May 19, 1931. H. ROSENBERG 1,806,502

LADDER

Filed Dec. 31, 1928 3 Sheets-Sheet 1

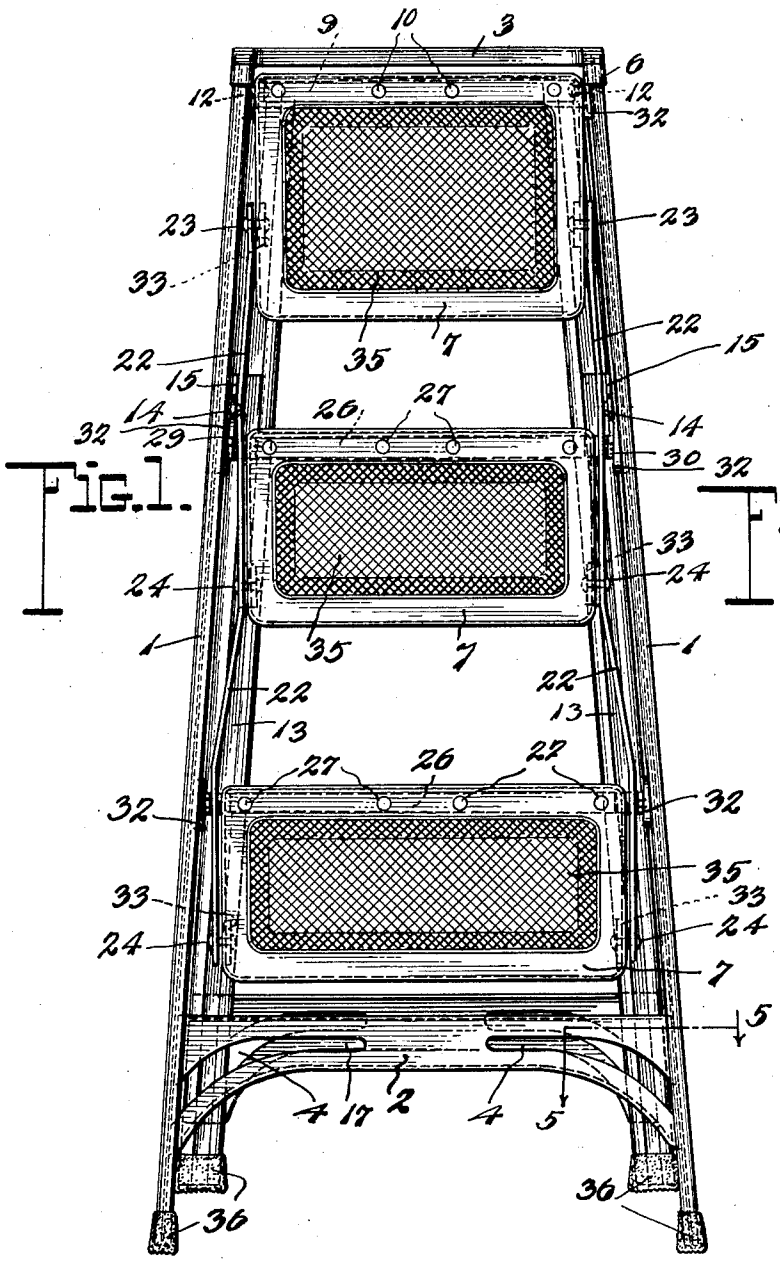


Fig. 1.

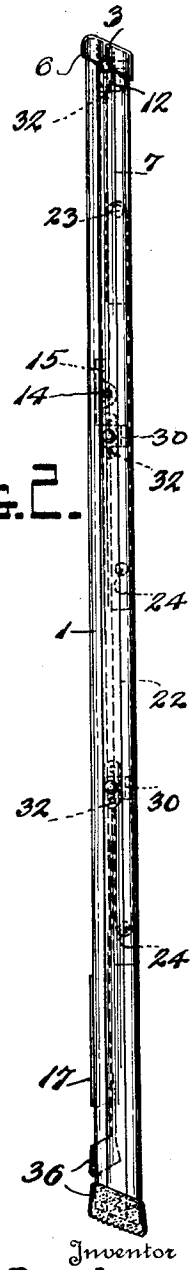


Fig. 2.

