Aug. 5, 1930. V. F. FRANCOIS 1,772,213

FOLDING STEP LADDER

Filed June 6, 1928 5 Sheets-Sheet 1

Fig. 1.

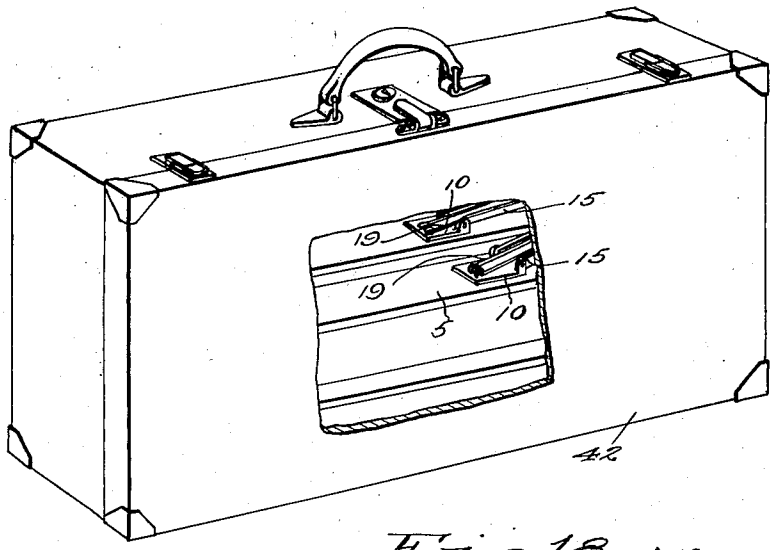


Fig. 18.

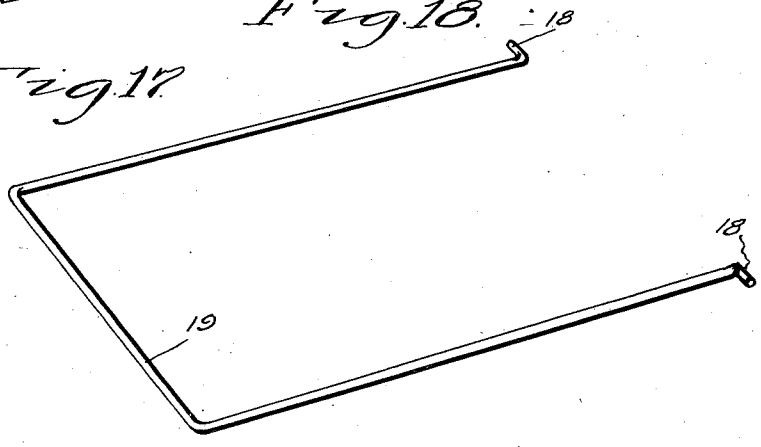
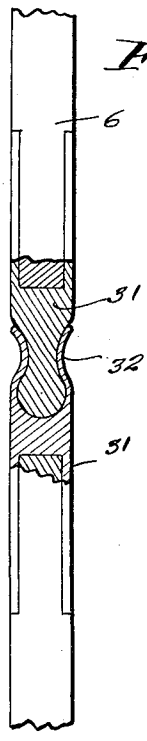


Fig. 17.



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FOLDING STEP LADDER

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Fig. 2.

