

April 27, 1943.

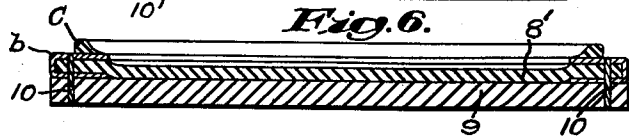
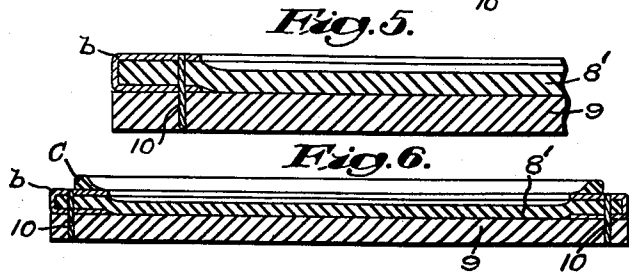
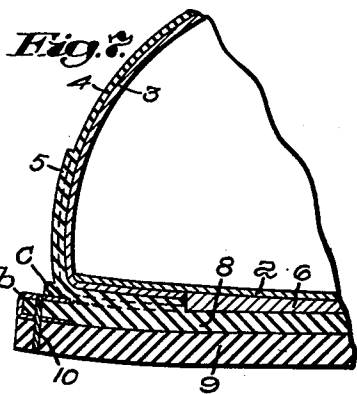
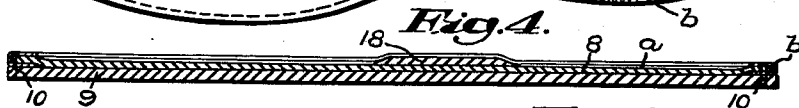
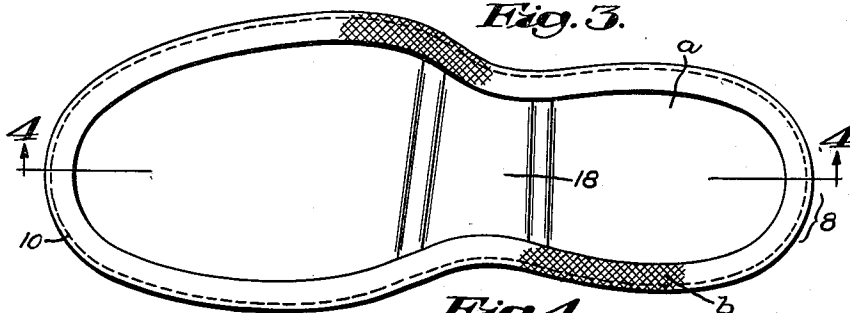
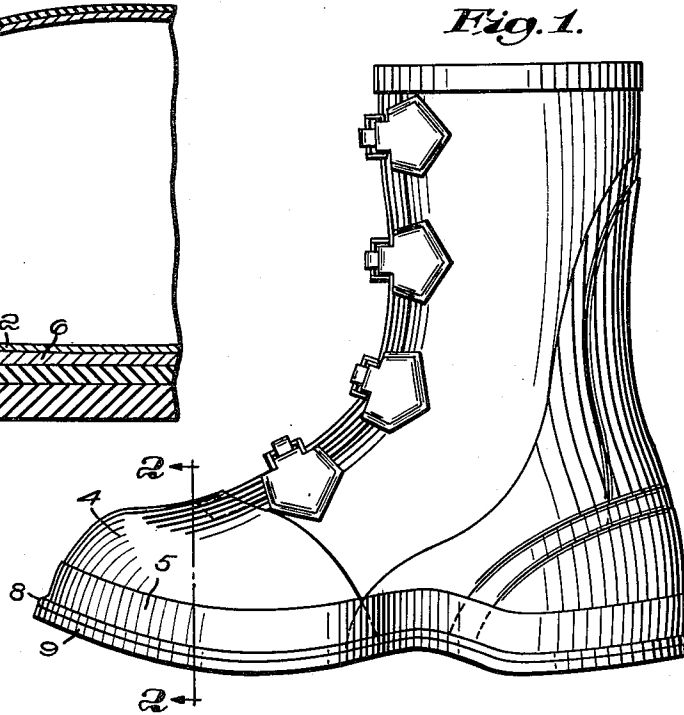
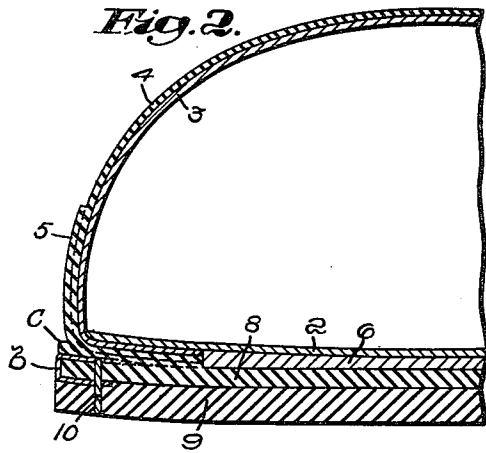
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2,317,879

