Feb. 26, 1924. 1,484,785

J. M. HISS

APPARATUS FOR SUPPORTING ARCHES

Filed May 14, 1923 3 Sheets-Sheet 1

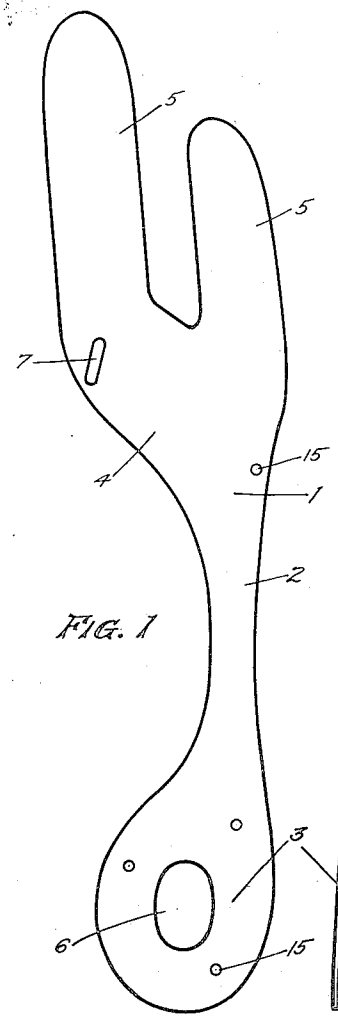

FIG. 1

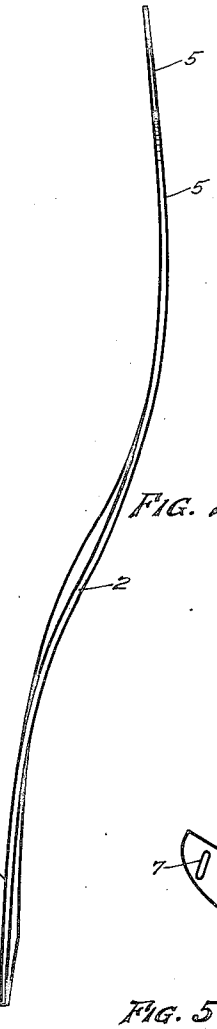

FIG. 2

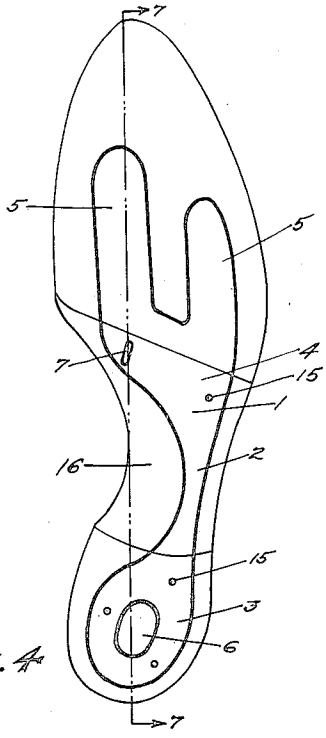

FIG. 4

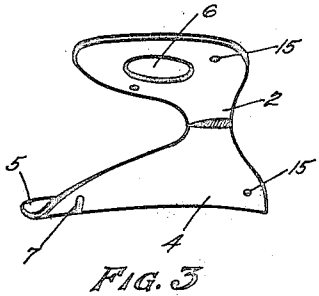

FIG. 3

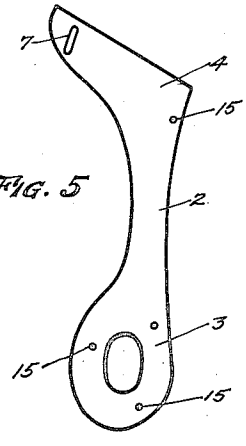

FIG. 5

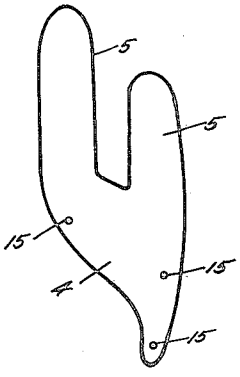

FIG. 6

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Feb. 26, 1924. 1,484,785

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APPARATUS FOR SUPPORTING ARCHES