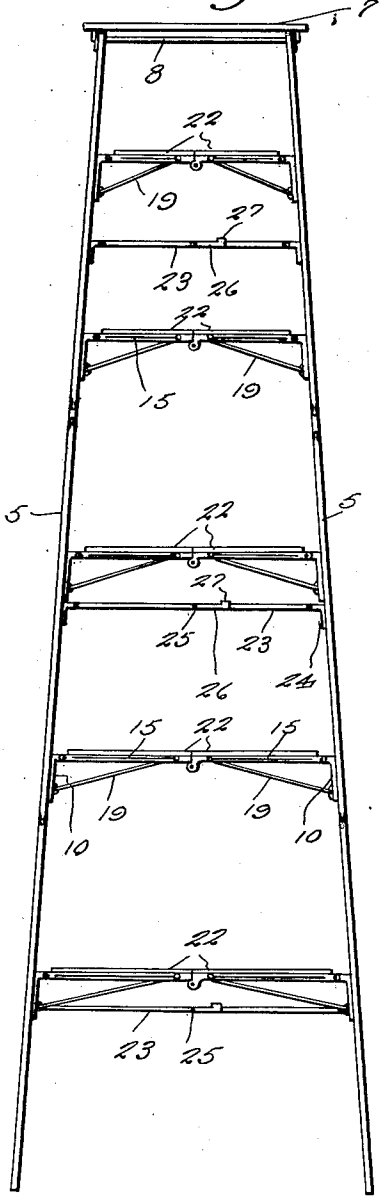
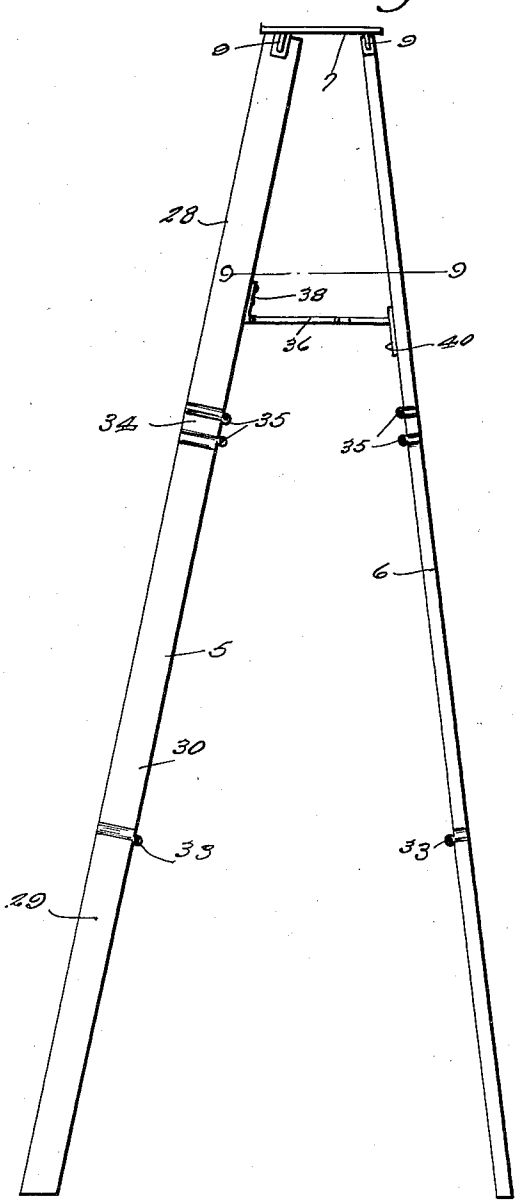


Fig. 3.



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FOLDING STEP LADDER

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Fig. 4.

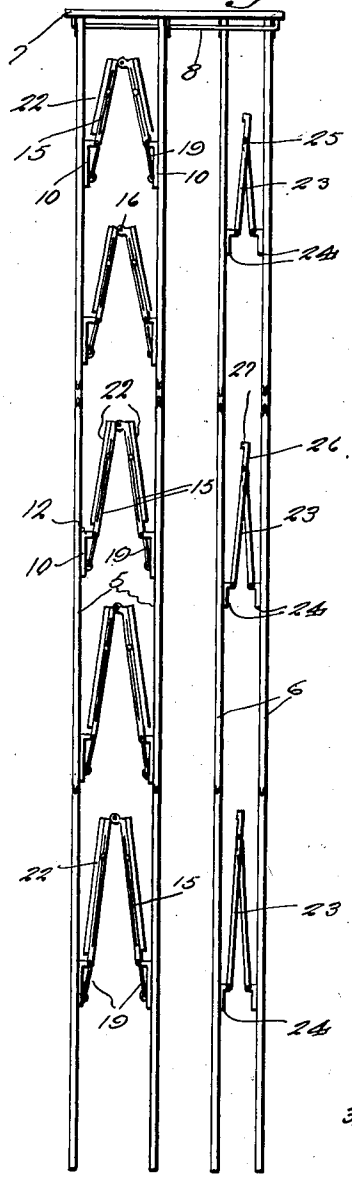


Fig. 5.