RUBBER FOOTWEAR

Filed Aug. 27, 1942

4 Sheets-Sheet 1



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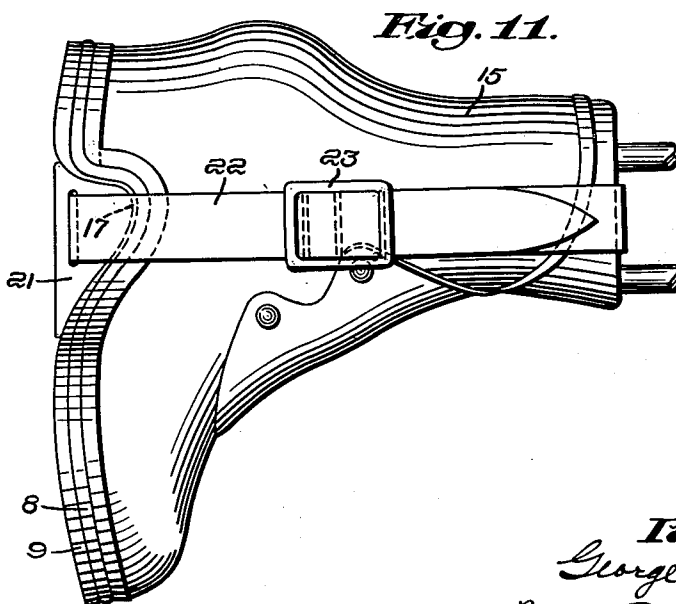
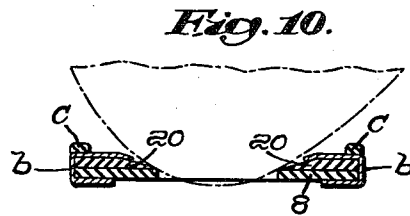
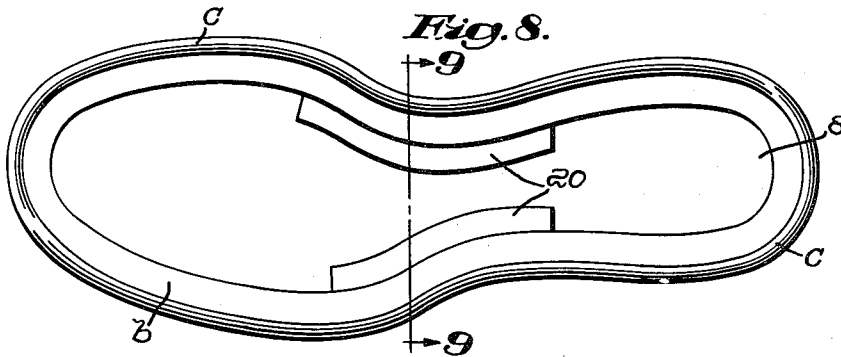
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2,317,879

RUBBER FOOTWEAR

Filed Aug. 27, 1942

4 Sheets-Sheet 2



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2,317,879

RUBBER FOOTWEAR

Filed Aug. 27, 1942

4 Sheets-Sheet 3

Fig. 12.

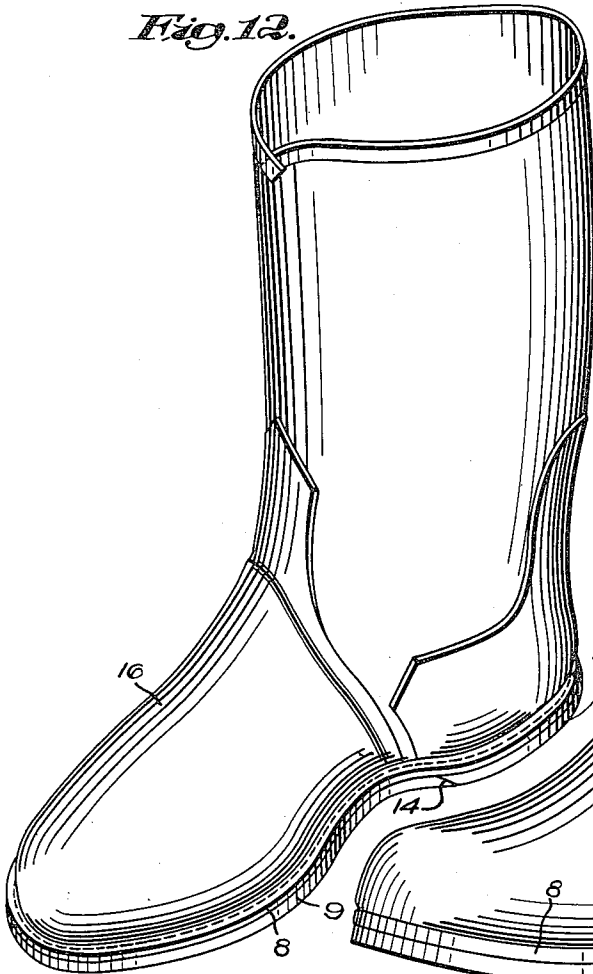


Fig. 13.

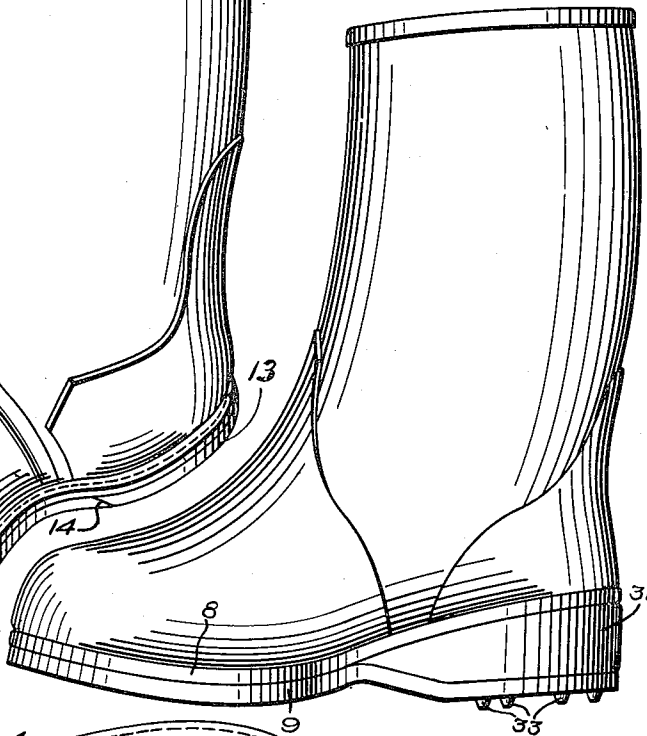


Fig. 14.

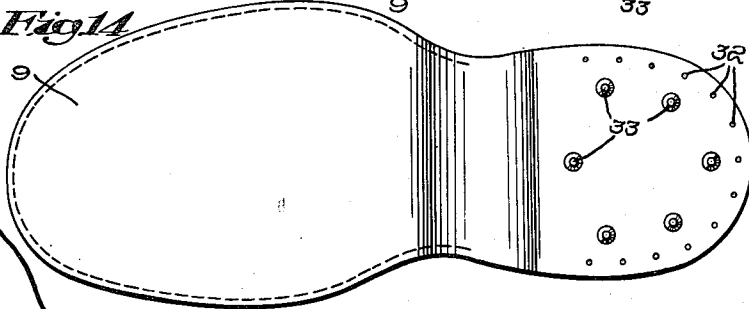
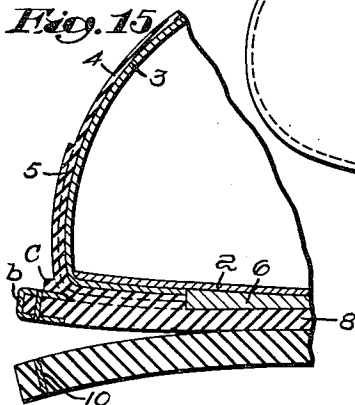


Fig. 15.