Inventor

Heyman Rosenberg

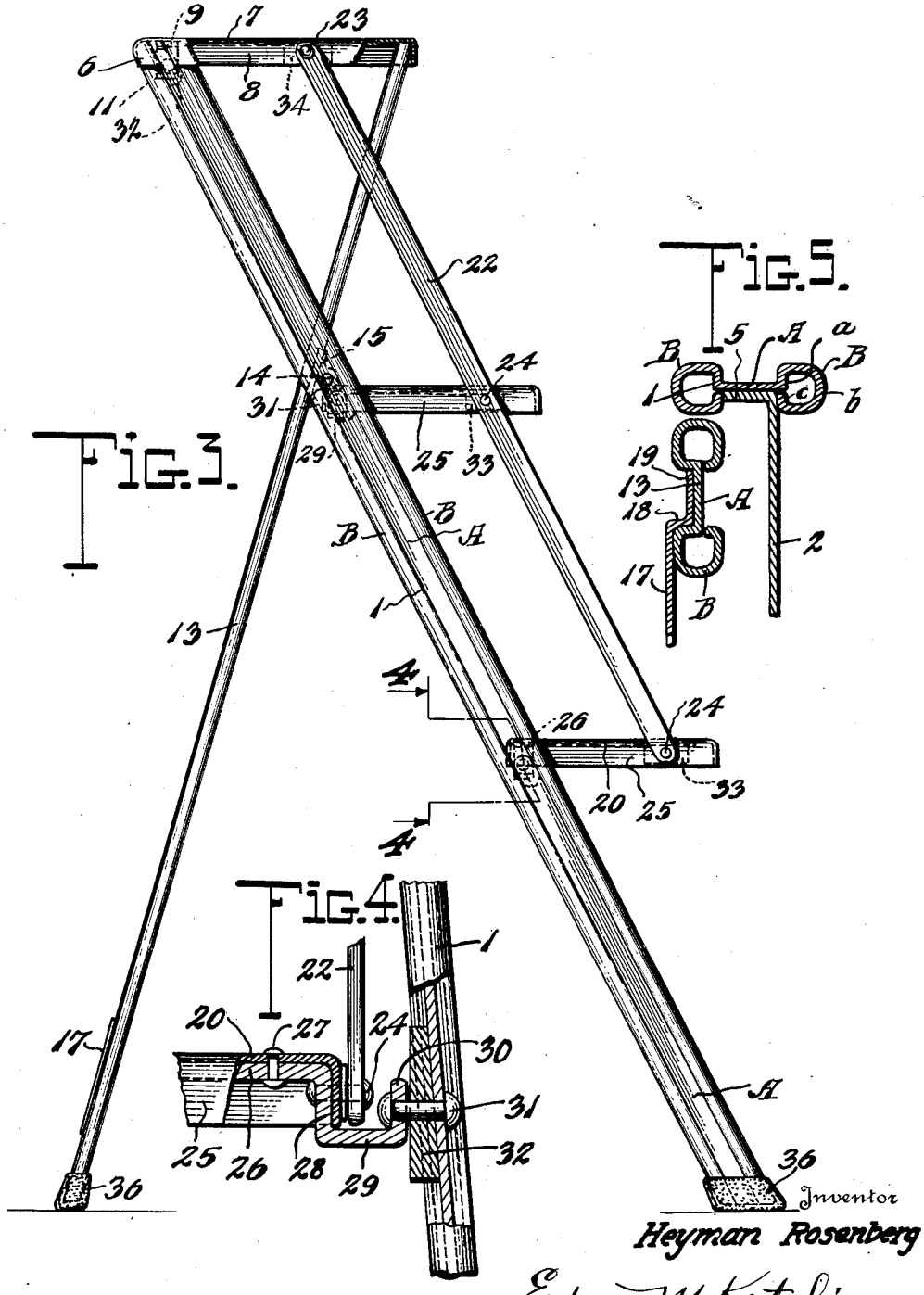
By Edgar M. Kitchin

His Attorney

May 19, 1931. H. ROSENBERG 1,806,502

LADDER

Filed Dec. 31, 1928 3 Sheets-Sheet 2



May 19, 1931. H. ROSENBERG 1,806,502