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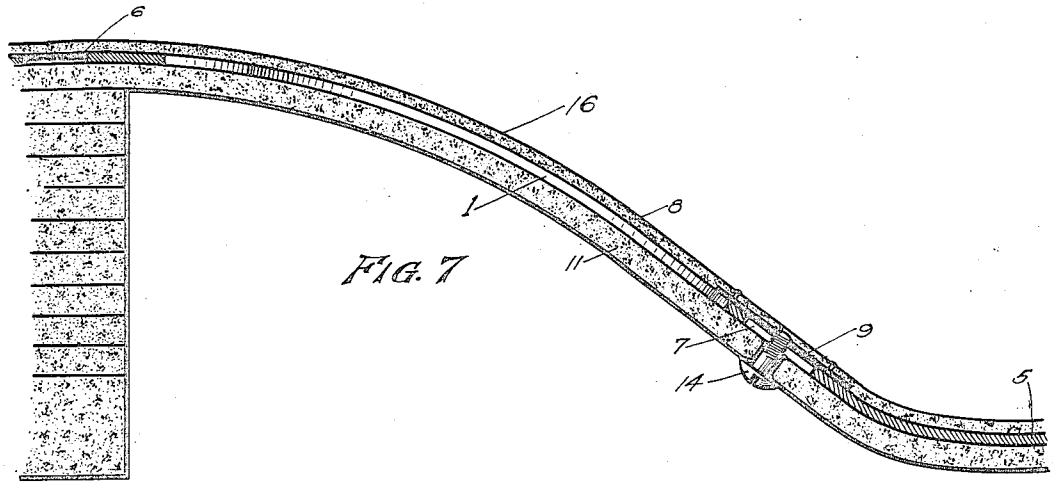

FIG. 7

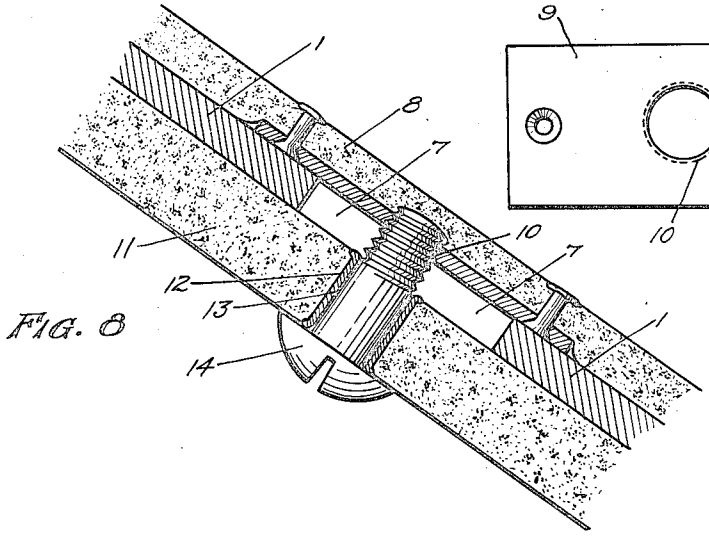

FIG. 8

FIG. 9

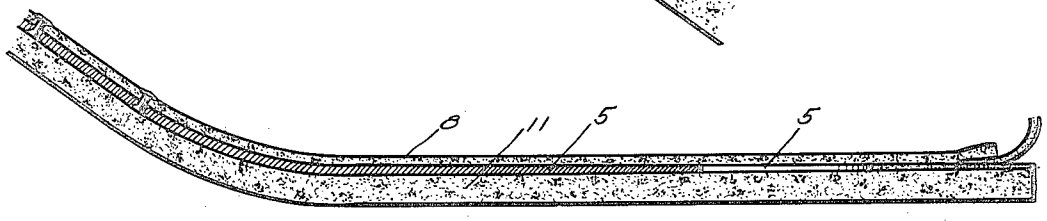

FIG. 10

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Feb. 26, 1924. 1,484,785

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APPARATUS FOR SUPPORTING ARCHES