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RUBBER FOOTWEAR

Filed Aug. 27, 1942

4 Sheets-Sheet 4

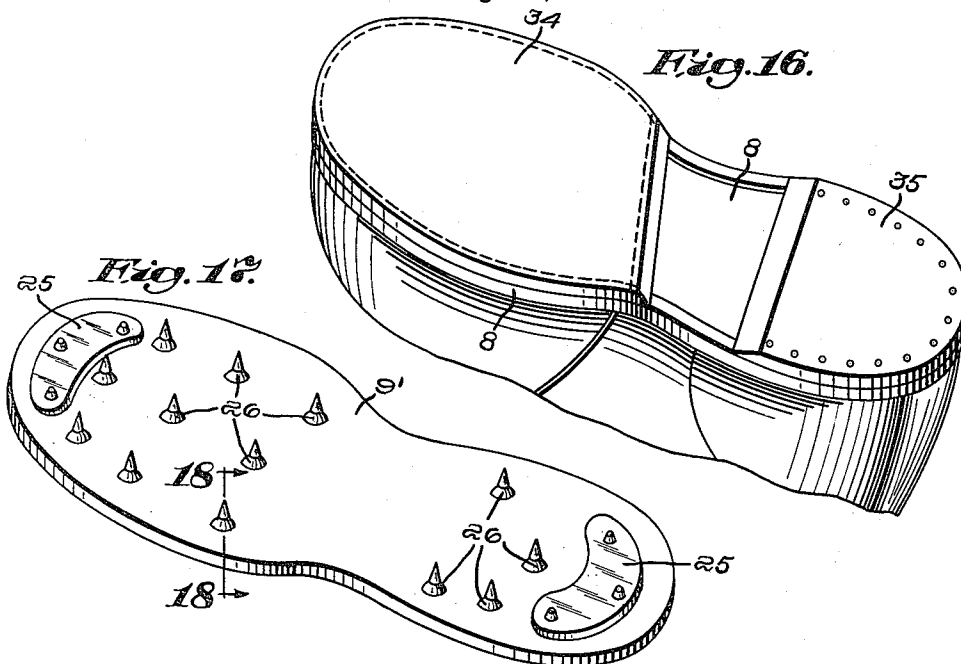


Fig. 16.

Fig. 1st.

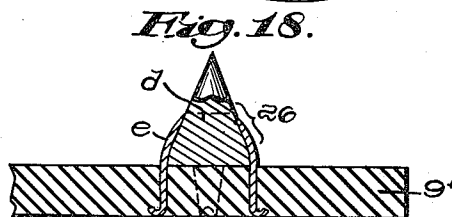


Fig. 18.

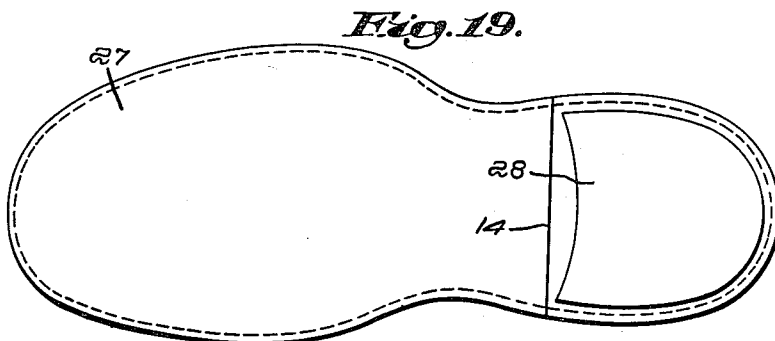


Fig. 19.

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UNITED STATES PATENT OFFICE

2,317,879

RUBBER FOOTWEAR

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Application August 27, 1942, Serial No. 456,388

13 Claims. (Cl. 12—142)

This invention relates to rubber footwear; that is, the type of footwear in which the parts of the bottom structure of the boot or shoe are united by rubber or its equivalent. The invention is more especially concerned with rubber boots or shoes of the kinds used by lumbermen, farmers, the army, and for rough wear generally, but it also involves shoes and overshoes for civilian use. For convenience such boots, shoes and overshoes will be hereinafter included in the term "rubber shoes" where the context permits.

The fact that there is available in the country only a definite and fixed amount of crude rubber, and that we can hope for no substantial additions to that supply within the next two years, or perhaps longer, makes it extremely important to make this supply go as far as possible. The Government has taken active steps in this direction; it controls all of the crude rubber available, and it has very complete control of all of the uses of rubber. However, its allocation of crude rubber to the entire rubber shoe industry is only about sufficient to supply the needs of the armed forces and of probably not over one-third of the normal rubber shoe demands of civilians. It is evident, therefore, that a very large proportion of our population is shortly going to be without protection which is essential to the health and welfare of the people.

The present invention is especially concerned with these considerations, and it aims to devise improvements in rubber footwear and methods of manufacturing such footwear with the object of making as efficient use of the very limited supply of rubber as possible, to the end that a much larger percentage of our population can be supplied with rubber footwear than now seems possible of attainment.

As is well known to all users of rubber footwear, the repair of a worn-out bottom of a rubber shoe is difficult and unsatisfactory, at best, and in most cases is impossible. Rubber boots and shoes, unlike the leather variety, have never been manufactured in such a manner that they can be re-bottomed readily and satisfactorily, and it has generally been considered that when a rubber bottom has worn through, the boot or shoe must be discarded. The present invention deals with this problem of repairing the bottoms of rubber shoes and aims to devise a thoroughly practical solution for it.

It is a further object of the invention to improve the methods of manufacturing rubber boots, shoes and overshoes with a view to minimizing the amount of crude rubber employed in

them while still producing an article having substantially as good wearing qualities as those which have been customarily made heretofore by the usual methods.