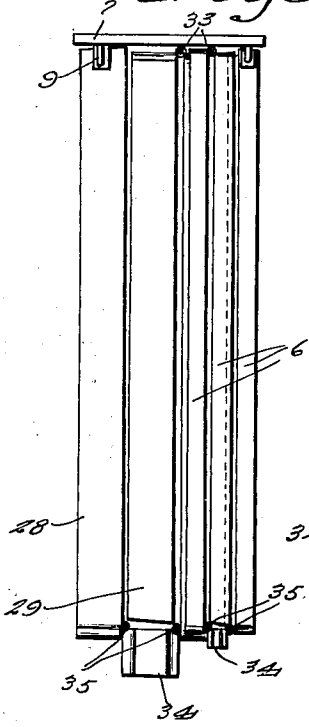
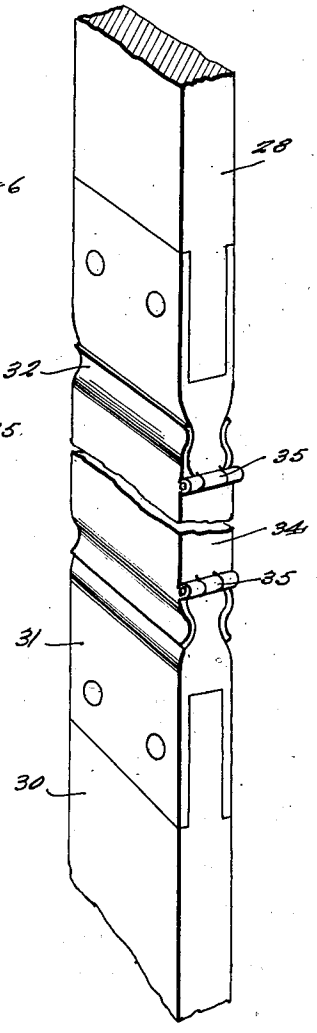


Fig. 6.



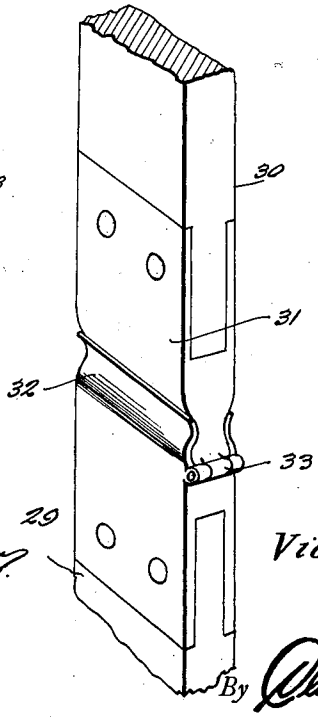


Fig. 7.

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Fig. 8.

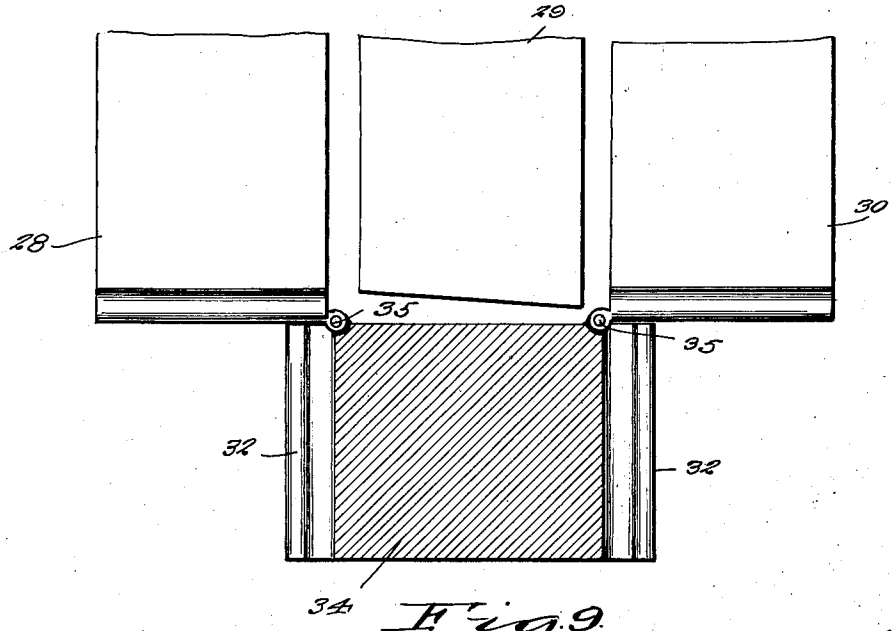

Fig. 9.