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FIG. 11

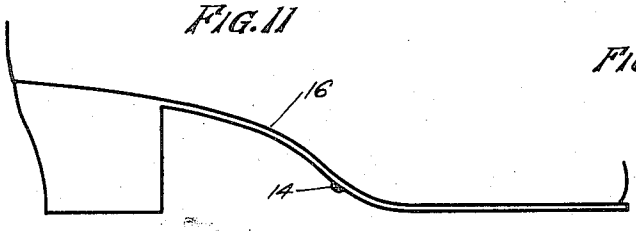


FIG. 12

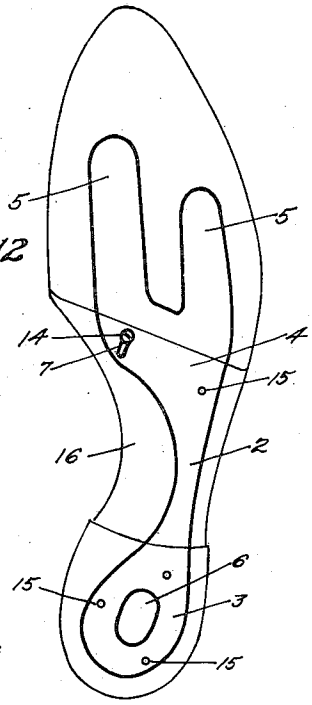


FIG. 14

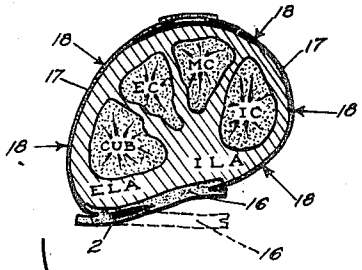


FIG. 13

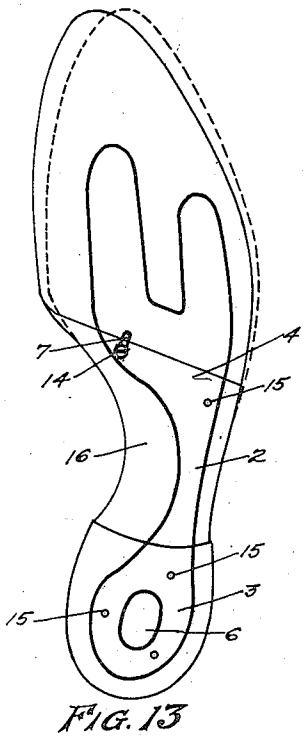
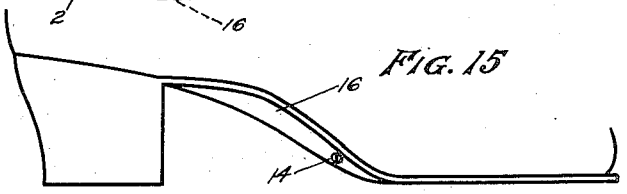


FIG. 15



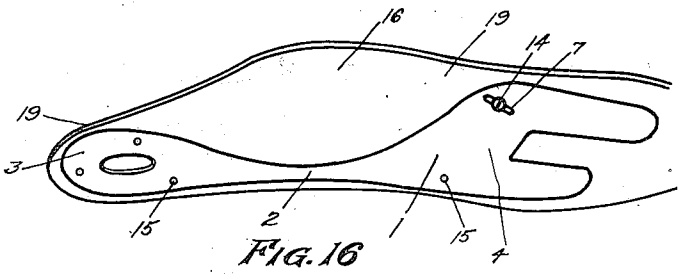


FIG. 16

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Patented Feb. 26, 1924. 1,484,785

UNITED STATES PATENT OFFICE.

