This invention relates to infants' and youths' footwear, and more particularly to an inner sole for shoes, sneakers, and the like capable of being built therein as a complete but in its more restricted sense, adapted to be inserted into the shoe or other article of footwear as a complete preformed article, for the purpose of correcting the stance of the wearer and thus properly support the foot.

By reason of the tendency of an infant to pitch its feet inwardly at the heel, and also due to the tendency of the arch breaking down because of an infant prematurely bearing its weight while taking its first steps, corrective measures must be resorted to in order to assure a proper posture for the child and thereby avoid the tendency of having the knees come in contact with each other and at the same time weaken the arch.

It is the primary object of my invention to provide an insole for a shoe or the like which will tend to correct such improper stance by pitching the heel portion of the foot outwardly, and at the same time forcing up the arch of the foot; the insole so provided preferably being preformed to conform to the interior of the shoe in which it is to be used and having foot-contact surfaces differing from that of the intended foot-contact surfaces of the shoe so as to correct the stance of the user.

Another object of my invention is to provide a corrective inner sole for infants or children to take care of weakened flat-foot conditions, or such tendencies from infancy onward, characterized by its having an upstanding flange or wall starting immediately at the extreme rear of the heel and rising instantly from such point to a considerable and effective height; said wall being interiorly so formed that the heel of the wearer will be pitched or rolled outwardly.

A further object is to construct an inner sole by forming the outer or lower surface thereof in conformity with the last over which the shoe is made and into the structure of which latter the inner sole is to be incorporated or into which it is to be inserted. I utilize such last to form the female member of a mold, in association with a corrective last of a form which will establish an altered and corrected inner or upper surface for the inner sole capable of lifting the heel outwardly and lifting the arch of the foot so as to enable the child to step properly with a corrected stance for the foot and leg. I also utilize said corrective last as the male member of the mold, which is spaced from portions of the female member to form the inner sole therebetween so that the outer or lower side of the inner sole will conform exactly to the outline, curvature, undulations, etc., of the sole proper of the shoe, while the inner or upper surface will be in exact conformity with the corrective last used as the male member of the mold; thus providing a corrected support for the foot which will have foot-contact surfaces preformed to properly support the weight of the wearer, position the bones of the foot to hold the legs straight, lift the arch, and tilt the rear portion of the foot outwardly.

It is a further object of my invention to provide an inner sole which is preferably made in-sertible into a shoe, sneaker, or the like, and which is fashioned to form individually for each size of foot and in thickness according to the weight of the user.

It is a still further object of my invention to provide an inner sole made of felt or other material having sufficient rigidity to properly support the foot, yet yield under force or pressure, and which is so formed that it will place the foot and maintain the same in a corrected or over-correction position so as to help a child outward is flat-foot tendencies; this being accomplished by so forming the inner sole that it provides a solid foundation for the foot, and at the same time sustains the arch while tilting the rear portion or heel of the foot outwardly, yet retaining the fore part of the foot in normal position, thereby avoiding wobbling and the consequent uncertainty in the child's footsteps.

It has been found that up to the present time no corrective has been provided to put into or form part of a shoe with a view of helping a child grow out of its weak-foot tendencies, and with this in view I preferably form or preform the inner sole by taking a wood last of standard shape or form, such as for instance the shoe of an infant or child has been made to conform to, and remove part of its heel at the inner side and at the rear thereof adjacent the inner side and also at the inner side at the arch region, with a view of rounding the normal last at the heel portion and providing a deeper depression in the last at the arch portion. When this corrected last is utilized as the male member of a mold, the inner sole will have its inner or upper surface so varied from that of the normal inner sole of the shoe which it was intended the child was to wear, or which the child has worn, that the heel of the child will be tilted outwardly and this posture of the foot be maintained when the child takes a step, although the tendency is to tilt the heel inwardly.
It will of course be understood that the cut-away portions of the corrective last will form the humps or convexities, slight, and prominent, on the inner or upper surface of the insole, and that these corrections are, in conjunction with other corrective formations to be hereinafter referred to, depended upon to correct the foot posture of the user; also, that these humps or convexities so formed create certain transverse and longitudinal concavities which serve in conjunction with said humps or convexities to form a solid foundation for the foot, overcoming the tendency of flattening out the foot when bending the same during the act of walking. So constructed, the inner sole properly supports the foot from its rear end to a point slightly in rear of the ball of the foot.