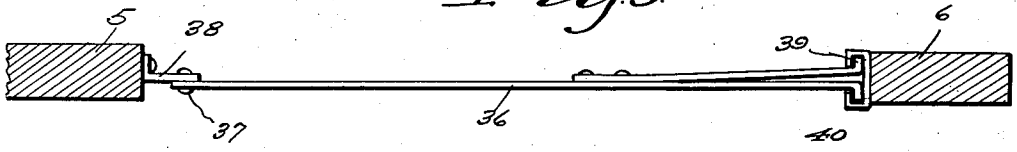

Fig. 10.

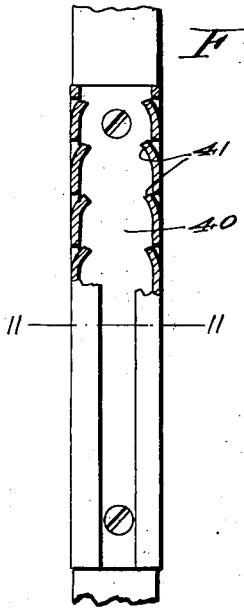

Fig. 11.

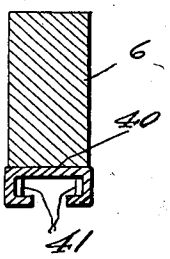

Fig. 12.