LADDER

Filed Dec. 31, 1928 3 Sheets-Sheet 3

Fig. 6.

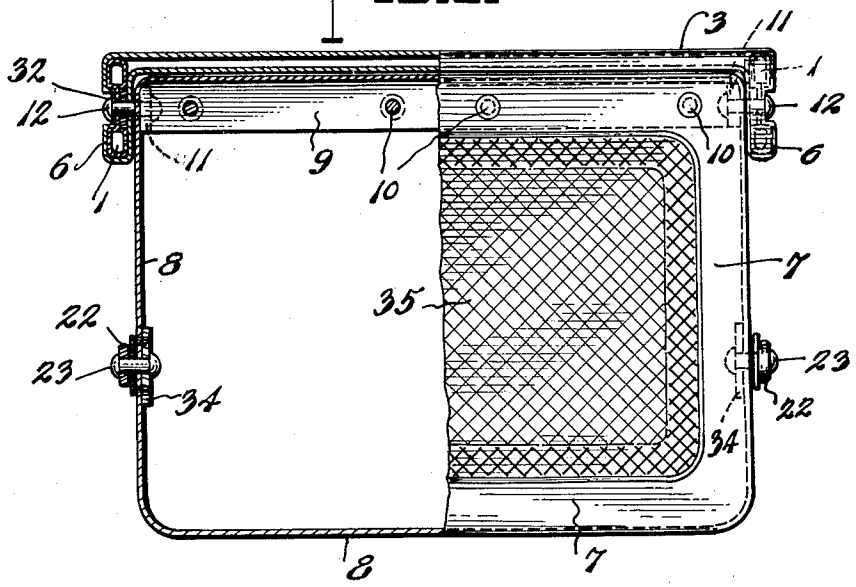


Fig. 7.

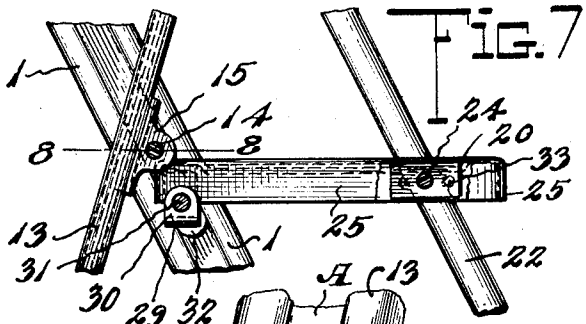
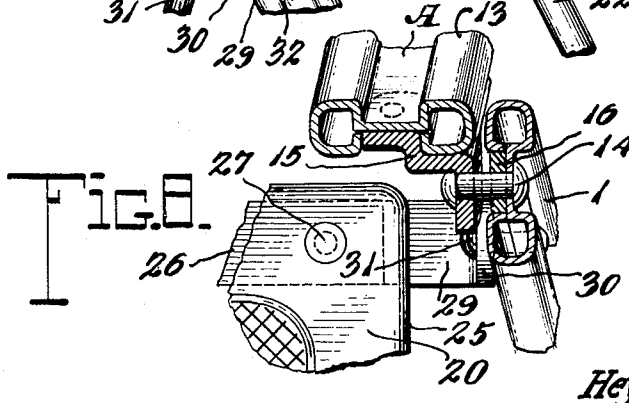


Fig. 8.