It is therefore a further object of my invention to form an inner sole with undulations on its upper or inner side which will not only tilt the rear of the foot outwardly, but allow the fore part of the foot to assume its natural position without strain. A still further object of my invention is to provide an inner sole for shoes or the like in which, while causing the heel portion of a foot to be tilted outwardly and the arch thereof to be lifted, nothing of the foot outwardly is caused along the fore part of the foot which would tend to place the weight of the body on the outer portion of the sole and thus cause callouses.

It is a still further object of my invention to provide an upstanding flange at the inner side of the inner sole which is slanted inwardly along the heel portion of the sole to assure the desired outward tilting of the heel of the foot. With these and other objects in view to appear hereinafter, my invention consists in the novel features of construction and in the arrangement and combination of co-related parts and varied foot regions as hereinafter described and more particularly pointed out in the subjoined claims.

Fig. 1 is a top plan view of an inner sole constructed in accordance with my invention and capable of being embodied in the construction of a shoe or the like, or adapted for insertion thereinto.

Fig. 2 is an inner side view of my improved inner sole.

Fig. 3 is a bottom view of the same.

Fig. 4 is a longitudinal section taken on or about line 4—4, Fig. 1, looking in the direction of the arrow crossing said line.

Figs. 5, 6, 7, and 8 are transverse sections taken on lines 5—5, 6—6, 7—7, and 8—8, Fig. 1, respectively, looking in the direction of the arrows crossing said lines.

Fig. 9 is a longitudinal section taken on line 9—9, Fig. 1, looking in the direction of the arrow crossing said line.

Fig. 10 is an inverted perspective view of the mold member of a mold or means of which my improved inner sole is formed to shape.

Fig. 11 is a perspective view of the female member of the mold.

Fig. 12 is a transverse section through the mold, showing in section my improved inner sole molded or pressed to form therein.

Fig. 13 is an end view of the male member of the mold, viewing the same from the heel portion thereof.

The inner sole, considered as a whole, is designated by the numeral 15, and it comprises a body portion 16 having what may be termed an outer or lower side 17 and an inner or upper side 18.

Along the inner edge of this body portion an upstanding flange or wall 19 is formed which extends from a point forward of the arch portion of the sole to a point at the rear edge of the heel portion of the latter. The portion 20 of this upstanding flange merges into the outer or lower side 17 of the body portion 15, while the inner surface 21 of said flange merges into the inner or upper side thereof. Therefore, in constructing the appended claims, the term "outer or lower side," when referring to the inner sole, is intended to include the outer side or surface of said flange; and when construing the term "inner or upper side" of said sole, it is intended to include the inner side or surface of said flange, unless the body portion is particularly referred to.

In forming the outer or lower side of this inner sole, I preferably employ a mold 22 which comprises a female mold member 23 in which the cavity 24 therein conforms exactly to the last over which the shoe adapted to receive my improved inner sole is or was formed, with the exception that in this cavity I form an inwardly projecting portion 25 which covers the area extending over the arch portion 26 of the mold and a portion of the side thereof adjacent the arch portion. I then employ a corrective last 27 which serves as part of the male member 28 of the mold. The portion 29 of said last serves as the insertion part of the mold and is designed to enter the cavity 24 of the female member with space between the two to conform to the thickness and undulations of the inner sole at its various regions. This space is provided between the corrective last properly in the body portion of the male member 28 of the mold, and it is to be noted that for convenience of inserting and removing the corrective last into the cavity 24 of the female member, the said last is inclined transversely to the inner surface of the body portion of the male member.

The inner sole is formed by placing the felt in the cavity of the female member, in layers or otherwise, so as to build up certain regions to a greater thickness than others with a view of compressing the material to approximately the same density, even though the thickness of the inner sole varies at different regions, and this will be easily determined by a little practice. The felt is combined with any suitable binder so that when compressed it will retain its shape. As this forms no part of my invention, it is to be understood that the inner sole may be formed in any other approved manner or of any other suitable material.

