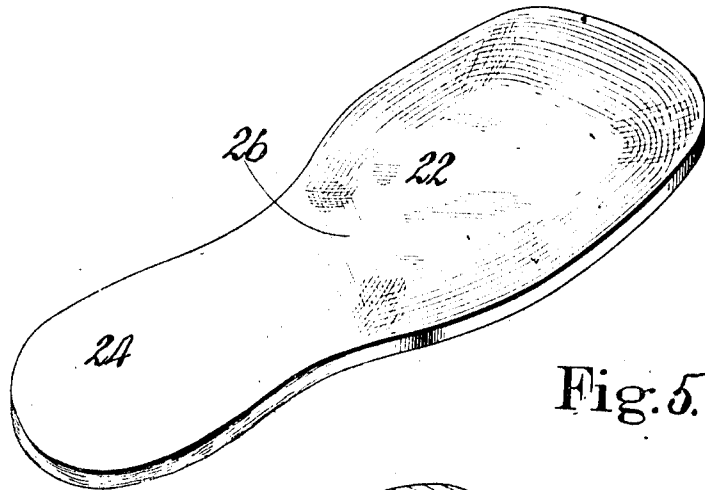


Fig. 5.

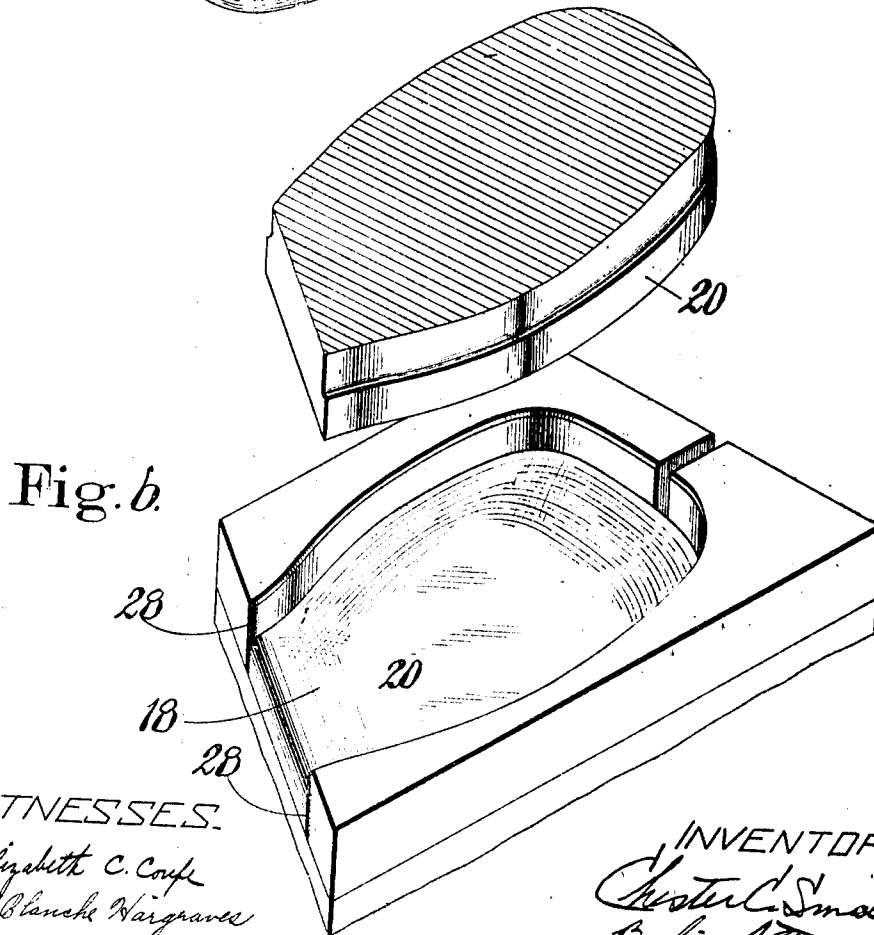


Fig. 6.

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SOLE FOR BOOTS OR SHOES.

1,061,415.

Specification of Letters Patent.

Patented May 13, 1913.

Application filed November 21, 1912. Serial No. 732,703.

To all whom it may concern:

Be it known that I, CHESTER C. SMALL, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented certain improvements in Soles for Boots or 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 soles, such as are used in the manufacture of boots and shoes.