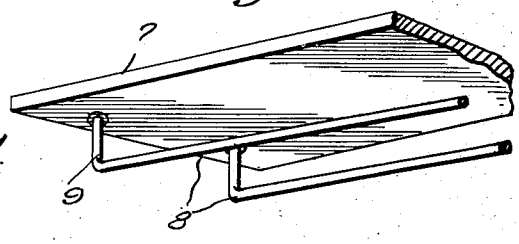

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Fig. 13

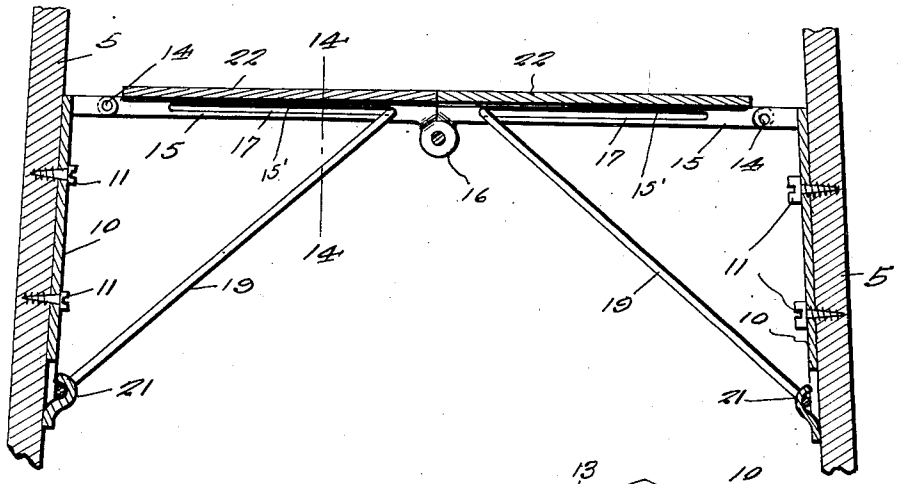


Fig. 14

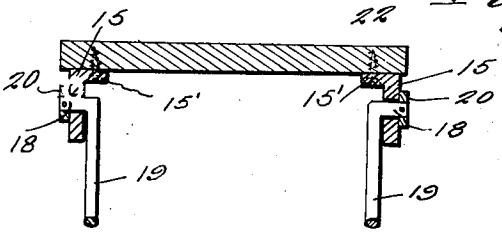


Fig. 15

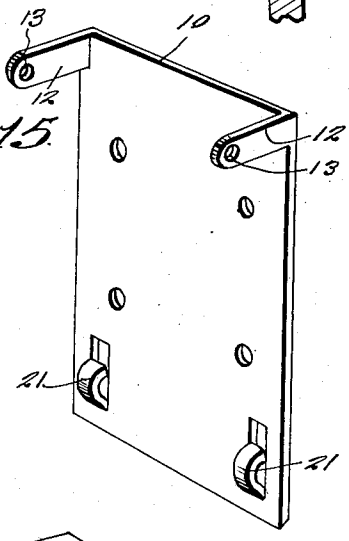
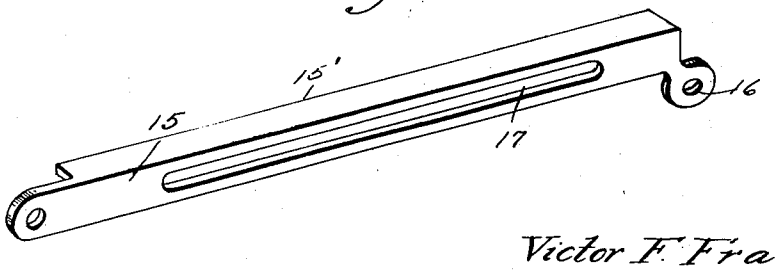


Fig. 16



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Patented Aug. 5, 1930

1,772,213

UNITED STATES PATENT OFFICE

VICTOR F. FRANÇOIS, OF NEW YORK, N. Y.

FOLDING STEPLADDER

Application filed June 6, 1928. Serial No. 283,366.

The present invention relates to folding step ladders, and has for its principal object to provide a novel construction in an article of this character, in which the ladder may be folded into an exceedingly compact form, so as to permit the convenient transportation thereof, when packed in a relatively small container, such, as, for instance, a suit case or the like.

A further object of the invention is to provide an article of this character, in which the legs of the ladder are arranged for folding, as well as each individual step forming a part of the ladder.

A still further object is to provide an article of this character which is simple and practical in construction, which is strong and durable, in which the same may be converted into its folded or extended position with a minimum amount of time and effort, which is relatively inexpensive to manufacture, and otherwise well adapted to the purposes for which the same is intended.

Other objects and advantages reside in the special construction and combination of the various elements comprising the invention, reference being had to the accompanying drawings, forming a part hereof, wherein:

Figure 1 is a perspective of a suit case of conventional construction, with parts broken away and shown in section, so as to illustrate the manner in which the step ladder may be folded, for transporting therein.

Figure 2 is a front elevational view of the ladder in extended position.

Figure 3 is a side elevational view thereof.

Figure 4 is a front elevational view, showing the manner in which one of the forward and rear legs of the ladder are adapted for transverse movement upon the folding of the steps of the ladder.

Figure 5 is a side elevational view of the ladder in folded position.

Figure 6 is a fragmentary detail perspective view of one of the hinged connections for the legs.

Figure 7 is a similar view.

Figure 8 is an enlarged detail, in section, of the intermediate joint for a pair of the folding sections of the legs.

Figure 9 is a transverse sectional view, taken substantially along the line 9—9 of Figure 3.

Figure 10 is a fragmentary detail, in elevation, and with parts broken away and shown in section, and illustrating the stop for one end of the folding brace disposed between the front and rear legs.

Figure 11 is a transverse sectional view, taken along the line 11—11 of Figure 10.

Figure 12 is a fragmentary perspective view of the top step of the ladder, and illustrating the guide rod for the transverse movement of one of the forward and rear legs of the ladder.

Figure 13 is a fragmentary transverse sectional view through one of the intermediate steps of the ladder.

Figure 14 is a vertical sectional view, taken substantially along the line 14—14 of Figure 13.

Figure 15 is a perspective view of one of the step supporting plates.

Figure 16 is a similar view of one of the supporting arms for the steps.

Figure 17 is a fragmentary vertical sectional view through one of the legs, and

Figure 18 is a perspective view of one of the U-shaped brace members for securing each of the steps.

Referring now to the drawing in detail, wherein for the purpose of illustration I have disclosed a preferred embodiment of my invention, the numeral 5 designates a pair of sectional spaced apart front legs of a step ladder, and the numeral 6 designates a similar pair of rear legs therefor.