The inner sole of a normal shoe is usually comparatively flat transversely at the heel and sole portion, with a slight upward curve where it meets the upper of the shoe and a slight rise or elevation at the arch, at which point it again has a slight curve downwardly to merge into the sole portion, which latter is slightly concave longitudinally. The outer or under side of my improved inner sole is therefore reversely formed so that it bears at all points against the upper surface of the bottom or normal sole of the shoe, and the upstanding flange or wall 13 is externally formed to conform to the inner surface of the upper at the inner side of the shoe; the exterior surface of this flange or wall merging into the outer or under surface of the region of the body portion transversely in allinement therewith.

It may here be stated that the exact formation of the interior of the shoe may be ascertained in any of various ways, although I prefer
to be governed by the last over which the shoe was formed to shape.

The flange or wall 19 of the inner sole is provided exteriorly with a recess 29 formed by the inwardly-projecting portion 25 of the mold, and in this recess a plastic or other semi-flexible reinforcement 33 is fitted which retains said flange or wall 19 in its proper relation to the inner or upper surface of the body portion of the inner sole. As clearly shown in Fig. 5, this flange or wall leans outwardly slightly over the upper surface of the body portion of the inner sole when the latter is given full bearing against the upper surface of the normal or true bottom of a shoe, and this outward inclination, taken in connection with a concaved elevated portion 31 extending along the lower region of the flange or wall, tends to tilt or roll the foot of the wearer outwardly, particularly at the heel portion thereof. This concaved elevated portion 31 extends from the rear end of the inner sole along the base of the flange or wall to a point in the fore part of the sole directly in rear of the ball of the foot, and from the heel portion it gradually rises upwardly, as at 32, so that considerable pitch inwardly occurs immediately forward of the extreme rear heel-center and this pitch is continued forward along the flange under a gradually rising longitudinal convexity 33. Near the front end of the flange or wall this pitch drops down, as at 34, to the normal level of the sole portion of this inner sole.

While this elevated or thickened portion of the sole is concaved from the inner side of the flange or wall 19 and gradually merges into the upper surface of the body portion at a point approximately central of the width of the inner sole, there is a component elevation 35 which extends diagonally from the front end of the elevated portion 31, and this component elevation merges into the normal surface of the body portion at a region closer to the outer edge of the sole than the inner edge thereof, forming a somewhat decided depression 36 adjacent the inner edge of the sole forward of said elevated portion 31.

The major part of the elevated portion 31 serves as the arch of the foot, and the transverse concavity formed by curving the inner side of the upstanding flange or wall so as to merge into the upper surface of the body portion of the inner sole, acts as a wedge or lever against the inner side of the rear portion of the foot, and particularly against the inner side of the rear portion of the os-calis of the foot so as to tilt the foot outwardly and thus correct the foot posture of the child or other person in whose shoe the inner sole is applied. The component or diagonal elevation 35 continued from the fore part of the elevated region 31, acts against the metatarsal arch of the foot, tending to keep the forward part of the foot balanced while the upstanding flange or wall 19 by reason of its immediate and pronounced rise from the extreme rear end of the insert acts wedge-like or lever-like against the rear portion of the os-calis so as to force the heel portion outwardly, especially when aided by the concaved elevated portion 31 at its rear end. By so forming the inner or upper surface of the inner sole, a transversely flat region 37 is provided across the major portion of the inner sole which merges into slightly concaved elevated portions 37' at the sides and may therefore be said to create a slightly cupped heel portion to receive the fleshy heel portion of the foot.

The formation of the inner sole thus described tends to not only raise the arch of the foot so as to overcome flat-foot tendencies, but the heel portion of the foot is also properly supported and the heel bone given proper setting. At the same time, the obliquely-disposed component elevation 35 supporting the metatarsal arch of the foot coats under the weight of the wearer to provide a proper footing for the user without straining the nerves, muscles, and bones of the foot.