5 These, and other features of the invention, will be readily understood from the following description when read in connection with the accompanying drawings, in which

Fig. 1 is a side elevation of a lumberman's shoe or army shoe constructed in accordance with this invention;

Fig. 2 is a vertical, sectional view, on a larger scale, through one side of the forepart of the shoe illustrated in Fig. 1;

Fig. 3 is a plan view of a combined midsole and outsole forming parts of the shoe shown in Fig. 2, the spacing of the stitching from the edge of the outsole, however, being nearer the edge of the sole than in Figs. 1 and 2;

Fig. 4 is a longitudinal, sectional view on the line 4—4, Fig. 3;

Figs. 5 and 6 are vertical, sectional views on a larger scale showing slight variations of the combined midsole and outsole construction;

Fig. 7 is a partial sectional view similar to Fig. 2 illustrating a slight variation thereof in which the bottom structure is slightly extended so that the stitching may be placed outside of the strip c;

Fig. 8 is a plan view of another form of midsole;

Fig. 9 is a sectional view on the line 9—9, Fig. 8;

Fig. 10 is a view similar to Fig. 9 showing another variation of the midsole;

Fig. 11 is a side view illustrating a step sometimes found advantageous in applicant's method of manufacture of rubber footwear;

Figs. 12 and 13 are perspective views and side views, respectively, of other forms of footwear embodying applicant's invention;

Fig. 14 is a plan view of the bottom of the boot shown in Fig. 13;

Fig. 15 is a sectional view similar to Fig. 7 showing a step in the repairing operation;

Fig. 16 is an angular view of the bottom of a rubber shoe repaired in accordance with one method;

Fig. 17 is a perspective view of an outsole equipped with wear plates and hob nails or spikes;

Fig. 18 is a sectional view on the line 18—18, Fig. 17, through one of the spikes; and

Fig. 19 is a bottom view of another form of

outsole which can be used in shoes embodying this invention.

Referring first to Figs. 1 and 2, the article there shown is much like the well-known four-buckle boot of the type worn by lumbermen and workers in various other industries. In manufacturing such a boot the various parts of the upper are cut out of rubber or rubberized fabrics, the nature and composition of which will depend upon the specifications to which the shoe is built, and these parts are assembled in suitable order upon a last, starting with an insole 2 placed on the last bottom. For example, such parts may consist of a fabric lining 3, a vamp 4 of sheeted rubber, and a foxing 5 also of rubber. A filler of rag stock, or some other suitable material, shown at 6, is then placed over the central portion of the insole which is not covered by the margin of the upper material, if the thickness of the lasted over parts of the upper requires the use of such filler. So far as the foregoing operations are concerned the process is like those commonly followed in the orthodox methods of making shoes of this type. Usually at this stage of the process a heavy unvulcanized rubber outsole is placed in position to cover the entire bottom of the lasted assembly. Because the parts are either made of unvulcanized rubber, or those parts which are to adhere to each other are heavily rubberized, a good adhesion of these elements, one to the other, is produced, and such adhesion is improved by rolling and pressing. Next, according to the customary operation, the entire structure is vulcanized, thus causing the parts to weld to each other so securely that the entire assembly becomes substantially an integral unit.

Applicant's method in its preferred form departs from the orthodox practice at the point where the outsole customarily is applied to the lasted assembly. At this point applicant applies an assembly of two bottom members 8 and 9 which have previously been combined, as indicated in Figs. 3 and 4. These consist of a special top sole or midsole 8 and an outsole 9. The former comprises a sole-shaped body *a*, the composition of which will depend somewhat on considerations of quality and the allowable expense, but which may, for example, consist of a sheeted rag stock compounded chiefly or entirely with reclaimed rubber and having ample tensile strength, thickness, and the other characteristics adapting it for use in this particular portion of the shoe. If desired, it may be reinforced on one or both faces by a layer of rubberized fabric, such as duck. Preferably the margins of this sole-shaped body piece are bound with a strip *b* of reinforcing material which usually consists of a suitable grade of sheeted uncured rubber, either with or without a fabric backing. The nature of this strip will depend upon the character and style of the shoe in which it is to be used. It is intended to produce a finished edge, to be vulcanized securely to the upper, to seal the edges of the midsole body, if necessary, against penetration of water thereinto, as when said body includes a fabric top, and to make a good abutting surface for the outsole. To the upper surface of the binder strip *b* a rubber sealing strip *c* often is applied, as shown in Figs. 2 and 6, this strip extending around the entire margin of the sole members 8 and 9. It will be seen that in Fig. 6 the stitching is outside of the sealing strip *c* while in Fig. 2 it is within said sealing strip. Also, it will be seen that in Fig. 6

a cavity is shown in element 8 for the purpose of making it fit better on the bottom of the lasted assembly. In Fig. 5 the sealing strip *c* is not shown and the stitching 10 is farther in from the edge than in Fig. 6, its location being like that shown in Fig. 2. Also, in Fig. 5 a similar cavity is shown as in Fig. 6 and for the same purpose.

The outsole 9 is made independently. Preferably it is molded to the desired shape and size, and is given a light cure, say four minutes, at 280° F. or thereabouts, at 2500 lbs. per square inch, so that in the subsequent vulcanization of the entire shoe the cure of the outsole will be completed. It is assembled with the midsole member 8 with the latter superposed on the former, and the two are fastened together by cement, or are held together in any other convenient manner, to retain them in the desired relationship while they are stitched, as indicated at 10 in Figs. 2, 3 and 4, provided stitching is to be used. Care should be taken, as will later be explained, to inhibit so firm an adhesion of the members 8 and 9 to each other as to prevent their subsequent separation for repair purposes.

The bottom assembly so produced is then applied to the bottom of the lasted upper assembly and is made to adhere thereto by preliminarily coating the entire upper surface of the member 8 with a vulcanizable cement and placing it accurately in position on the bottom of the lasted upper. Usually, also, the lasted-over margins of the upper and the bottom of the insole are coated with similar cement prior to the application of the sole member thereto.

At this stage of the process the entire assembly so produced is cured, either by vulcanization with heat or by a cold cure, as may be desired. The result of this process is to create essentially the same union of the upper to the bottom member 8 (which may here be designated as a midsole, although it performs certain functions of an outsole) that is produced in the orthodox methods of making rubber shoes. Consequently, this vulcanized shoe now has a waterproof bottom structure, and if the upper has been made of waterproof materials, then the entire structure so formed, exclusive of the outsole 9, is waterproof. In fact, it could be worn without the outsole, but usually it is not economical to make the midsole 8 with sufficient abrasive resistance to perform the functions of an outsole.