JOHN M. HISS, OF COLUMBUS, OHIO.

APPARATUS FOR SUPPORTING ARCHES.

REISSUED

Application filed May 14, 1923. Serial No. 638,838.

To all whom it may concern:

Be it known that I, JOHN M. HISS, a citizen of the United States of America, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Apparatus for Supporting Arches, of which the following is a specification.

My invention relates to an apparatus for supporting arches of the foot and has particularly to do with the provision of a novel means for supporting different parts of a fallen arch to varying degrees and gradually elevating the arch to its former height, although it is equally well adapted to the correct support of the arches of any foot.

In the prior art, it has been customary to provide variously shaped arch supports of both stiff and semi-rigid material and in some cases the support itself has been made adjustable. In all cases, however, these supports have been designed to directly support the center and internal part of the arch and to focus the weight of the body at the inner center of the foot. These efforts in the past have apparently failed because, for one reason, they have failed to provide a firm walking surface to the external tarsal arch which is intended by nature to touch and bear weight along its entire length. Another reason is that these efforts have attempted to support the arches by applying pressure directly to the internal tarsal arch and thus really causing atrophy of the very important foot muscles comprising this internal arch.

My invention contemplates the method of firmly supporting the external tarsal arch of the foot and then initially or gradually adjusting the means for fitting such arch support to flexibly support the internal tarsal arch. This novel method of adjustably supporting the internal and external arches of the foot is accomplished by means of a very simple, substantial and compact structure which comprises a shank adapted to be inserted in the shoe or a detached arch support to insure proper firm support for the external arch of the foot and at the same time to provide flexible support for the internal arch of the foot.

One of the objects of my invention is the provision of an appliance of such shape and material that it will furnish stiffening to the external-lateral portion of the shank of the shoe, thereby giving a spring or rigid support to the external lateral skeletal tarsal arch.

Another object of my invention is the provision of means adapted to be inserted or placed in the shoe and which means when connected to the shoe will be effective to flexibly support the internal lateral skeletal tarsal arch.

Another object of my invention has to do with the provision of means for firmly supporting the external arch of the foot and which means may be adjusted to flexibly support internal arches of varying heights.

Another object of my invention contemplates the provision of a splint for the tarsal bones of the arch, in combination with the firm support for the external arch and the flexible support for the internal arch. The result of this combination is that the various means will be effective to grasp the instep of the foot, thereby holding the tarsal bones together.

A further object of my invention has to do with the provision of means for adjusting the inner shank of the shoe to fit any height of arch or to gradually adjust and raise such shank in order to elevate a fallen foot arch.

A further object of my invention has to do with the provision of means for massaging the foot muscles with every step. In this case the outer part of the arch is firmly supported while the inner part of the arch is only flexibly supported in order to permit free play and exercise of the muscles of the inner part of the arch.

A still further object of my invention has to do with the provision of flexible means designed to extend under the ball of the foot and to give a spring step and aid locomotion without undue weight being thrown on the ball of the foot and further to provide means just back of said first named means or just back of the tread of the vamp, to prevent twisting of the sole when stepping on rough surfaces and to distribute the weight across the heads of the metatarsal bones to prevent undue pressure at any one point. In this case I have provided means for encouraging a spring forward in locomotion without undue weight on the ball of the foot, which ball is a most frequent site of inflammation, pain and callous in case of broken, weak or fallen arches.

Various other features of my invention

will be apparent as this description progresses and will be brought out in the claims appended thereto. The various objects of my invention are preferably obtained by the structure illustrated in the drawings wherein similar characters of reference designate similar parts and wherein;

Figure 1 is a plan view of my arch support appliance and showing the preferred form of the shank of the appliance, the adjustable slot for adjusting the inner arch of the shoe and the forward projecting tongues for supporting the ball of the foot.

Figure 2 is a side elevation of the structure shown in Figure 1.

Figure 3 is an end elevation of the structure shown in Figure 1 and showing the preferred shape of such structure.