As it is well known to those skilled in the art to which this invention relates, the os-calis is the strongest bone in the tarsal group and in the foot itself, and it also extends rearwardly and downwardly farther than any other bone of the foot structure. It is therefore ideally adapted for weight-bearing. The os-calis, or calcaneum as it is also termed, is irregularly cuboidal in form, having its long axis directed forward and outward. In connection with this invention we are interested in its internal and inferior or lower surfaces, especially due to the importance of the rear portion of the upstanding wall 19 and because of the fact that the internal surface of the os-calis is deeply concave. And by reason of such surface being directly obliquely downward and forward so as to create a sort of depression on the inner-side of this bone structure which serves for the transmission of the plantar vessels and nerves to the sole of the foot. At the upper and fore-part this bone presents an eminence known as the sustentaculum tall, and under this eminence, or projection as it may be termed, is a groove through which passes the tendon of the flexor longus hallucis. This eminence or projection is, however, too far from the bottom of the foot and too distant from the rear of the heel toward pressure without affecting the weight carrying qualities of the os-calis. In any event, pressure at this point in an outward direction would tend to lift the rear heel portion bodily for its support provided by the inner lining of the shoe, especially since the inferior or under surface of the os-calis is narrow, rough, uneven and wider at the rear than at the front. Consequently the leverage applied by an upstanding wall at the inner-side of a foot would be most effective if applied at the said side and rearmost portion of the os-calis, as provided for in this invention.

Immediately upon contact with the ground, the heel is rolled outwardly, producing a high arch effect which is not filled in by the arch portion of the shoe insole, but is held by the tilt of the upstanding wall and not by any action from underneath the arch itself. The forward portion of the wall or flange merely follows the foot outwardly and this allows the bones of the forepart of the foot and the metatarsal heads to retain their normal positions.

At this point it may be stated that the forward portion of the wall or flange does not exert pressure against the foot. This portion of the wall or flange merely conforms to the shape of the foot and is moved outwardly by reason of its being formed integrally with the rear portion of the wall or flange. Solely to establish a feeling of snugness. Therefore, this forward portion of the wall or flange functions solely under action of the rear portion and has no effect in tilting the foot outwardly, nor could it tilt the foot outwardly because of its location opposite a fleshy-padded portion of the heel, as herebefore inferred. To make this more apparent, the groove or depres-
sion formed on the innerside of the os-calis, through which the plantar vessels and nerves leading to the sole of the foot are passed, is forward of the prominence or bone protuberance at the extreme rear of the os-calis. Therefore, any attempt to exert pressure solely against this flesh-padded region with a view of tiring or rolling the heel of the foot outward would result in failure. Such pressure as would be required to tilt or roll the heel outward, if applied to such region, would first have to compress the fleshy covering over the groove or depression at the innerside of the os-calis that the force applied to the vessels and nerves in this groove or depression would become painful and unbearable, and no assurance could be had that the heel would be forced outward, as this would depend to a certain extent on the formation of the bone structure, which varies considerably in different persons. This region also presents a flesh-covered or padded portion of the foot in which are located functioning body-elements not intended to be subjected to pressure.

In my invention, therefore, pressure is applied to the prominence or protuberance at the extreme rear of the os-calis, which exists in all cases and, whether small or pronounced, serves to tilt or roll the heel outwardly when pressure is applied thereto without in any manner strain- ing vital functioning parts of the foot structure. Applicant therefore wishes to stress the point that the wall or flange, although extending over the groove or depression at the inner side of the os-calis and forward of the prominence or protuberance at the extreme rear portion thereof, serves merely at that portion to hug the heel for snugness and to provide a connection between the rearmost or rolling-portion of the wall or flange and the more advanced portion of the insole, serving more particularly as a follow-up portion which bears gently against the arch of the foot to furnish a snug feeling against the latter, regardless of the position it may be in.

It will, therefore, be understood that the rolling effect on the heel would be assured without extending the flange or wall forwardly against the innerside of the foot, but a certain looseness of feeling would result from such a structure. For this reason a forward portion of this flange or wall is controlled solely by the rear portion, the latter being the effective heel-rolling medium which is followed in action to provide the snugness of feeling against the foot so desirable in all footwear.