Various forms of rubber shoes may be made in accordance with the foregoing method, typical examples being shown in Figs. 1, 11, 12 and 13.

While, as above stated, a rubber shoe made by the orthodox methods is practically useless when the outsole has been worn through, that provided by this invention can be resoled and made very serviceable by removing part, or all, of the outsole 9 when worn out and replacing it with new parts, or a new outsole. This may be done by cutting along the upper surface of the outsole at its junction with the binding *b*, and thus severing the stitches and breaking the union, as shown in Fig. 15. The union usually is strongest along this margin, so that when once well started, the entire outsole can be taken off. The lower surface of the midsole 8 can next be cleaned up, washed with gasoline, or the like, and a new outsole 9 can then be secured to the bottom of this member in any of the ways described. If the midsole has an edge sufficiently extended, then the new outsole can be stitched to it, as shown in Figs. 7 or 12. If, however, the edge is too close, or ex-

tends to only a degree beyond the upper too slight to permit attachment of the new outsole in this way, then the latter can be cemented to the bottom of the midsole 8 in the manner hereinafter described for producing a permanent union between these parts. Usually it is preferable to adopt the construction shown in Fig. 7 since stitching produces a more reliable union and the stitches in this form of the invention are located entirely outside of those parts of the shoe relied upon to keep the wearer's foot dry. Also, this construction permits more than one renewal of the outsole if the upper and the midsole are not too badly worn.

Control of the adhesion of the outsole to the midsole can be effected in any one of several ways, for example as follows:

(1) By the use of an unvulcanizing cement which may either have a base of natural rubber, latex, synthetic rubber, or the like. These cements should only be used in connection with stitching.

(2) By vulcanizable cements, the strength of the adhesion which is effected by them in the finished shoe being controlled;

(a) By the use of diluents, such as talc, powdered mica, clay, and the like.

(b) By adjustment of the quantity or character, or both, of the vulcanizing agents, the proportion of these agents, or their quality, being such as to produce a union having ample strength for the purposes of this invention, but a degree of strength considerably less than that obtainable with a good grade of vulcanizing cement of normal composition.

(3) By applying a sheeting, duck, or napped cotton flannel, to substantially the entire surface of the bottom of the midsole and securing it thereto with a coating of a good grade of vulcanizable cement or a calender coating; securing another sheet of fabric to the upper surface of the outsole in the same manner and preferably during the molding and vulcanizing step, when the outsole is made in this way; then applying the outsole to the midsole, after first coating the meeting surfaces of these two fabric sections with vulcanizable cement. After the shoe has been vulcanized, it will be found that the outsole is secured very firmly to the midsole, but separation of these soles can readily be effected by inserting a dull knife blade between the two fabric sheets above referred to, thus breaking the union at a local point. When this has been done, the outsole can then be peeled off the midsole because the union of these two sheets of fabric to each other is very much weaker than that of said sheets to the midsole and outsole, respectively. The same result can be secured by using only one of the fabric sheets above mentioned.

(4) By producing a strong bond or adhesion of the rubber outsole to the rubber binder of the midsole and a relatively weak adhesion of the rubber covering of the binder to the binder fabric itself. This may be done by making the binder strip from sheeting which is frictioned or frictioned and calender coated on the side to be secured to the body of the midsole and has a calender coating of rubber on its opposite side. Preferably the calender coating contains a substantial percentage of gum rubber. Consequently, if the upper surface of the margin of the outsole is roughened and coated with a good grade of vulcanizable cement, and this cemented area is applied to a cemented surface of the calender

coating at the lower side of the midsole, a firm union of the outsole to the rubber coating of that portion of the binder folded over upon the bottom of the midsole body will be produced during vulcanization. When it is desired to remove the outsole a dull knife blade, or some similar instrument, can be forced between the binding and the outsole far enough to produce an initial rupture of the union securing these two parts together. Thereafter the outsole can be peeled off and it will carry with it that part of the rubber coating of the binder to which it has been bonded. This is not objectionable, however, for the reason that while it leaves the sheeting body of the binding strip exposed at the lower surface of the midsole, it does not materially injure the midsole and it still leaves a smooth outer surface to which a new outsole can be secured. In fact, when this securing operation is to be performed with the aid of cement, there is some advantage in having this fabric surface exposed in this way since the cement anchors itself more firmly to this fabric surface than it would to a vulcanized rubber surface unless care was taken to roughen the latter thoroughly. In this method the relatively weak union of the calendered coating of rubber to the fabric body of the binder strip is relied upon to break before any of the other adhesive unions will give way. And one advantage of this method is that the strength of the union of the calender coating to the fabric can be easily controlled.

(5) When the rubber outsole has been given a light cure, as above described, the strength of the adhesion that can be produced between this member and the midsole through the use of vulcanizable cements, depends very largely on the degree to which the upper margin of the outsole is roughened prior to the application of cement to it. If a thorough job of roughening is performed and a good grade of vulcanizable cement is used, then a permanent union of the outsole to the midsole will be produced. On the other hand, if the margin of the outsole is merely buffed lightly so that the abrasive action does not go deeply into the surface, then the union will not be strong. This fact also may be utilized in producing a readily breakable adhesive union between the outsole and the midsole.

The adhesives used may be those commonly employed in the manufacture of rubber footwear, such as one of those having a base of natural or synthetic rubber, or it may be a latex cement, a solvent cement, or one of those made with, or including, synthetic resinous materials. Of the synthetic rubbers, buna, neoprene, and thiokol are much used as an ingredient of, or as a base for, rubber cements, and it is a common practice to include some of the resinous materials, either natural or synthetic, in these cements to improve their adhesive properties. Examples of these resinous materials are rosin, the polyterpines, casein adhesives, ester gums and cumar resin. In all of these cases, also, the union preferably is produced only between the upper margin of the outsole and the coated binding of the midsole, no union of the main body of the outsole to the corresponding portion of the midsole usually being necessary or desirable.

As is well understood by those skilled in this art, the nature of the cement used in making a cemented union of two rubber parts to each other should be selected in accordance with the composition of those parts when the strength of that union is to be controlled. In the ordinary manufacture of rubber shoes this is not necessary be-

cause the only object is to make a permanent union and no adjustment or control of strength is involved, but it does have to be considered in practicing this invention. Thus, if an outsole is composed entirely, or practically so, of reclaimed rubber, and contains little or no gum rubber, then a better grade of cement must be used to produce a strong union of that outsole to the midsole than would be the case if the outsole contained, say, 20% or 25% of gum rubber. The nature of the cement used will also depend on the curing method to be followed. That is, whether it is to be vulcanized by heat or by a cold cure.