Figure 4 is a diagrammatic bottom plan view of my arch support device as applied to a shoe and showing the manner of extending the spring extensions under the vamp of the shoe, the fitting of the transverse portion just behind the tread of the sole, the fitting of the narrow shank at the external side of the shank of the shoe and the manner of attaching the heel plate of the appliance to the heel of the shoe.

Figure 5 is a detail view of a modified form of arch support which is similar to the structure shown in Figures 1 to 4 but which is not provided with the ball support extensions.

Figure 6 is a detail view of the front extension vamp spring and showing the manner in which it may be used with the transverse portion instead of with the entire shank appliance.

Figure 7 is an enlarged longitudinal section taken on line 7—7 of Figure 4 and showing the manner of applying my adjustable arch support appliance preferably between the inner and outer soles of a shoe.

Figure 8 is an enlarged fragmentary detail view of the locking mechanism of Figure 7 and showing the manner of adjustably locking the arch support appliance in any desired position.

Figure 9 is a detail plan view of the lock plate utilized for locking the arch support appliance in any given position.

Figure 10 is a fragmentary longitudinal sectional view showing the inner and outer sole of the shoe and also showing the manner of extending the vamp spring extensions forward between the inner and outer sole.

Figure 11 is a diagrammatic side elevation of a shoe provided with my arch support appliance but showing the shoe in initial non-adjusted position.

Figure 12 is a bottom plan view of the structure shown in Figure 11.

Figure 13 is a bottom plan view of the structure shown in Figure 12 but showing the shoe bent inwardly and also showing the arch support appliance locked in this inner adjusted position.

Figure 14 is a diagrammatic view of a cross section of the instep of the foot taken through the transverse tarsal arch and showing the manner of supporting the transverse arch, the external arch and the internal arch.

Figure 15 is a diagrammatic side elevation showing the raised inner arch of the shoe after it has been locked in adjusted position.

Figure 16 is a bottom plan view, partially in perspective, and showing a modified form of arch support wherein the arch support appliance is applied to a distinct unit, separate from the shoe, and designed to be inserted in the shoe as an adjustable arch support.

In the drawings, my arch support appliance is shown as comprising a simple and compact shank of preferably integral structure and this appliance may be designated 1 and preferably comprises a narrow shank piece 2, a heel plate 3, a transverse portion 4 and anterior extensions 5.

This arch support appliance is preferably made of spring steel and may be of a uniform thickness or may be tapered towards its inner edge as best illustrated in Figure 3. The shank part 2 of the appliance is approximately of the general shape of the shank of the shoe and is so designed, when placed in a shoe, that it will be effective to directly support the external lateral longitudinal tarsal arch of the foot. The base or heel 3 of this appliance is preferably provided with an aperture 6 for convenience in lasting the shoe and providing a space for tacks.

Towards the upper part of the appliance 1 the shank 2 gradually widens into the transverse portion 4 which is designed to fit just behind the tread of the sole of the shoe. This arrangement is best illustrated in Figure 4. The vamp spring extensions 5 extend in the general longitudinal direction of the shoe and may be of any desired number and are preferably made of the same material as the other part of the appliance, namely a live, thin piece of spring steel.

When the appliance 1 is placed between the inner and outer soles of a shoe, as best shown in Figures 7, 8 and 10, the transverse portion 4 of the appliance is preferably provided with an adjustment slot 7 which extends in the general longitudinal direction of the shoe. In this case the inner sole 8 of the shoe is provided with a suitable lock plate 9 which is preferably rectangular in shape and which is provided with a threaded aperture 10 which is designed to register with the slot 7 of the appliance 1. The outer sole 11 of the shoe is provided with an aperture 12 and a bushing 13 which bushing

is designed to receive and support a suitable set screw 14 which set screw in turn is designed to pass through the slot 7 in the arch support appliance 1 and to enter and cooperate with the threaded aperture 10.