Inventor

Heyman Rosenberg

By Edgar M Kitchin,

his attorney

Patented May 19, 1931

1,806,502

UNITED STATES PATENT OFFICE

HEYMAN ROSENBERG, OF NEW YORK, N. Y.

LADDER

Application filed December 31, 1928. Serial No. 329,479.

This invention relates to improvements in the class of ladders commonly known as step-ladders, and the object in view is the provision of a light, durable, strong, and easily operated structure adapted to function effectively in use and to be collapsed to a minimum size.

With this and other objects in view as will in part hereinafter become apparent and in part be stated, the invention includes certain novel constructions, combinations, and arrangements of parts as subsequently specified and claimed.

In the accompanying drawings,—

Figure 1 is a view in front elevation of a ladder embodying the features of the present invention, the parts being shown in the folded or collapsed position.

Figure 2 is an edge view of the parts as seen in Figure 1.

Figure 3 is a view similar to Figure 2 with the parts extended or unfolded.

Figure 4 is an enlarged, detailed section taken on the planes indicated by line 4—4 of Figure 3, parts being seen in elevation.

Figure 5 is a transverse section taken on the plane indicated by line 5—5 of Figure 1 and looking downward.

Figure 6 is an enlarged plan view of the top of the ladder, parts being broken away and seen in section, and the parts beneath being omitted to avoid confusion.

Figure 7 is an enlarged, detailed elevation of the middle step portions of the ladder.

Figure 8 is a transverse, fragmentary sectional elevation taken approximately on the planes indicated by line 8—8 of Figure 7.

Lightness, strength, and durability being among the objects of the present invention, the structure is preferably formed almost wholly of sheet metal, but, of course, may be constructed of any other appropriate material. To enable use of sheet metal to form the legs or side bars and braces of the ladder, specially produced shapes are employed in the form of bars, each of which, as clearly seen in Figures 5 and 8, is I-beam shaped in cross section having an intervening web A terminating marginally in enlarged beads B. The webs and beads A and B are, of course, identical whether the resulting bar be used as the legs or side bars of the ladder or as the braces, but are preferably arranged with the webs A at right angles to each other for convenience of assemblage and compactness when folded, as will hereinafter become apparent. Each bead B is produced by offsetting, at *a*, the sheet of material forming the respective web A, and then curving the sheet to form in cross section a loop *b*, and again forming an offset *c* causing the free edge of the sheet to approach or touch the face of the web A opposite the offset portion *a*.

The organized ladder structure involves the side bars or legs 1, 1, preferably disposed to converge toward their upper ends in the usual manner of the conventional step-ladder. A spacing tie plate 2 connects the bars 1 at their lower end portions, and the upper ends are connected by a spacing tie bar 3. The plate 2 is preferably arched at its lower edge and formed with slots 4, 4 in its web for increasing lightness and improving the appearance of the structure. The plate 2 is preferably provided with marginal flanges for adding rigidity, and the terminal portions of the plate 2 are extended beyond the said marginal flanges and bent at right angles to form feet 5, disposed in contact with the web A of the respective bar 1, and preferably spot-welded thereto, or otherwise appropriately anchored to the web. The spacing tie bar 3 is preferably stamped from sheet material in a manner to provide an intervening web and pendent marginal flanges, so that the bar 3 is, in fact, a channel bar and is bent at its terminals to allow the main body of the bar to connect the upper ends of the side bars 1 while extending across the rear portions of said side bars, and having the terminal portions 6, 6 of the bar 3 disposed to enclose and form sockets for the upper ends of the side bars 1.