The line of stitching is of advantage in making any of these adhesive unions because the cement customarily is applied only around the margin at opposite sides of the line which the stitching is to follow, and the stitches hold the surfaces to be united securely to each other while the cement hardens or cures, as the case may be. Usually there is no need of cementing the meeting surfaces of either the midsole unit or the outsole within the bound area of the former, although this can be done, when desired, and the adhesion can be controlled in the manner above described. If the bottom of the body portion of the midsole is covered with a fabric, as in the preferred construction, that fact facilitates the matter of making any adhesive union between the two sole members inside the marginal area a readily breakable one. And the cemented union is of advantage in holding the outsole on the shoe after the portions of the stitches exposed at the tread surface of the sole have worn off and when, consequently, the strength of the stitched seam is greatly reduced.

The methods of manufacture above described are somewhat more expensive from a labor standpoint than are the orthodox methods of making rubber shoes. However, the primary object of this invention is not to reduce the expense of manufacture of a rubber shoe but to produce a shoe that is repairable and to economize in the use of crude or gum rubber. A considerable reduction in the proportion of crude rubber required throughout the upper can be realized by using reclaimed rubber. Rubber substitutes can also be used as the chief ingredients of the uppers of shoes of this construction.

By molding the outsole under high pressure, say from one to three or four thousand pounds per square inch, a rubber composition composed almost entirely of reclaimed rubber, fillers and curing ingredients can be made to have wearing qualities comparing favorably with those of the outsoles commonly used heretofore in shoes of the orthodox types. Of course the percentage of gum rubber added to the composition can be increased to practically any desired degree. Within reasonable limits a very definite improvement in wearing properties is realized by such increase. However, as an example, an outsole of what would be regarded as of a low grade composition, containing little or no crude, can be so improved as to wearing qualities by molding under high pressure that a rubber shoe equipped with such a sole will stand up to hard wear fully as well as do the currently manufactured calendered soles containing a very much higher proportion of gum rubber.

Because the rate of wear of the shoe bottom at the heel or at the heel end of the sole portion usually is much more rapid than at any other point in the sole, this portion of the sole may

be made separate from the main body of the outsole, the meeting edges of the two pieces being butted together and cemented preferably along a rearwardly inclined surface, as indicated at 14 in the army boot shown in Fig. 12. With such a construction the composition of the heel end section 13 may be made much richer in gum and therefore made to afford a longer life than if made of the same composition as the forepart. Or, this section may include a molded heel, as shown in Fig. 19. Here the heel section has a heel 28 of any desired height integral therewith or superposed thereon, but the margin of the heel preferably is inset from the edge of the outsole sufficiently to permit stitching the latter to the midsole. This same type of heel can, of course, be used for repair purposes.

In manufacturing shoes by the method above described on lasts of the character customarily used in the commercial production of rubber footwear, a problem not encountered in the prior art practice is introduced by the fact that the outsole 9 is premolded under high pressure and to a form which, in most cases, is not exactly like that of the bottom of the last on which the shoe is to be made. Assuming, for example, that the outsole is relatively flat, while the last has an upward curve in the shank, as is very common, it will be found that there is a strong tendency for the outsole to pull away from the midsole at the shank during vulcanization of the shoe. In addition, if the midsole is stitched to the outsole so that the two act as a unit, then this whole unit may pull away from the upper at the shank portion of the latter.

While this difficulty could be obviated by molding all the soles to the curvature of the last bottoms on which they are to be assembled, this requires an excessive expenditure for molding equipment. Another object of this invention, therefore, has been to devise more economical means for compensating for the difference between both the longitudinal and transverse curvatures of last bottoms and the shape of the molded outsoles.

I have found that such compensation can be achieved in several ways. For example, in a shoe having an excessive curvature in the shank, such as in the women's two-button gaiter shown in Fig. 11, the outsole 9 can be skived throughout the shank region to a very thin dimension, as there illustrated, so that the tendency of this part of the shoe to retain indefinitely the form to which it has been molded, will be reduced to a value that it will not give trouble during vulcanization of the shoe.

Another method is illustrated in Figs. 3 and 4 in which the upper surface of the midsole 8 has been built up in the shank portion, as shown at 18, by means of suitably shaped pieces of rubberized stock attached to its upper surface to compensate for the longitudinal shank curve. Or, this compensation may be made in the same manner on the insole 2.

A method of dealing with transverse curvature in the shank is illustrated in Figs. 8 and 9. Here skived pieces of rubberized stock 20-20 are placed along the upper marginal surfaces of the shank portion of the midsole member 8 and the edge binding b at this part of the sole covers the edges of these pieces as well as the edge of the member 8. The sealing strip c extends along the marginal surface of this entire assembly. In some cases it may also be necessary to gouge or cut out a portion of the midsole 8, as illustrated in

Fig. 10. The construction here shown is, in other respects, like that illustrated in Figs. 8 and 9. And the dimensions of the parts so gouged or cut out of the member 8 so produced naturally will depend upon the degree of curvature of the last. The object in all of these cases is to make the upper surface of the midsole 8 conform, so far as may be necessary, to the curvature of the bottom of the last and to leave the bottom face of the midsole relatively flat for the application thereto of the outsole member 9 or a repair part when required. Such parts as 18 and 20 may both be used when desired.

Another method of dealing with this difficulty is illustrated in Fig. 11. Here a form piece 21 having a shape approximately complementing that of the shank is held in place by means of a strap 22 extending through a slot in said form piece and over the top of the last, this strap being tightened up and secured by a buckle 23 so that it will hold the shank portion of the bottom assembly snugly against the bottom face of the last. In some cases this function can be performed by the strap alone or by one having a section shaped for this purpose.

Essentially the same expedients above described for compensating in the bottom structure for variations in shape between the outsole and the bottom of the last, or those parts of the shoe which are necessarily shaped to the bottom of the last, may be adopted where such compensation is required at other points than in the shank. In some lasts this may be found necessary in the forepart of the shoe. Most of the difficulty, however, occurs in the shank.

