March 24, 1925. 1,531,237

M. M. LARSEN

STEPLADDER

Filed March 10, 1924 2 Sheets-Sheet 1

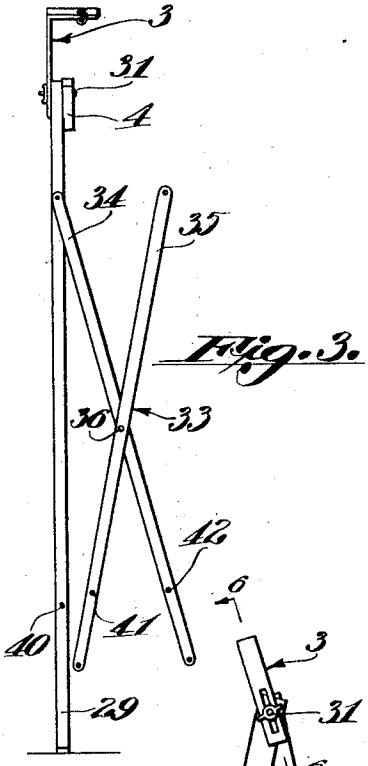

Fig. 3.

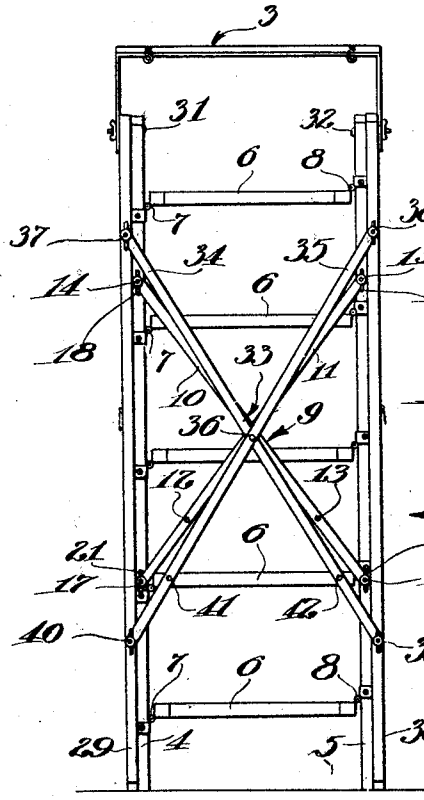

Fig. 2.

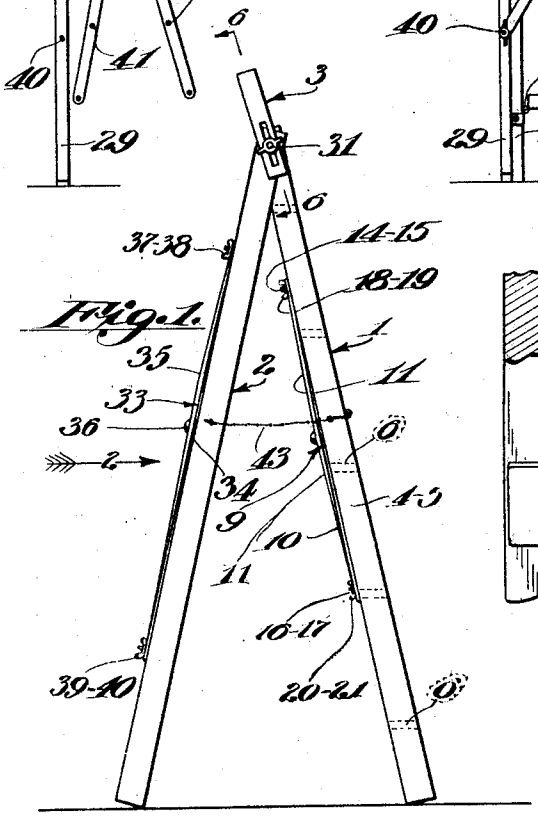

Fig. 1.

