L. FERGUSON.

METALLIC LADDER.

APPLICATION FILED FEB. 6, 1904.

975,223. Patented Nov. 8, 1910.

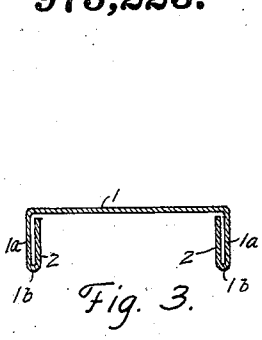

Fig. 3.

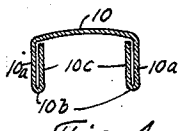

Fig. 4.

Fig. 1.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 2.

Fig. 8.

Fig. 9.

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METALLIC LADDER.

975,223. Specification of Letters Patent. Patented Nov. 8, 1910.

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To all whom it may concern:

Be it known that I, LYMAN FERGUSON, a citizen of the United States of America, residing at Ithaca, in the county of Tompkins and State of New York, have invented a new and useful Improvement in Metallic Ladders, of which the following is a specification.

My invention relates to metallic ladders generally, and the particular adaptation of the same herein shown and described relates to metallic step ladders.

The objects of my invention are to provide a metallic ladder that will be light and stronger and more durable than a wooden ladder, and one that can be cheaply manufactured.

To these ends my invention consists in the novel construction and arrangement of the several parts, as hereinafter more fully described and claimed.

For convenience I have illustrated in the accompanying drawings and have described my invention as adapted for use to metallic step ladders; but it will be evident that the principles of my construction can readily be adapted to other forms of ladders.

Referring to the drawings herewith, in which similar characters indicate like parts throughout the several figures,—Figure 1 is a sectional elevation of a metallic step ladder. Fig. 2 is a sectional view taken on the line x—x of Fig. 1. Fig. 3 is a sectional view of one of the side rails. Fig. 4 is a sectional view of one of the rear braces. Fig. 5 is a sectional view of the cap or top step. Fig. 6 is a sectional view of one of the steps. Figs. 7 are sectional views showing different forms of the treads of the steps. Fig. 8 shows the union of a stile and a step. Fig. 9 shows a section of the step and an elevation of the interior or ribbed side of the stile.

A new and novel feature of my invention is its reinforced channel formation. From the following description it will be evident that various kinds of ladders can be made by the use of my reinforced channel construction. In this description and drawings, however I show and describe a typical adaptation of the principles of such formation as applied to a step ladder, but do not desire to limit myself to the particular form of ladder herein illustrated and described.

Referring to the drawings, the side rails 1 are each formed of a single sheet or strip of sheet metal flanged at each of its edges. The sheet may be flanged by having its edges bent first inwardly as shown at 1^a, then laterally as shown at 1^b, and then outwardly as shown at 2 parallel with the inward bend 1^a. This formation makes a two-ply flange of great strength and gives to the side rails great rigidity. This makes the side rails of channel form, but it is evident that any other flanged or channeled construction could readily be adapted for the same purpose, such, for example, as an I-sheet or strip, or a tube. The steps 3 of the ladder are formed of a single sheet or strip of metal, the edges of which are first bent downwardly as shown at 4^a, then inwardly as shown at 4^b, then upwardly as shown at 5, then horizontally as shown at 5^a to provide a false top, and then downwardly as shown at 5^b and 6, when one edge 6 of the edges 6 is bent transversely as shown at 6^a and upwardly as shown at 6^b and is folded around the other edge 5^b to form a three-ply reinforcing rib 5^b, 6, 6^a, 6^b upon the false top 5^a. By following this construction it will be evident that the tread 4 5^a of the step is made of two-ply metal, and that it is reinforced at each of its edges by two-ply flanges 4^a 5, 4^a 5, and that at its center is a reinforcing rib 5^b 6, 6^a 6^b which is three-ply. The ends of the sheet are bent downwardly so as to form at each end a single-ply flange 7. The steps 3 thus constructed are secured to the side rails 1 by any suitable interlocking means, such as bolts or rivets, which pass through the flanges 1^a, 2 of the side rails 1 and also through the flanges 4^a, 5 of the steps 3. The end flanges 7 of the steps 3 are also secured by like means to the side rails, the securing means passing through the single thicknesses of the flanges 7 and the side rails 1.