A platform or top tread plate 7 is arranged with its rear edge located between the side bars 1. The plate 7 is preferably of sheet metal provided with a completely-surrounding pendent marginal flange 8. A stiffening strap 9, preferably of rolled steel or the like, is arranged beneath the plate 7 within the rear

edge flange 8 thereof and contacting with the under face of the plate 7, and attached to the plate 2, as by rivets 10, 10. Of course, bar 9 may be spot-welded or otherwise effectively and appropriately anchored to plate 7 than by the rivets 10. The bar 9 has its terminals 11, 11 turned downward (when the tread plate 7 is horizontal) to provide pivot tabs for the tread plate. The tabs 11 preferably extend below the flange 8 and are alined with the web A of the respective side bars 1 and pivoted thereto by appropriate rivets 12, 12, or other appropriate pivotal connecting means. Thus the plate 7 is mounted to be free to swing on the pivots 12.

To support the plate 7 in an outstanding or horizontal position, as best seen in Figure 3, brace bars 13, 13 are provided, as is customary with step-ladders, but different in anchorage from the conventional brace by being pivoted at 14 to the respective side bar 1 at a point adjacent and slightly above the next step below the platform or top step 7. Details of the pivotal connection 14 are best seen in Figures 7 and 8. As seen in these figures, each brace bar 13 is provided with an offset plate 15 spot-welded or otherwise appropriately anchored to the web A of the respective brace 13, and having an end portion outstanding laterally from the respective brace 13 with its face approximately parallel to the adjacent face of the web A of the respective adjacent side bar 1. As the web A of the respective side bar 1 is relatively thin, it is desirable to stiffen the parts by electrically welding a plate 16 to the inner face of the web A of the respective side bar 1 through which the rivet comprising the pivot 14 is passed. The plate 16 also preferably is formed somewhat wedge-shaped or tapered to compensate for the inclination of the respective side bar 1 and to present a face of plate 16 parallel to the plane of the face of the pivot-engaged projection of plate 15. The rivet comprising the pivot 14 serves both as a pivot and as an anchorage of the respective brace 13 against lateral play, so that the upper ends of the braces 13 will maintain their proper relation to function as hereinafter stated.

As best seen in Figures 1 and 5, the braces 13 are connected at their lower end portions by a spacing tie bar 17, constructed generally like the tie plate 2, but slightly differing therefrom at the terminals for anchorage to the respective braces 13, as clearly seen in Figure 5. The tie plate 17 has its web extended beyond its marginal flange (there being an upper marginal flange to said tie plate) and said web being offset at 18 to provide an anchoring foot 19 resting against and preferably electrically welded to the web A of the respective brace 13. Thus the braces 13 are held against lateral approach or separation throughout their length by the tie plate 17 at one place and the pivotal anchorage to the side plates 1 at another. The braces 13 extend upward beyond their pivotal engagement with the side plates 1, and have their upper, free ends located to rest against the under face of the tread plate 7, socketed within the respective angles of the forward portions of the flange 8, so that weight upon the plate 7 tends to increase the intimacy of engagement between the plates 7 and the braces 13 and to prevent any possible relative movement of said parts during use of the ladder.

Spaced beneath the topmost tread plate 7 are as many tread plates 20, 20 as may be desired, according to the length of the ladder, each of the plates 20 being pivoted to the side bars 21 and being supported by suspension links 22, 22 pivoted at 23 to the top tread plate 7, and at 24 to the respective tread plates 20. As best seen in Figure 1, a link 22 is provided at each end of the series of steps 7 and 20, and each step is pivoted to both links 22, so that all steps must move together when moved, and the steps beneath the topmost tread plate 7 are suspended therefrom, and the weight of said lower steps with the load thereof at any given time is delivered through the plate 7 to the side bars 1 and the braces 13. This fact further insures against dislocation of the braces 13 during use. As best seen in Figure 1, each of the tread plates or steps 20 and 7 is of a different length from the others incident to the lateral inclination of the side bars 1, but each of said tread plates or steps is preferably substantially rectangular in form and to adapt the links 22 to the difference occasioned by the inclination of the side bars 1 with respect to the relatively straight ends of the tread plates, each link is made straight for a distance equal to the width of the respective tread plate 20, and then bent to an inclination sufficiently exceeding the inclination of the respective side bar 1 to compensate for the straight end of the next tread approached, and this offset provision of the links 22 between tread plates and straight portion across tread plates is continued throughout the several lower tread plates 20 regardless of the number thereof.