In order to secure the appliance 1 to the sole of the shoe it is provided with a series of holes 15 which are preferably arranged as shown in Figures 1, 4, and 13, so as to definitely secure the heel and transverse portion 4 of the appliance preferably to the inner sole of the shoe. As the heel 3 and transverse portion 4 are secured to the sole of the shoe it will be obvious that whenever the sole of the shoe is pressed or bent inwardly, as shown in Figure 13, the set screw 14 will be moved along the slot 7 of the appliance 1 and the internal portion of the shank 16 of the shoe will be gradually raised as this set screw is moved rearwardly in such slot 7. It will further be obvious that whenever the set screw 14 is tightened the inner shank 16 of the shoe will be locked in any desired vertical position in accordance with the relative position of the set screw 14 in the slot 7 of the appliance. The two extremes of this adjustment are best illustrated in Figures 11 to 15.

In Figures 11 and 12 the appliance 1 is shown in its normal non-adjusted position with relation to the sole of the shoe. In this position the set screw 14 is positioned in the forward end of the slot 7 and the inner part of the shank of the shoe will obviously remain in its normal position. In Figures 13 and 15 the sole of the shoe has been bent inwardly until the set screw 14 is positioned adjacent the rear or opposite end of the slot 7. When the set screw has been moved to this extreme adjusted position the internal portion of shank 16 of the shoe will have been raised to its maximum vertical position. It will thus be obvious that the shank piece 2 of the appliance will always be effective to firmly support the external tarsal arch of the foot while the internal portion of shank 16 of the shoe may be fixed in one position to flexibly support the internal longitudinal arch of a normal foot or may be adjustably positioned to fit and build up the internal longitudinal arch when it is broken down.

In attaching the arch support appliance to a shoe, the appliance is preferably placed adjacent the outer sole 11 of the shoe, as best shown in Figures 7 and 8, and positioned transversely and longitudinally relative to the general contour of such shoe, as best shown in Figure 4. The appliance 1 is then preferably secured to the inner sole of the shoe by means of suitable fastening means inserted through the holes 15 in the appliance. The outer sole 11 is then provided with a suitable set screw 14 which is adapted to register with the upper end of the slot 7 in the appliance when the shank of the shoe is in its normal position, and the inner sole 8 of the shoe is provided with a lock plate 9, riveted thereto and designed to register with the set screw 14 and slot 7. The vamp-spring extensions 5 project forward in the vamp of the shoe and are preferably located between the inner sole 8 and the outer sole 11, as best shown in Figures 4 and 10.

When the foot is placed in the shoe the shank 2 of the appliance, being directly below the external tarsal arch, will firmly support such arch at all times. If the internal tarsal arch is low the appliance may be permanently fixed in one position so that the inner shank 16 of the shoe is only lifted slightly, but if the arch is broken and requires gradual raising or if the arch is naturally high the adjustment feature may be utilized to gradually raise the inner shank of the shoe as the arch is gradually raised to its normal position, or the adjustment may be made instantaneously so that the inner shank may be raised to flexibly support the naturally high arch. Such adjustments and the effect thereof are best illustrated in Figure 14, which shows a cross section of the instep of the foot through the transverse tarsal arch, made up of cuboid (CUB), external cuneiform (EC), middle cuneiform (MC) and internal cuneiform (IC) bones. The internal longitudinal arch is designated ILA, in this figure, and the external longitudinal arch is designated ELA. The inner shank 16 of the shoe is shown in the normal lower position in dotted lines and in raised, extreme flexibly supporting position in solid lines. It will be noted that the shank 2 of the appliance will always firmly support the external longitudinal arch regardless of the position of the shank 16 and it will also be noted that when the flexible inner shank 16 is raised by the adjustment of the appliance this shank will be effective to flexibly support the internal lateral arch. By adjustment of the shank, the upper 17 of the shoe is permitted to grasp the transverse arch and give support by lateral pressure, at the points and in the direction of the arrows marked 18. This prevents the spreading of the bones in a normal foot, and pulls the bones together in a broken, weak or fallen arch. As the shank piece 16 is flexible no harm is done to the muscles in the internal lateral arch of the foot.