An important advantage of this invention as applied to shoes intended for hard wear is that it provides a thoroughly practical way of attaching metal wear plates, hob nails, and other metal parts designed to protect the sole, improve wear, or to afford better traction. This has been found so troublesome in prior art rubber shoes that it has seldom been attempted, but it becomes entirely practical in the shoe above described. One form in which this feature may be embodied is illustrated in Figs. 17 and 18. Here the molded and vulcanized outsole 9' is equipped with toe and heel metal wear plates 25-25'. They can be secured to it by nails or prongs driven through the outsole and clinched against its upper surface. Hob nails of any desired form can also be driven through any desired parts of the outsole, and such nails, in this case of the spike type, designed to improve traction and to resist abrasion, are shown at 26. These spikes include a hardened tip *d* having a relatively sharp point and a flat base resting against the outsole, and a shell *e* enclosing the base portion of the part *d* and provided with fingers or prongs which may be driven through the outsole and clinched, as shown in Fig. 18.

This invention also lends itself readily to use in manufacture of the wedge-heel type of shoe bottoms as shown, for example, in Figs. 13 and 14. This shoe may be made in the manner above described with a wedge section 31 of wood or any suitable material, preferably rubber coated, and united to the midsole 8 during the curing operation. The molded outsole 9 may be applied in any of the ways above referred to, or the heel end of this outsole may be nailed to the wedge section, as indicated at 32. Also, if desired, hob nails 33 may be used in this part of the shoe.

In connection with the repairing operations above described, a tap sole only, such as that

shown at 34 in Fig. 16, may be applied instead of a full length outsole, and a heel section 35 may be secured to the midsole independently, as by means of nails, stitching or cement. This leaves exposed the intermediate shank section of the upper sole 8 but under some circumstances that may not be objectionable.

It will be evident from the foregoing that three important advantages are achieved by this invention:

(1) The conservation of crude rubber in the rubber footwear industry. As above explained, the proportion of new rubber essential in a shoe made in accordance with this invention can be reduced to a minimum and it may be so utilized as to obtain a high degree of balance in wear between the upper and the outsole which has not been available heretofore, so far as I have been able to learn.

(2) It makes full use of the salvage value of worn rubber footwear. While it has been possible heretofore to patch the upper of a rubber boot or shoe, there has been no way, so far as I know, of satisfactorily repairing the outsole in a manner that has served to extend the useful life of the shoe to any substantial degree. This invention, however, makes it possible to replace a worn-out sole at a very modest expense and thus to restore to the boot or shoe a very large measure of its initial usefulness. Examination of a great number of worn-out boots shows that it is rarely the failure of the upper that makes a boot unservicable but that, on the contrary, the upper usually will outwear two or three outsoles. This invention makes it possible to utilize practically all of the wear initially built into a rubber shoe.

(3) Because of the fact just mentioned, the invention also reduces to the ultimate consumer the cost of rubber footwear protection over a period of years. In other words, it gives to the consumer a greater number of wear-hours per dollar.

While I have herein shown and described preferred embodiments of my invention and a preferred manufacturing procedure, it will be evident that the invention may be embodied in other forms within the spirit and scope thereof, and that departures from details of the method described can be made while still retaining essential features of the invention.

By the term "essentially" non-curing cement used in the claims herein it is intended to cover any cement or adhesive that will not cure to the parts united thereby so strongly as to prevent them from being separated cleanly without tearing them.

This application is a continuation-in-part of my pending application Serial No. 438,657, filed April 11, 1942 and Serial No. 446,870, filed June 13, 1942. This case contains all of the subject-matter of the latter application, and claims covering the subject-matter common to this case and to the two pending applications just mentioned are presented in the instant application.

Broad claims covering the subject-matter common to this application and to my companion application Ser. No. 456,815 are presented in this case, the claims of Ser. No. 456,815 being limited to species not claimed specifically in the instant application.

Having thus described my invention, what I desire to claim as new is:

1. A rubber shoe comprising an upper and a waterproof bottom structure integrally united thereto, said bottom structure including an insole

and a midsole both vulcanized to the upper, the edge of the midsole being bound and forming part of the exposed edge of the shoe bottom, and a rubber outsole secured to said midsole by a rubber base cement between the rubber outsole and the midsole producing between said soles and adhesive union which is secure for wearing purposes but is adapted to be readily broken to permit removal of the outsole without materially damaging the midsole or upper so that the outsole can be removed when worn out and replaced by securing a new outsole to the margin of said midsole.

2. A rubber shoe comprising an upper and a waterproof bottom structure integrally united thereto, said bottom structure including an insole and a midsole vulcanized to the upper, the edge of the midsole being bound and forming part of the exposed edge of the shoe bottom, and a rubber outsole vulcanized to said midsole by an essentially non-curing rubber base cement between the rubber outsole and the midsole, whereby there is produced between said soles an adhesive union adapted to be readily broken to permit removal of the outsole without materially damaging the midsole or upper so that the outsole can be removed when worn out and replaced by securing a new outsole to the margin of said midsole.

3. A rubber shoe comprising an upper and a waterproof bottom structure integrally united thereto, said bottom structure including an insole and a midsole both vulcanized to the upper, the edge of the midsole projecting beyond lateral surfaces of the upper, said edge including a binding therefor vulcanized to the upper, a rubber outsole secured to said midsole by an essentially non-curing cement between the rubber outsole and the bound margin of the midsole, whereby there is produced between said soles an adhesive union adapted to be readily broken to permit removal of the outsole without materially damaging the midsole or upper so that the outsole can be removed when worn out and replaced by securing a new outsole to the margin of said midsole, and stitches extending through the outsole and the bound portion of the midsole and lying entirely outside of the parts of said bottom structure relied upon to keep the wearer's foot dry.

4. A rubber shoe comprising an upper and a waterproof bottom structure integrally united thereto, said bottom structure including an insole and a midsole both vulcanized to the upper, the edge of said midsole including a binding therefor exposed at the edge of the shoe bottom and vulcanized to the upper, a rubber outsole secured to said midsole by a vulcanized rubber base cement union between the rubber outsole and the midsole, the strength of said union being so predetermined that it is secure for wearing purposes but is adapted to be readily broken to permit removal of the outsole without materially damaging the midsole or upper so that the outsole can be removed when worn out and replaced by securing a new outsole to the margin of said midsole.