The sole of a shoe is its most expensive part and the quality of the shoe as a whole and its satisfactory service to the wearer depend more upon the quality of the sole than that of any other part of the shoe. Shoe soles are made of leather of various grades, corresponding with the quality and price of the shoe. All sole leather, particularly of the poorer grades, is irregular in thickness and density, and frequently there are soft or thin spots in the middle of the forepart of a sole, where the greatest wear occurs, so that the sole wears through very quickly. The thin and spongy parts absorb water readily, and the surface is often so wrinkled or rough that the grain of the leather is very likely to be cut through when a sole including a portion of the wrinkled or rough surface is buffed to obliterate the irregularities. It also sometimes happens that the stitches or other fastenings used to attach the sole to the shoe pass through a soft spot in the sole, where they will not hold. There is also irregularity in the thickness of the edges of the sole, due to the variations in thickness which are found in every hide. This irregularity in the thickness of the sole edge makes the finishing of the edge difficult and is detrimental to the appearance of the shoe.

It has heretofore been known that sole leather for use in boots and shoes could be greatly improved by subjecting it to very great pressure. In the case of top lifts for heels, for example, it has been found that such pressure compresses and condenses the leather, forcing its fibers together and making it dense and hard, thereby adding substantially to its wear resisting qualities and increasing very much its capacity to resist the absorption of water. Prior to my invention, however, it has been impracticable

so to condense sole blanks inasmuch as such condensation would result in a product that would be commercially unsatisfactory because the thickness of the sole blank after condensation was the same throughout, the edge being reduced in thickness uniformly with the remainder of the blank.

The substantial and symmetrical appearance of a shoe depends to a large extent upon the thickness of the sole at its edges so that any sacrifice of thickness at the edges, such as is involved in the compression of articles of sole leather as heretofore practised, is not permissible. So conspicuously important is this matter of the thickness of the sole edges that it has always been the practice to gage soles of a given quality and to determine their commercial value entirely by the thickness of the edges in the forepart. This thickness of the edges is measured in "irons"; a difference in thickness of one "iron," i. e., $\frac{1}{16}$ of an inch, between two soles of medium size and quality, represents a difference in market value of from three to four cents a pair.

I have discovered that a sole blank may be produced which will possess the advantages imparted by compression under great pressure, while at the same time there is no substantial reduction in the thickness of the edges of the blank. I have accomplished this by exerting very great pressure upon the interior portion of the blank, where the wear is greatest and where alone great compression is of primary consequence, and less pressure on the marginal portion for a short distance from the edges, so that there will be at the marginal portion sufficient condensation for all practical purposes and a symmetrical, uniform edge of substantially the same thickness as that of the edge before compression. In this way an extremely satisfactory result is attained. All that portion of the sole blank where great compression and consequent solidification are especially important, namely, all except the narrow marginal portion, is compressed and solidified to the requisite degree while the marginal portion, where extreme compression and solidification are not important, is sufficiently compressed and solidified without any substantial reduction in the thickness of the edge which, however, is made of uniform thickness and more uniform in character than before compression. Pref-

erably the thickness of the marginal portion will increase gradually from its inner boundary to its outer edge. I also prefer so to form the blank that the faces of the interior and the marginal portions shall be practically continuous, smooth and unbroken by any substantial changes in direction, so that neither the utility nor the appearance of the sole shall be impaired.

A sole blank uniformly and powerfully compressed and solidified except for a narrow margin near the edges and with less and less compression and solidification from the portion of uniform, heavy compression to the edges, where the compression and compacting are not sufficient substantially to reduce the thickness of the edge, is the preferred form of my invention. It is obvious, however, that a sole blank compressed as aforesaid in one section only as, for instance, in the forepart, would involve the principle of my invention.

The compression and formation of the sole are preferably effected by suitably formed dies and I have illustrated in the accompanying drawings and described in the following specification specific forms of dies which are suitable for this purpose.

The method which is practised in producing my improved sole is not herein claimed but will be made the subject-matter of a separate application for Letters Patent of the United States.