As best seen in Figures 4, 7, and 8, each of the tread plates 20 is provided with a completely-surrounding pendent marginal flange 25, and a cross strap or bar 26, similar in form and material to the bar or strap 9, is arranged along the rear or upper edge and beneath the respective tread plate and anchored to the web thereof by rivets 27, 27, or other appropriate anchorage means. Each bar or strap 26 is bent downward, as at 28, at each end to form an offset below the flange 25, and is extended, at 29, beyond said flange and provided with an upturned terminal portion or ear 30, which terminal portion or ear

is penetrated by the rivet 31 which extends through the web of the respective side bar 1 and provides a pivotal mounting for the bar 26 and the respective tread plate 20 of which it is a part. A strengthening and filler block 32 is preferably electrically welded to the web A of the respective side bar 1 at the place of each of the rivets 12 and 31, and each block 32 is preferably wedge-shaped after the manner stated with respect to the strengthening block 16, the taper being best seen in Figure 4 and being sufficient to compensate for the inclination of the respective side bar 1, and thus presenting a surface parallel to the surface of the upturned ear 30 or tab 11.

The pivots 24 are preferably in the form of rivets penetrating the respective suspension link 22, the respective end flange 25, and a plate 33 electrically welded, or otherwise appropriately fixed, to the respective flange 20 as a supplementing and strengthening means. The pivots 23, like pivots 24, are also preferably in the form of rivets and penetrate the flange 8 of tread plate 7, and also penetrate a reenforcing plate 34 electrically welded or otherwise appropriately fixed to the flange 8.

The parts are so proportioned, spaced, and arranged with respect to each other that, when in the open or extended condition, as indicated in Figure 3, they function efficiently as a ladder and are at the same time designed for and capable of easy and quick folding or collapsing to the condition shown in Figures 1 and 2. While extended and when in use, the parts are so arranged that a weight placed on the first tread 20 will have a part of its stress delivered through the pivots 31 to the side bars 1, and the balance of its stress delivered to the pivots 24, to links 22, and thence through the pivots 23 to the top tread 7 and the braces 13, and also to the side bars 1. To collapse the parts from the position seen in Figure 3, it is only necessary to swing the braces 13 on pivots 14 to the closed or collapsed position, and to allow the treads to drop to the collapsed condition. Of course, when the braces 13 are being swung to the collapsed condition, the treads are slightly elevated until the arc described by the upper ends of the braces 13 begins to descend below the normal horizontal plane of tread 7, and after that the treads descend to their collapsed condition. Ample space is provided, as clearly seen in Figure 1, to accommodate the links 22 between the treads and the side bars 1, so that the parts may readily assume the position seen in Figure 2. Also, there is ample space in the width between the planes of the front and rear edges of the side bars 1 to allow the tread plates 7 and 20 to be provided with depressions to accommodate flush-mounted rubber treads 35, or, if preferred, the tread plate itself may be provided with a roughened or other friction surface.

It is to be observed that the structure thus set forth affords particularly advantageous opportunity for use of metal in the construction of all the parts with the exception of the rubber treads, if rubber be employed. Also, it may be desirable to mount silencing cushions 36, 36 on the lower terminals of the side bars and braces.

What is claimed is:—

1. A ladder comprising side bars each consisting of a shape formed up from sheet metal, ladder treads pivoted to said bars, a brace bar pivoted to one of the side bars to swing free of the treads to and from a position to support one of the treads against pivotal movement, and means for suspending the other treads from the tread supported by the brace.