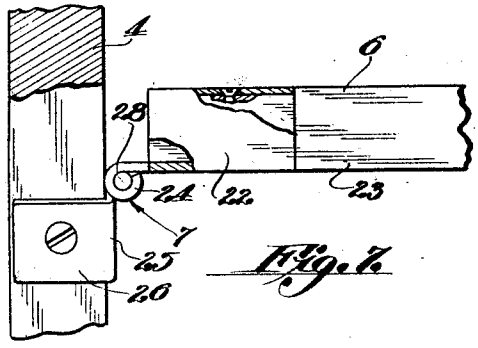

Fig. 4.

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Fig. 5.

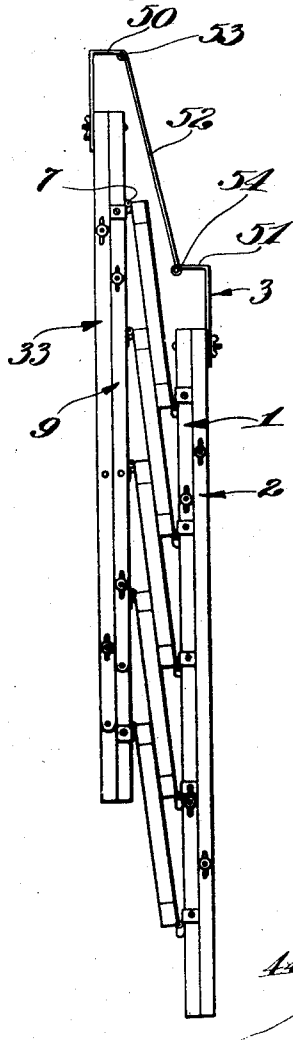
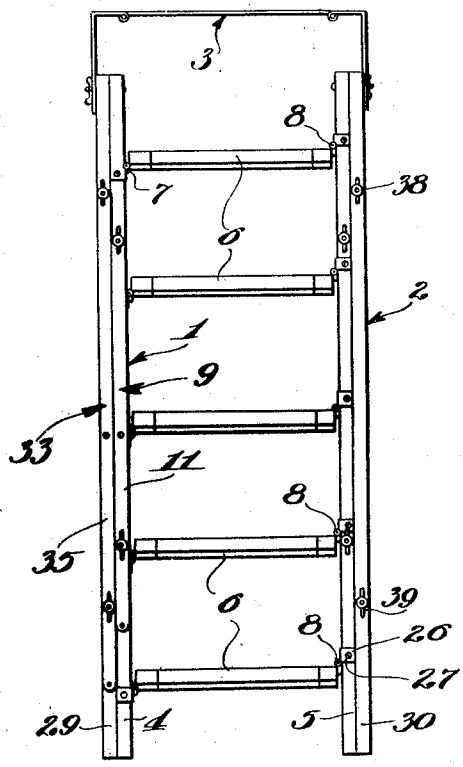


Fig. 4.



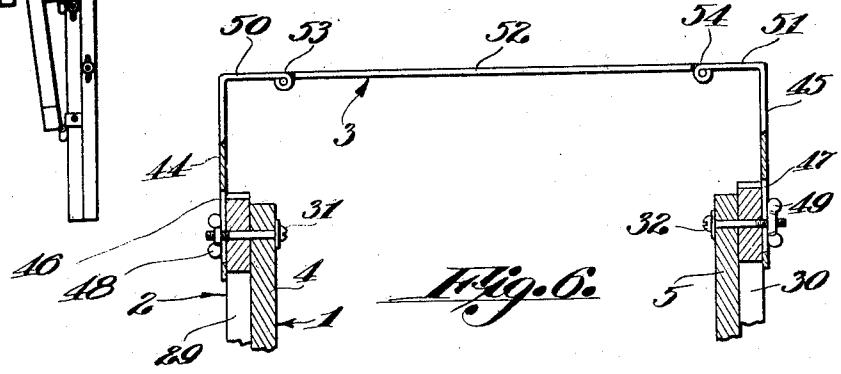


Fig. 6.

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UNITED STATES PATENT OFFICE.

MADS M. LARSEN, OF COLTON, CALIFORNIA.

STEPLADDER.