These inner soles may be formed to the requirements of each individual, but assurance is had when made to fit into various sized shoes that beneficial results will be obtained therefrom, regardless of the individual using the same. The thickness of the inner sole may be varied without departing from the formation or undulations of the inner sole as described, which would be beneficial where the weight of any individual is above normal for a shoe of the size worn. The density of the felt or other material may also be varied, depending on the age of the wearer, if being understood that beneficial results may be obtained by the use of such inner sole even in shoes of adults, in which case, by reason of the bones and other parts of the foot being less flexible, a softer material or composition will be employed for the inner sole, yet the flexibility of the reinforce- ment at the side and arch of the sole would be less so that a more rigid upstanding flange or wall would be provided to pitch the heel portion of the foot outwardly and to sustain the arch than would be required for an infant, or a child a few years of age.

It will be apparent that by means of the wedge, lever, or tilt part created by merging the inner surface of the flange or wall 18 into the upper surface of the body portion of the inner wall, and particularly by reason of the said flange or wall being tilted outwardly, the foot is maintained in a corrected or even fully corrected position to help a child to outgrow its flat-foot tendencies, and this is especially true because of the fact that the concavity at the inner side of the heel is continued along the inner side of this flange under the arch of the foot so as to snugly fit the foot to the inner or upper surface of the inner sole, and thus guard against the natural inward tilting of the heel portion so common in children. This formation also assures a pressure upward almost perpendicular to a horizontal plane along the inner surface of the flange or wall 19; thus, under weight of the child, the foot becomes unstrained as soon as the child takes its first step.

I particularly wish to stress the fact that the outer or under side of the inner sole is so formed that it will fit snugly in the shoe and have the general shape or contour of the last over which the shoe is made. The inner or upper surface of the inner sole is therefore altered or corrected in accordance with the experience taught by practice, and this surface comes in direct contact with the foot of the child. It is so shaped as to give even pressure along the foot arch and tilt the foot so that it will assume a better position, assuring freedom in action, and assurance in stepping or walking with a proper posture.

The thickness of the reinforcement, or the flexibil- ity of the same otherwise determined, will be according to the weight of the child or other person using the inner sole within a shoe. It is of course understood that a child two years of age will not require as heavy a reinforcement as a child of ten years of age.

My improved inner sole eliminates wobbling action of a child when taking its first steps, thereby guarding against the uncertainty of securing a substantial footing caused by reason of the fact that the ordinary shoe constructed over the conventional last, does not provide the proper footing for the infant's foot and tends to augment flat-footed tendencies and the inclination to pitch the heel of the foot inwardly.

While I have referred to the inner sole being preferably constructed of felt, it may be formed of rubber, fibroid, plastics, etc., but experience has taught that a material composed of cotton and wool, and other animal or vegetable products, either alone or combined and pressed to form, answers admirably for use in infants' or children's shoes, as well as those of adults.

Having thus described my invention, what I claim is:

1. An inner sole for shoes, comprising a preformed body portion insertable as a unit into a shoe and provided with an upstanding wall extending from the rear edge of said body portion forwardly along the inner edge of the same to a point forward of the arch region thereof, the inner surface of said wall curving concavely and merging into the inner or upper surface of said body portion, said curved portion rising gradually from the rear edge of the heel forwardly and reaching its highest elevation approximately midlength of said wall and thence gradually
lowering from said point of highest elevation to approximately the front end of said wall, said wall being fashioned to exert pressure against the rearmost portion of the os-calasis of the foot structure and the remaining portion of said wall following the rearmost portion in movement to maintain a snug feeling against the foot under all conditions.

2. An inner sole for a shoe, comprising a preformed body portion having an outer or under surface conforming normally to the upper surface of the true sole of the shoe and having a corrective inner or upper surface provided with a lever-like concaved and outwardly inclined inner surface extending along the inner portion of said body portion from the rear of the heel portion to a point forward of the arch, said lever-like concaved and outwardly inclined portion varying in height along its length and having its highest elevation between its ends and being lowered forwardly to merge into the level of said body portion directly in rear of the sole portion against which the ball of the sole portion of the foot rests, said lever-like concaved and outwardly-inclined portion rising immediately from the rear end of said body portion to act against the rear portion of the os-calasis of the wearer.