In the drawings: Figure 1 is a perspective view of an uncompressed sole cut from a poor grade of leather; Fig. 2 is a perspective view of a sole after it has been compressed and formed; Fig. 3 is a perspective view of a compressing mold; Fig. 4 is a transverse section of the mold with a sole in it, shown on a scale four times that of the remaining figures. The section is taken in the plane 4-4 of Fig. 3, the narrow portion of the mold being selected to permit the enlargement. Fig. 5 is a view similar to Fig. 2, showing a modified form of the invention; and Fig. 6 is a perspective view of a mold suitable for producing the sole shown in Fig. 5.

In producing the sole of my invention it is my practice first to prepare sole blanks by sprinkling them with water and then piling them up and allowing them to stand for some hours, preferably over night, in order that they may be in proper temper for compression. Preferably the compression is effected by suitably formed dies in a very strong and powerful compressing machine and dies which may be used for this purpose are shown in Figs. 3 and 4, in which the numerals 4 and 6 indicate a pair of edge dies which are arranged for movement toward and from a lower die 8 upon which the sole blank is placed. I have found it practicable to cut the sole blank around the fore-

part slightly larger than the edge dies when closed, this excess of size being approximately $\frac{1}{2}$ of an inch around the forepart, making a total excess in width of $\frac{1}{8}$ of an inch. The excess may be reduced along the shank, to nothing at the wide part of the heel seat. After the edge dies 4, 6 have been moved toward each other from the position shown in Fig. 3, relative movement between the dies 4, 6 and 8 and an upper die 10 is effected and the sole is thereby subjected to heavy pressure. The broken lines 15, 15 in Fig. 4 show the position of the faces of the blank before compression. The faces of the dies 8 and 10 are beveled at their margins, as shown at 12, 14, the beveled faces being merged into the flat faces of the interior portions. In the dies from which the drawings were made these beveled portions were of substantial width, varying from a minimum of $\frac{1}{8}$ of an inch to a maximum of $1\frac{1}{2}$ inches, this variation being for reasons hereinafter explained. The depth of the bevel at the extreme edge, measured from the plane of the flat interior portion, was approximately .012 of an inch in each face die, so that, when the face dies were in their pressure applying positions, the edges were approximately .024 of an inch farther apart than the flat interior portions. In the use of such dies to produce the best embodiment of my invention now known to me very great pressure is imparted through them to the sole blank. The machine in which I have used these dies was especially constructed for the purpose and is by far the most powerful compressing machine ever used in the manufacture of shoes or their parts. It is of sufficient strength to impart a pressure of 500 tons to the sole. The amount of pressure required to produce the sole of my invention will vary considerably according to the quality of the leather and the hardness of the stock.

In order to impart all the advantages herein discussed the pressure should be sufficient to render the interior portion of the sole very hard and dense, to make the marginal portion firm and to impart a smooth hard surface to the entire grain side of the sole. The thickness of the edges will be approximately the same as that of the edges of the original blank and the interior portion will be reduced substantially in thickness, although the recovery, due to the elasticity of the leather, after the pressure is released is greater in the heavily compressed interior than in the margin so that there will not be as great difference between the thickness of the interior portion and the thickness of the edges as might be expected from the dimensions of the molds. An operator of the compressing machine quickly learns to determine from the appearance of the compressed blank and from the action of

the machine whether sufficient pressure is being applied and the machine is provided with a convenient device for varying the pressure which enables him to regulate it until the desired amount of pressure is being exerted. The result of this operation is a sole blank which is thoroughly compressed and condensed in its interior portion while its edges, owing to the beveled formation of the edges of the face dies, are compressed to a less degree and are substantially as thick as were the edges of the blank before the compressing operation. Thus the portion of sole which receives most of the wear is rendered dense and hard while the edges are of substantially the same thickness as they were before compression. The surface of the flat interior portion of each face of the sole merges into the surface of the marginal portion so that the two surfaces are practically continuous, smooth and unbroken by any substantial changes in direction, the outward flare of the sole is not noticeable and any appearance of distortion of the sole is prevented. The securing of this effect, while at the same time retaining the requisite thickness in the edge portion of the blank, is materially helped by forming the bevel upon both sides of the sole. If the bevel were all on one side of the blank the natural tendency to warp might be aggravated to an objectionable extent; also the forming of the bevel on both sides of the sole secures the additional advantage that both right and left soles may be compressed in the same mold. While, as above stated, the marginal portion, owing to the bevels formed on the face dies, is compressed to a less extent and is therefore less dense than the interior portion of the sole, it should be understood that in the preferred embodiment of the invention this portion of the sole receives enough compression to improve it substantially in many respects. It is made harder and smooth and the edges are substantially uniform in thickness, the objectionable irregularities in thickness having disappeared during the compressing operation. Variations in thickness at different points in a sole edge become very noticeable after the edge is trimmed and finished. After the sole is attached to the shoe, it is the practice to trim the edge of the sole by a rotary cutter so formed as to bevel the corner at the junction of the edge face of the sole and its tread face. This beveled corner and the edge face of the sole are blackened or stained and given a high finish by an edge setting iron having the same form as the trimming cutter. When looking at the shoe from the bottom the beveled corner appears as a narrow bright line around the edge of the sole. When the edge of the sole is uniform in thickness the width of the bevel formed by the trimming cutter and