Application filed March 10, 1924. Serial No. 698,116.

To all whom it may concern:

Be it known that I, MADS M. LARSEN, a citizen of the United States, residing at Colton, in the county of San Bernardino and State of California, have invented new and useful Improvements in Stepladders, of which the following is a specification.

My invention relates to step ladders and consists of the novel features herein shown, described and claimed.

An object of my invention is to make a portable folding step-ladder.

Other objects will appear from the drawings and specification.

The drawings illustrate the invention.

Figure 1 is a side elevation of a portable folding step-ladder embodying the principles of my invention, the view being taken looking in the direction indicated by the arrow 1 in Fig. 2.

Fig. 2 is a rear elevation looking in the direction indicated by the arrow 2 in Fig. 1.

Fig. 3 is a fragmentary rear elevation illustrating the process of folding and unfolding.

Fig. 4 is a rear elevation still further illustrating the process of folding and unfolding.

Fig. 5 is a rear elevation of the ladder completely folded.

Fig. 6 is an enlarged cross sectional detail of the upper part of the ladder as indicated by the line 6—6 in Fig. 1.

Fig. 7 is an enlarged fragmentary detail showing the connection between a step and a side bar.

Broadly, the ladder consists of the step assembly 1, a brace assembly 2, and an extension assembly 3.

The details of the step assembly 1 are as follows:

The side bars 4 and 5 are connected to the steps 6 by down-swinging hinges 7 and up-swinging hinges 8. In order that the steps may be substantially horizontal when the ladder is unfolded for use, the hinges 7 and 8 extend across the inner faces of the bars 4 and 5 at a slight incline so that when the side bars 4 and 5 are inclined as shown in Fig. 1 the steps 6 will be substantially level, and in order that the side bars 4 and 5 may fold toward each other all the hinges 7 on the steps 6 must swing downwardly relative to the side bar 4 and all the hinges 8 upon the side bar 5 must swing the steps upwardly relative to the side bar 5, so as to fold as shown in Fig. 5. In order to hold the step assembly 1 unfolded and rigid a diagonal cross brace 9 is formed of two bars 10 and 11 pivotally connected together near their centers and crossing each other and having bolt holes 12 and 13 between the pivotal connection and their lower ends and having bolt holes in their extreme ends.

Screw threaded studs 14, 15, 16 and 17 are fixed to extend from the rear edges of the side bars 4 and 5 in proper positions to be received through the bolt holes at the ends of the bars 10 and 11 and wing nuts 18, 19, 20 and 21 are applied to the studs to hold the bars 10 and 11 to the bars 4 and 5 and hold the step assembly extended ready for use. When it is desired to fold the ladder the wing nuts 19, 20 and 21 are removed and the bar 10 swung upon the stud 14 and the bar 11 folded parallel with the bar 10 and the stud 17 is received through the bolt holes 12 and 13 and a wing nut applied to the stud.

The hinges 7 and 8 are all substantially alike and each hinge consists of a metal socket member 22 extending around the end 23 of the wooden step 6 and having a hinge member 24 extending from either the lower part of the socket for the hinges 7 or the upper part of the socket member for the hinges 8. The plate 25 fits against the inner face of the bar 4 and flanges 26 extend from the ends of the plate 5 and fit against the edges of the bar 4 and the flanges 26 are secured in place by screws 27. Hinge members extend upwardly from the plate 25 and match with the hinge members 24 and are connected by the hinge pin 28. The hinge members extend upwardly from the plates 25 for the hinges 7 and downwardly from the plates 25 for the hinges 8.

The details of the brace assembly 2 are as follows:

The side bars 29 and 30 are connected to the upper ends of the side bars 4 and 5 by bolts 31 and 32. A diagonal cross brace 33 formed of crossed bars 34 and 35 and connected at their centers by a pivot 36 is secured to the side bars 29 and 30 by studs and wing nuts 37, 38, 39 and 40 to securely brace the side bars 29 and 30. The brace 33 has bolt holes 41 and 42 and is adapted to be folded in the same manner as the brace 9.