5. A rubber shoe comprising an upper and a waterproof bottom structure integrally united thereto, said bottom structure including an insole and a midsole both vulcanized to the upper, the edge of the midsole projecting beyond lateral surfaces of the upper, said edge including a binding therefor vulcanized to the upper, a rubber outsole secured to said midsole by a vulcanized rubber base cement union between the rubber

outsole and the midsole, the strength of said union being so predetermined that it is secure for wearing purposes but is adapted to be readily broken to permit removal of the outsole without materially damaging the midsole or upper so that the outsole can be removed when worn out and replaced by securing a new outsole to the margin of said midsole, and stitches extending through the outsole and the bound portion of the midsole and lying entirely outside of the parts of said bottom structure relied upon to keep the wearer's foot dry.

6. A rubber shoe comprising an upper and a waterproof bottom structure integrally united thereto, said bottom structure including an insole and a midsole both vulcanized to the upper, the edge of the midsole projecting beyond lateral surfaces of the upper, said edge including a binding therefor vulcanized to the upper, a rubber outsole secured to said midsole by a rubber base cement between the rubber outsole and the midsole producing between said soles an adhesive union which is secure for wearing purposes but is adapted to be readily broken to permit removal of the outsole without materially damaging the midsole or upper so that the outsole can be removed when worn out and replaced by securing a new outsole to the margin of said midsole, stitches extending around the forepart of said midsole and uniting the forepart portions of said outsole and midsole together, and a separate heel section also secured to said midsole by a similar union permitting the removal of said heel section from the shoe when worn out and its replacement by securing a new section to said midsole.

7. A rubber shoe comprising an upper and a waterproof bottom structure integrally united thereto, said bottom structure including an insole and a midsole both vulcanized to the upper, the edge of said midsole having a rubber coated fabric binding forming a part of the exposed edge of the shoe bottom, and a rubber outsole secured to the binding of said midsole by a vulcanized rubber base cement, the union between said outsole and the rubber coating of said binding being strong and the union between the portion of the rubber coating of the binding to which the outsole is secured and the binding fabric being relatively weak, whereby the latter union may be broken to permit the removal of the outsole together with that portion of the rubber coating of the binding to which the outsole is secured, thus leaving the bottom of the midsole and the fabric portion of the binding in condition for the attachment thereto of a new outsole.

8. That improvement in the methods of making rubber shoes, comprising the steps of assembling an insole and the parts of the upper with each other on a last, lasting the upper to the insole, applying a vulcanizable midsole to the bottom of the lasted assembly so produced, adhesively securing said parts to each other with the edge of said midsole forming a part of the exposed edge of the shoe bottom, vulcanizing the assembly so produced, at some stage in the process securing a preformed rubber outsole to the bottom of said midsole by a rubber base cement serving to produce a union which is secure for wearing purposes but is breakable in the finished shoe to permit the removal of the outsole therefrom and its replacement with a new one, and stitching said preformed rubber outsole to the exposed marginal portion of said midsole.

9. That improvement in methods of making rubber shoes, comprising the steps of assembling an insole and the parts of an upper with each other on a last, lasting the upper to the insole, cementing a preformed and partially cured rubber outsole to an uncured rubber midsole with the latter superposed upon the former, thereafter adhesively attaching said midsole to the lasted upper, vulcanizing the entire structure so produced, adjusting the initial cure of the outsole to the requirements of the other parts of the shoe so that the vulcanizing operation on the shoe will complete the cure of the outsole and, with the cement, cause the adhesion of said outsole to the midsole only to such a degree that the outsole can be removed from the shoe when desired without injuring materially either the shoe upper or said midsole.

10. That improvement in methods of making rubber shoes, comprising the steps of assembling an insole and the parts of an upper with each other on a last, lasting the upper to the insole, cementing a preformed and partially cured rubber outsole to an uncured rubber midsole with the latter superposed upon the former, stitching the marginal portions of said outsole and midsole together, thereafter adhesively attaching said midsole to the lasted upper, vulcanizing the entire structure so produced, adjusting the initial cure of the outsole to the requirements of the other parts of the shoe so that the vulcanizing operation on the shoe will complete the cure of the outsole and, with the cement, cause the adhesion of said outsole to the midsole only to such a degree that the outsole can be removed from the shoe when desired without injuring materially either the shoe upper or said midsole.

11. That improvement in methods of making rubber shoes, comprising the steps of assembling an insole and the parts of the upper with each other on a last, lasting the upper to the insole, adhesively securing a midsole to the lasted upper, said midsole including a rubber coated binding for the edge thereof with a portion of the rubber coating covering the marginal portion of the bottom of the midsole and being cemented thereto, vulcanizing the entire assembly so produced, at some stage in the process securing a rubber outsole to said marginal rubber coating by a

vulcanized rubber base cement, and so predetermining the strengths of the adhesive unions thus produced that the union of the outsole to said rubber coating of the midsole binding will be strong and that of said marginal rubber coating of the midsole binding to the body of the midsole will be relatively weak, whereby the outsole may be removed from said shoe by breaking the latter union and peeling the outsole and that part of the coating united thereto from the underlying part of the midsole.

12. That improvement in methods of making rubber shoes, comprising the steps of assembling an insole and the parts of the upper with each other on a last, lasting the upper to the insole, producing an uncured vulcanizable midsole unit comprising a midsole body with an edge binding therefor, adhesively securing said midsole unit to the bottom of the lasted assembly with the bound edge of the unit projecting beyond lateral surfaces of the upper, vulcanizing the entire assembly so produced, at some stage in the process securing a preformed rubber outsole to the bottom of said midsole by a rubber base cement serving to unite said outsole to the edge binding of said midsole with an adhesion so limited in strength that the outsole can be removed from the shoe when desired without injuring materially either the shoe upper or said midsole, and stitching said preformed rubber outsole to the exposed marginal portion of said midsole.

13. A rubber shoe comprising an upper and a waterproof bottom structure integrally united thereto, said bottom structure including an insole and a midsole, both vulcanized to the upper, said midsole including an edge binding therefor exposed at the edge of the shoe bottom and vulcanized to the upper, a rubber outsole secured to said midsole by a vulcanized rubber base cement union between the rubber outsole and said edge binding for the midsole, the strength of said union being so predetermined that it is secure for wearing purposes but is adapted to be readily broken to permit removal of the outsole without materially damaging the midsole or the upper so that the outsole can be taken off when worn out and replaced by securing a new outsole to the midsole.

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