The operations of the extensions 5, are such that, in ordinary walking when the weight is thrown on the ball of the foot the vamp-spring extensions are brought into action and as the step is completed by dorsal flexion of the ball of the foot, stress is put upon the vamp-spring. The tension thus produced in the vamp-spring prevents ex-

treme bending of the vamp of the shoe and gives the body a forward spring motion instead of allowing the forward motion and the stress to be felt and cause a strain on the ball of the foot. It will be obvious that by minimizing the pressure from weight-bearing and locomotion, the pain from broken arches and inflamed tissues in the ball of the foot is relieved and eliminated.

In the modified form of my appliance, as shown in Figures 5 and 6, the appliance may be used solely as a shank piece comprising the transverse portion 4, shank 2 and heel 3, while the spring-vamp forward extensions 5 may be used as a separate mechanism in combination with the transverse portion 4 as best illustrated in Figure 6. It will be obvious that in using the shank piece alone it will be effective to firmly support the external arch of the foot and flexibly support the internal arch of the foot, while the vamp extensions when used alone will be effective to encourage a spring forward in locomotion without undue weight on the ball of the foot.

In the modification of this arch support appliance, as illustrated in Figure 16, the appliance 1 may be applied to the distinct unit 19, separated from the shoe and designed to be inserted in the shoe as an independent arch support. The body piece 19 of this unit is made of a suitable flexible material, preferably of soft sole leather, and may be adjusted to various heights in precisely the same manner as the adjustment of the inner shank of the shoe as described in the preferred form of my apparatus.

It will be seen that I have provided a novel and decidedly simple method and apparatus for supporting arches of the foot which is effective to firmly support such arches of the foot as are intended to firmly bear the weight by nature and flexibly support and exercise such arches of the foot as are intended to be naturally muscular and resilient.

It will also be seen that I have provided a method and apparatus for binding, or to prevent from spreading, the tarsal bones of the transverse arch. Furthermore, it will be noted that I have provided a means for encouraging a spring forward in locomotion without undue weight on the ball of the foot, which ball is a most frequent site of inflammation, pain and callous in cases of weak, broken or fallen arches.

Obviously my invention may take many different forms in that the support appliance may be made in various sizes to conform to different shoe sizes and likewise may be made in various shapes to conform to different shoe shapes. It will also be obvious that the appliance may be of any firm or spring material such as leather and applied to any part of the shoe and that it may be provided with any suitable adjustable or non-adjustable means which will be effective to raise the internal portion of shank 16 of the shoe. All such changes, however, are within the scope of the appended claims.

Having thus described my invention, what I claim is:

1. In combination with a shoe, a reinforcing element comprising a shank portion mounted to extend only beneath the longitudinal outer arch of the foot and avoiding support of the inner longitudinal arch, a portion thereof extending back over the heel of the shoe, and a transverse portion thereof extending across the forward end of the shank.

2. In combination with a shoe, a reinforcing element comprising a shank portion mounted to extend only beneath the longitudinal outer arch of the foot and avoiding support of the inner longitudinal arch, a portion thereof extending back over the heel of the shoe.

3. In combination with a shoe, a reinforcing element comprising a shank portion mounted to extend only beneath the longitudinal outer arch of the foot, and avoiding support of the inner longitudinal arch, a portion thereof extending back over the heel of the shoe, and a transverse portion thereof extending across the forward end of the shank, and means for fixing the inner portion of the shank of the shoe in different adjusted positions.

4. In combination with a shoe, a reinforcing element comprising a shank portion mounted to extend only beneath the longitudinal outer arch of the foot and avoiding support of the inner longitudinal arch, a portion thereof extending back over the heel of the shoe, and means for fixing the inner portion of the shank of the shoe in different adjusted positions.

In testimony whereof I hereby affix my signature.

JOHN M. HISS.