The cap or top step may be formed like those just described, as illustrated in Fig. 5, or it may be made as shown at 19 with a single-ply flange on all four sides. Into the top of the side rails 1 are preferably placed blocks of wood 20, which serve as an extra support for the rod 11, and help to furnish securing means for properly fastening the top step 19 to the side rails 1. It is evident that other means for accomplishing this end, such as an end flange to the side rail 1, could be used instead of the block 20. It

is apparent that the steps 3 are as described of reinforced channeled formation, having the ribs 5^b, 6 6^a 6^b, as a reinforcing means. It is likewise apparent that a tube with a flat top and a semi-circular bottom could with like effect be used; and similarly other reinforced channeled formations could be used, such as an I-sheet or strip. Or a reinforced channel plate could be used without the reinforcement of the rib 6, and thus be in construction like the side rails 1. Preferably, however, some reinforcement is desirable, and in place of such rib a bar or rod of metal could be employed and separately secured to the side rails 1. The tread 4 of the steps 3 may be left smooth, or may be roughened in any suitable manner to prevent slipping. In Fig. 6 I have shown upwardly bent indentations as at 4; in Fig. 7 are shown at 8 corrugations and at 9 downwardly bent indentations for this purpose. Of course the indentations 4 and 9 should be placed irregularly on the surface of the treads to get the best effect from their use. The rear supporting braces 10 are formed in like manner as the side rails 1 except that they are made smaller, since they do not have to stand as must strain as the latter. The rear braces 1 are flanged by having their edges bent first inwardly, as shown at 10^a, then laterally, as shown at 10^b and then outwardly, as shown at 10^c, parallel with the inward bend 10^a. These rear braces 10 are pivoted to the side rails 1 at 12 and swing around the rod or bolt 11, and are placed between the flanges 7 and the side rails 1 so as to prevent the sidewise play to the ladder when in use. The side rails 10 are braced by strips of metal 15 which cross each other and tend to prevent the rails 10 from spreading. At a suitable distance from the top are secured metal strips 16 and 16^a, secured on either side of the ladder at 17 to rails 1 and at 18 to rails 10. The two strips 16 and 16^a are pivotally connected at 19, thus forming a hinge joint. To the bottom ends of the side rails 1 and the rear braces may be fitted shoes 21, that are secured thereto, and thus provide a smooth surface for the ladder to rest upon. Blocks of wood 22 are placed at the bottom ends of the side rails 1 and the rear braces 10 as additional supports to the securing means for fastening the said shoe to the rails and rear braces.

It is apparent that the side rails 1 and the rear braces 10, if greater strength be desired, could be reinforced by the same means as heretofore described concerning the formation of the steps 3. In practice I preferably bow the side rails 1 inwardly so as to get a greater resistance to strain, and this construction is illustrated in Fig. 2. With the construction as above described a securely built and solid ladder is made, and it is apparent that the step ladder herein particularly described can be as readily and compactly folded as the ordinary wooden step ladder.

Having thus described my invention, what I claim is:—

1. A step for ladders constructed of sheet metal with a tread part, with downwardly bent front and back parts, with upwardly bent parts extending to the tread part parallel with the front and back parts, and with horizontal parts connected together beneath the tread part so as to provide a reinforce for the step.

2. A step for ladders constructed of sheet metal with a tread part, with downwardly bent front and back parts, with upwardly bent parts extending to the tread part, parallel with the front and back parts, with a horizontal part having a depending part, and with a horizontal part having depending and upturned parts embracing the depending part so as to provide a reinforce for the step.

3. A ladder comprising a pair of side rails each constructed of sheet metal, with a side part, with inwardly bent front and back parts, and with outwardly bent parts extending to the side part parallel with the front and back parts, so as to provide reinforcing strips for the side rail of approximately the width of the front and back parts, steps, and means for securing the steps to the side rails.

4. In a ladder, sheet metal stiles, each having flanges at its edges and an intermediate flange, said flanges being longitudinally parallel and each consisting of a section of the stile bent together, sheet metal steps, each having flanges at its edges, and an intermediate flange extending longitudinally of the step, each flange consisting of a section of the step bent together, the edge flanges of the step lying inside of and against the edge flanges of the stiles with the steps in horizontal planes, and connections between the steps and stiles, substantially as described.

5. In a ladder, stiles formed of sheet metal, bent upon itself to form flanges extending lengthwise of the stiles and substantially transverse to the cross section of the stiles, there being a flange at each edge of each of the stiles and an intermediate flange, and sheet metal steps secured between said stiles, substantially as described.

6. In a ladder, sheet metal stiles, the metal of each stile being bent upon itself to form flanges extending lengthwise of the stile and upon the inside thereof transversely to the cross section, there being a flange at each edge of the stile and an intermediate flange consisting of a double thickness of the sheet, and sheet metal steps formed with flanges upon the under side of the steps, said steps being secured to the stiles, substantially as described.

7. In a ladder, sheet metal stiles, the metal

of each stile being bent upon itself to form flanges on the inside of the stile extending lengthwise thereof and substantially transverse to the cross section, there being a flange at each edge of the stile and an intermediate flange consisting of a double thickness of the sheet bent out from the stile proper, sheet metal steps, the metal of each of which steps is bent upon itself to form on the under side of the step, flanges extending lengthwise of the step and substantially parallel with and abutting the flanges of the stiles, the said steps being secured between the stiles, substantially as described.

In witness whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

LYMAN FERGUSON.

Witnesses:
GEO. L. HAGER,
S. BROWN.