3. A corrective inner sole for a shoe, comprising a body portion whose outer or under surface normally conforms to that of the true sole of the shoe in which it is placed and whose inner or upper surface at the heel is transversely flat across the major portion of its width and longitudinally concaved and whose sole region is similarly formed, said body portion being arched between said heel and sole regions and having an upward wall at its inner edge pitched outwardly at least along a portion of its length to lean over the upper surface of said body portion and said inner sole having an outwardly inclined portion at the junction of the inner surface of said wall with the upper surface of said body portion to said wall in pitching the heel of the foot of the user outwardly and to elevate the arch of the foot.

4. A corrective inner sole for a shoe, comprising a body portion whose outer or under surface is accurately shaped to conform to that of the true sole of the shoe in which it is placed and whose inner or upper surface is transversely flat through the major portion of its width and longitudinally concaved at the heel and whose sole region is also transversely flat and longitudinally concaved, said body portion being arched between said heel and sole regions and having an upward wall at its inner edge pitched outwardly at least along a portion of its length to lean over the upper surface of said body portion and said inner sole having an outwardly inclined portion at the junction of the inner surface of said wall with the upper surface of said body portion, said outwardly inclined portion undulating longitudinally to provide an intermediate high portion to support the arch of the foot and low end portions merging into the surface of the body portion at the heel and the sole portion of the inner sole against which the ball of the sole portion of the foot is to rest.

5. A corrective sole for a shoe, comprising a body portion whose outer or under surface is patterned after and conforms to that of the true sole of the shoe in which it is placed, said body portion being provided with an upward wall extending from the rear end of the inner edge forwardly to a point forward of the arch region thereof, the inner surface of said wall curving concavedly and merging into the inner or upper side of said body portion, said curved portion rising gradually from the rear edge of the heel forwardly and reaching its highest elevation approximately midlength of said wall and thence gradually lowering from said point of highest elevation to approximately the front end of said wall, the upper side of said body portion also having an elevated portion extending diagonally from the front end of said curved portion and merging thereinto and into the normal surface of said body portion at a region closer to the outer edge of said inner wall than the inner edge thereof.

6. An inner sole for shoes, comprising a comparatively flexible body portion arched longitudinally between its ends and having an upward wall at its inner edge extending from the rear edge of said heel portion to a point forward of the arch portion, said upward wall having a shallow depression formed therein over an area extending longitudinally along a considerable portion of said wall to a region underneath said arch and a slightly yielding reinforcing element fitted into said shallow depression and yet of sufficient rigidity to maintain said wall in position.

7. A preformed corrective inner sole for a shoe, comprising a body portion whose outer or under surface is designed to conform to and bear against the true sole of the shoe in which it is placed and against whose inner or upper surface the sole of the foot is adapted to bear, said body portion being provided with an upward wall along its inner edge at the heel portion thereof and said wall being pitched outwardly to bear against the rear portion of the inner side of the os-calasis of the wearer and thereby force the heel of the wearer outwardly, the remaining portion of said wall following said rear portion in action to retain snug contact with the foot of the wearer.

8. A corrective inner sole for a shoe, comprising a body portion provided with an upward wall at its inner edge extending upward gradually a distance from the rearmost point of the heel-portion along the inner edge of said body portion, and thence downwardly, said wall being pitched outwardly and rounded concavedly to merge into the upper true surface of said body portion, the rearmost portion of said upward wall serving as a medium to tilt the heel portion of the wearer outwardly by pressing against the inner and rearmost portion of the os-calasis in the foot of the wearer, while the remainder of said wall follows in action the action of said rearmost portion.

9. A corrective inner sole for a shoe comprising a body portion provided with an upward wall along its inner edge and extending upward gradually from the rearmost point of its heel-portion forwardly and thence downwardly to the level of said body portion, said wall being pitched outwardly to exert pressure against the rearmost portion of the os-calasis in the foot of the wearer to pitch or roll the heel of the wearer outwardly and said inner sole being otherwise formed to maintain the fore-part of the foot in normal position while pitching the heel portion outwardly.

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