2. A ladder comprising side bars each consisting of a shape formed up from sheet metal, ladder treads pivoted to said bars, a brace bar pivoted to one of the side bars to swing free of the treads to and from a position to support the topmost tread against pivotal movement, and means connecting the treads for suspending the lower treads from the topmost tread.

3. A collapsible ladder comprising stamped sheet metal side bars spaced apart, spacers connected to sustain the side bars in their spaced relation, stamped metal brace bars pivoted to the side bars, stamped metal treads also pivoted to the side bars, the brace bars being free of all of the treads and located to engage and sustain one of the treads in an outstanding position, and a link pivotally connecting the several treads to suspend all the other treads in an outstanding position when the brace bar engaged tread is so sustained.

4. A collapsible ladder comprising stamped sheet metal side bars spaced apart, spacers connected to sustain the side bars in their spaced relation, stamped metal brace bars pivoted to the side bars, stamped metal treads also pivoted to the side bars, the brace bars being free of all of the treads and located to engage and sustain one of the treads in an outstanding position, and a link pivotally connecting the several treads to suspend all the other treads in an outstanding position when the brace bar engaged tread is so sustained, all of the parts being located with respect to each other such as to enable the pivoting of the brace bars and treads to a position lying between the planes of the edges of the side bars.

5. In ladder construction, the combination of side bars each stamped from sheet metal to a shape having a medial web and marginal beads, and a spacer for one end of the side bars having a cap at each end snugly receiving the respective ends of the side bars.

6. In ladder construction, the combination of side bars each stamped from sheet metal

to a shape having a medial web, and a stamped sheet metal spacer stamped to provide an intermediate channel terminating in end caps proportioned to snugly receive the ends of the respective side bars.

7. A collapsible ladder comprising side bars, a stamped sheet metal tread arranged therebetween, a stiffening strap fixed to the under surface of the tread and having terminal extensions disposed alongside the respective side bars, means pivotally connecting the terminal extensions to the side bars, and a brace bar pivoted to one of the side bars for swinging to and from a position for sustaining the tread in an outstanding position against pivotal movement.

8. A collapsible ladder comprising side bars, a stamped sheet metal tread arranged therebetween, a stiffening strap fixed to the under surface of the tread and having terminal extensions disposed alongside the respective side bars, means pivotally connecting the terminal extensions to the side bars, and a brace bar pivoted to one of the side bars for swinging to and from a position for sustaining the tread in an outstanding position against pivotal movement, the said tread being formed with a marginal flange and said strap being bent about the flange to reach the respective side bar.

9. A collapsible ladder comprising side bars, a stamped sheet metal tread arranged therebetween, a stiffening strap fixed to the under surface of the tread and having terminal extensions disposed alongside the respective side bars, means pivotally connecting the terminal extensions to the side bars, and a brace bar pivoted to one of the side bars for swinging to and from a position for sustaining the tread in an outstanding position against pivotal movement, and a second tread pivoted to the side bars and having a pivotal suspension from the first-mentioned tread.

10. A collapsible ladder comprising side bars, a stamped sheet metal tread arranged therebetween, a stiffening strap fixed to the under surface of the tread and having terminal extensions disposed alongside the respective side bars, means pivotally connecting the terminal extensions to the side bars, a brace bar pivoted to one of the side bars for swinging to and from a position for sustaining the tread in an outstanding position against pivotal movement, a second tread pivotally suspended from the first tread, and a stiffening strap fixed to the second tread and having extensions pivoted to the side bars.

11. A ladder comprising side bars each consisting of a shape formed up from sheet metal, ladder treads similarly formed and pivoted to said bars, one of said treads having a flange extended to provide an angle between the tread and the flange, a brace bar pivoted to swing for moving one of its ends into and out of the said angle, and means connecting the flanged tread to the other treads for sustaining the latter when the flanged tread is sustained by engagement of the end of the brace bar in said angle.

In testimony whereof I affix my signature.

HEYMAN ROSENBERG.