finished by the edge setter will also be uniform but if the thickness of the sole edge varies, the width of the bevel will vary to the same extent and the appearance of the shoe will be greatly impaired.

Other advantages of a sole embodying my invention are that, while the marginal portion is not hardened to such an extent as to prevent the needle penetrating the sole readily during the stitching of the sole to the shoe, it is nevertheless sufficiently compressed and hardened to increase its resistance to the pull of thread used in attaching the sole to the insole or the welt of a shoe, both in the attaching operation and in subsequent wear of the shoe. This increased resistance to cutting through of the stock by the thread is particularly noticeable in portions of the stock which, before compression of the sole, were too soft to afford any substantial resistance to the thread. In the operation of attaching soles of the poorer grades on the McKay sewing machine it has been a frequent experience that the thread would cut entirely through the sole with the result that the machine would have to be stopped, the sole torn off and thrown away and the attaching operation begun over again with a new sole.

A further important advantage of a condensed sole embodying my invention is that by condensation its resistance to the absorption of water is greatly increased. In the tempering operation preliminary to rounding and channeling it may be rendered soft enough for those operations without losing to any material extent the beneficial effects of the compressing operation. The putting of the sole in proper temper without losing the advantages imparted by the compressing operation is facilitated by the fact that the marginal portions which are to be operated upon by the rounding and channeling machines are less dense than the interior portion and will therefore absorb water much faster than the interior portion.

It is a common practice to cut with a single die a sole blank of a given size from which in the subsequent rounding operation soles of a considerable variety of shapes will be formed. For this reason it is desirable that the thicker marginal portion of the blank shall be of substantial width so that all the lines on which the various shapes of soles are cut shall be within this thicker edge. It is preferable that the marginal portion shall be wider at the point or points where the greatest variation in these shapes is likely to occur. This is usually at the toe and in the embodiment of the invention herein illustrated the maximum width of the bevel is shown at the toe, where it is at least 1½ inches wide. In Fig. 2, showing a sole blank embodying my invention, the broken line 16 indicates the outline of a sole

which may be cut from the blank on the sole rounding machine and it will be observed that this line lies within the thickened marginal portion all the way around the forepart.

Since the shank of the sole of a shoe receives practically no wear and since the thickness of the edge of the sole in the shank is not important and is, in fact, usually reduced in the making of the shoe, it may be preferred in some cases to compress the forepart only without applying pressure to the shank or heel portions. A sole possessing the characteristics above discussed in the forepart only constitutes one embodiment of my invention, and is illustrated in Fig. 5. However, when a sole has its forepart only compressed it is important that the sole should not be marred by a line or ridge in the region between the compressed and the uncompressed portions. While this would be especially objectionable on the faces of the sole, and particularly on the grain face, it would also be undesirable to have such a mark upon the edges of the sole. Accordingly a feature of this embodiment of the invention is the gradual merging of the uncompressed and compressed surfaces. A mold for producing a sole having its forepart, only, condensed is shown in Fig. 6.

Referring to Figs. 5 and 6, the sole illustrated has the same characteristics in its forepart as the sole shown in Fig. 2, but a bevel 18 is formed upon each face die 20, 20 at its rear end. This causes the surface of the flat interior portion 22 of the forepart of the sole to be connected to the surface of the uncompressed rear end 24 of the sole by a beveled portion 26 which merges gradually into both of the said surfaces. The rear corners of the edge dies are also rounded at 28, 28 to prevent the formation of marks upon the edges of the sole. Marring of the sole by the formation of lines or ridges in the region between the compressed and uncompressed portions is thus avoided, while the improvement due to compression is secured in that part of the sole where it is most needed.