A flexible connection 43 may be attached to the outer face of the side bar 30 and ex-

tend past the outer face of the side bar 5 and be attached to the forward edge of the side bar 5, so as to limit the spread of the assemblies 1 and 2 as shown in Fig. 1 and so as not to interfere with the folding operations. This connection 43 may be applied to one side or both sides or it may be omitted.

The details of the extension 3 are as follows:

Referring to Fig. 6, the extension comprises dimension bars 44 and 45 having longitudinal slots 46 and 47, the bars fitting against the outer faces of the bars 29 and 30 and the bolts 31 and 32 extending through the slots 46 and 47, so that the bars may be slid endwise to the extent of the slots and wing nuts 48 and 49 are applied to the bolts 31 and 32 against the bars 44 and 45 to hold the assembly in an adjusted position. The upper ends of the bars 44 and 45 are bent inwardly at right angles to form extension supports 50 and 51 and the connecting bar 52 is connected to the supports 50 and 51 by hinges 53 and 54. The parts are exactly laid out and made so that when the ladder is folded as in Fig. 5 the bar 52 will fold into position substantially parallel with the positions of the steps. The assembly 3 may be raised or lowered or tilted forwardly or backwardly to make a handhold, or an additional step, or a support for paint or the like, or it may be used as a means for hooking the ladder on to some elevated support.

When it is desired to fold the ladder from a position shown in Fig. 1 the bars 29 and 30 fit along the outer faces of the bars 4 and 5 and the ladder will lay flat upon the ground or floor with the diagonal cross braces 9 and 13 on top and the braces may be disconnected and folded as shown in Fig. 4. Then the side bars 5 and 30 will move longitudinally relative to the side bars 4 and 29 and produce the folded ladder as shown in Fig. 5.

Thus I have produced a portable folding ladder comprising a step assembly having side bars and steps foldably hinged together, removable and foldable braces for holding the assembly unfolded, a brace assembly having side bars pivotally connected to the upper ends of the side bars of the step assembly, removable and foldable braces for holding the brace assembly unfolded, and a foldable extension assembly mounted upon the pivots connecting the step assembly and the brace assembly.

Various changes may be made without departing from the spirit of my invention as claimed.

I claim:

1. A portable folding ladder comprising a step assembly having side bars and steps foldably hinged together removable and foldable diagonal cross braces for holding the assembly unfolded, a brace assembly having side bars pivotally connected to the upper ends of the side bars of the step assembly removable and foldable diagonal cross braces for holding the brace assembly unfolded, and a foldable extension assembly mounted upon the pivots connecting the step assembly and the brace assembly.

2. In a portable folding ladder, a foldable step assembly, a foldable brace assembly pivotally connected at its upper end to the upper end of the step assembly, foldable braces for holding the step assembly and brace assembly unfolded, and a foldable extension assembly mounted upon the top of the step assembly.

3. In a portable folding ladder, a foldable step assembly, a foldable brace assembly pivotally connected at its upper end to the upper end of the step assembly, diagonal cross braces for holding the assemblies unfolded, and a foldable extension assembly adjustably mounted at the top of the step assembly.

4. A portable folding ladder comprising a step assembly having side bars and steps foldably hinged together, removable and foldable diagonal across braces for holding the assembly unfolded, a brace assembly having side bars pivotally connected to the upper ends of the side bars of the step assembly, and removable and foldable diagonal cross braces for holding the brace assembly unfolded, each removable and foldable diagonal cross brace comprising screw threaded studs fixed in the side bars, two bars crossed and pivotally connected at their centers and having holes to fit the studs in extended positions and having holes to fit the studs in folded positions, and nuts for the studs.

5. In a portable folding ladder, a step assembly having side bars, steps foldably hinged to and between the side bars, and a removable and foldable diagonal cross brace construction for holding the assembly unfolded and comprising screw threaded studs fixed in the side bars, two bars crossed and pivotally connected at their centers and having holes to fit the studs in extended positions and having holes to fit the studs in folded positions, and nuts for the studs.

In testimony whereof I have signed my name to this specification.

MADS M. LARSEN.