While the invention has been described as embodied in a sole blank which is to be shaped subsequently by the rounding operation to give it the contour desired for the shoe of which it is to form a part, the invention is of course not limited to a sole blank which is compressed before the rounding operation. Furthermore, it should be understood that the invention may advantageously be embodied in what is variously termed a "tap", "slip sole" or "half sole". The terms "sole" and "sole blank", as used in the specification and claims, should be construed accordingly.

Having described my invention, what I

claim as new and desire to secure by Letters Patent of the United States is:—

1. As a new article of manufacture, a sole for boots or shoes having the interior wear resisting portion of its forepart compressed and condensed, and having that part of the sole between said interior portion and the edge of the forepart compressed to a less extent and thicker than the interior portion.

2. As a new article of manufacture, a compressed sole having its faces smooth and unbroken by any substantial changes in direction, and having edges of a substantially uniform thickness greater than that of the interior portion of the sole.

3. As a new article of manufacture, a sole thinner in its interior than at its edges and having both faces flaring from the interior toward the edges.

4. As a new article of manufacture, a sole blank for boots or shoes having a compressed interior portion and a thicker marginal portion, the opposite faces of the marginal portion being shaped to form with the respective faces of the interior portion substantially smooth surfaces.

5. As a new article of manufacture, a sole for boots or shoes having the interior wear receiving portion of its forepart compressed and condensed, having the marginal portion compressed to a less extent and thicker than the interior portion and having the opposite faces of the marginal portion shaped to form with the respective faces of the interior portion substantially smooth surfaces.

6. As a new article of manufacture, a sole for boots or shoes having its interior wear receiving portion compressed and having the surrounding marginal portion compressed to a less extent and formed with its opposite faces flaring from the faces of said interior portion.

7. As a new article of manufacture, a sole for boots or shoes having its forepart, only, compressed and having the opposite faces of the compressed forepart forming with the respective faces of the rest of the sole substantially smooth and continuous surfaces.

8. As a new article of manufacture, a sole for boots or shoes having the interior wear receiving portion of its forepart compressed and condensed, having the marginal portion compressed to a less extent and thicker than the interior portion, and having the grain face of the compressed interior portion of the forepart merging gradually into the grain face of the uncompressed shank portion of the sole.

9. As a new article of manufacture, a sole for boots or shoes having the interior wear resisting portion of its forepart compressed and condensed, and having the marginal

portion thicker than the interior and compressed to a less extent, the thickness of the margin increasing gradually from its inner boundary to its outer boundary.

5 10. As a new article of manufacture, a compressed sole blank for boots or shoes having the marginal portion of its forepart thicker than the interior portion, and having the opposite faces of the marginal portion shaped to form with the respective
10 faces of the interior portion substantially smooth surfaces, said thicker marginal portion being of substantial width to provide an edge for the sole thicker than the interior after the rounding operation.
15

11. As a new article of manufacture, a sole blank for boots or shoes having the marginal portion of its forepart thicker than the interior portion, and having the
20 opposite faces of the marginal portion shaped to form with the respective faces of the interior portion substantially smooth surfaces, said thicker marginal portion being of substantial width all around the fore-
25 part to provide an edge for the sole thicker than the interior after the rounding operation and being of greater width in the region of the greatest variation in the width of the stock removed in the rounding operation.
30

12. As a new article of manufacture, a compressed sole blank for boots or shoes having

the marginal portion of its forepart thicker than the interior portion, and having the opposite faces of the marginal portion shaped to form with the respective faces of
35 the interior portion substantially smooth surfaces, said thicker marginal portion being of substantial width all around the forepart and of greater width in the region adjacent to the toe to provide an edge for the
40 sole thicker than the interior after the rounding operation.

13. As a new article of manufacture, a sole blank for boots or shoes having the interior wear resisting portion of its fore-
45 part compressed and condensed, and having the entire marginal portion of the forepart, between said interior portion and the edge of the sole, compressed to a less extent and thicker than the interior portion, said
50 thicker marginal portion being of substantial width to provide an edge for the sole thicker than the interior after the rounding operation.

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

CHESTER C. SMALL.

Witnesses:

JAMES O. WRIGHT,
FREDERICK L. EDMANDS.