The upper ends of each of the sets of legs are connected with a top platform or bridge member 7, having a pair of spaced apart transversely extending guide rods 8, secured to its under side in spaced relation therefrom, the rods 8 being inserted through openings formed adjacent the upper ends of the respective legs. The ends of the guide rods 8 extend upwardly for attachment to the under side of the bridge member as shown at 9 and provides a stop at each end of the guide, limiting the transverse movement of each of the legs. At spaced intervals upon the inner

edge of the legs 5 is secured an attaching plate 10, by means of screws or the like 11, the upper edge of said plate being provided with a pair of inwardly extending projections 12, disposed in spaced parallel relation and provided with openings 13, within which a pin 14 is inserted, pivotally mounting the outer ends of a sectional step supporting arm 15. Each of the projections 12 has one of the arms 15 extending therefrom, with its opposite end similarly connected to the opposite projection carried on the other leg of the ladder. The sections of the arm 15 are of a duplicate formation, and are connected to each other by a hinge joint 16. This joint is disposed substantially equi-distantly between the front legs 5. Each section of the arms 15 are provided with the longitudinally extending slotted opening 17, within which is slidably disposed the angularly arranged extremity 18 formed at the end of a U-shaped rod 19. The end of the bracket 19 is prevented from withdrawal from the slotted opening, by means of a washer 20, secured thereon, in any suitable manner, well known in the art. The bracket 19 is inclined downwardly in a direction toward the adjacent leg 5, and is pivotally seated in arcuate shaped lugs 21 struck out from the face of the plate 10. It will be apparent from the foregoing that by reason of this construction, the arms 15 may fold upwardly from their hinged connection 16, the ends 18 of the bracket being slidably disposed in the slotted openings so as to permit this upward folding movement of the sections of the arm. It will be apparent, however, from an inspection of Figure 13 of the drawing, that the arm 15 is prevented from swinging downwardly, by reason of the ends of the bracket engaging the end of the slotted opening 17 and accordingly the arm is supported in horizontal position between the legs 5. Upon the upper edge of each pair of arms 15 is formed an angular flange 15′ providing attaching means for a sectional step 22, which is attached to the arms in any suitable manner and adapted for movement with the respective sections of the arms 15, when folded upwardly. The rear legs 6 are connected by a sectional brace 23, the opposite ends of the brace being pivotally attached to brackets 24 attached to the opposed edges of the rear legs, the sections of the brace 23 being pivotally connected, intermediate their adjacent ends by a pivot pin 25. One of the sections of the brace is provided with an extension 26 disposed in closely spaced parallel relation with respect to the other of said sections and having stops 27 formed at its end and extending laterally therefrom in overlapping relation with respect to the other of said sections, whereby to prevent the downward folding movement thereof. The brace is thus secured in horizontal position for supporting the rear legs 6 in spaced relation, as illustrated in Figure 2 of the drawings, and may be folded upwardly as shown in Figure 4, to permit the legs to be moved toward each other, the manner in which the upper ends of the legs are slidably mounted on the rods 8 permitting this movement. Both the front leg 5 and rear leg 6 are constructed in sections, each of said legs comprising upper and lower end sections 28 and 29 respectively and an intermediate section 30. The respective sections of the legs are disposed in end to end relation and the adjacent ends of each section are provided with an end plate 31 to form a reinforcement for the material at the ends of the sections, the ends of the plate of the lower section 29 also being provided with a pair of spaced apart spring pressed fingers 32.

The end of the plate carried at the adjacent end of the intermediate section 30 having its sides formed with transversely extending grooves within which the fingers 32 are seated in friction gripping relation. The rear edges of the plates 31 carried by the adjacent ends of the leg sections are also connected by a hinge 33, whereby to provide for the folding of the lower section 29 upwardly and rearwardly against the rear edge of the intermediate section 30. Between the upper ends of the intermediate section 30 and the upper section 28 is interposed a hinged block 34, also having its upper and lower edges provided with a pair of the spaced apart spring pressed fingers 32, for seating in grooves formed transversely in the end plates 31 at the adjacent ends of said sections. The end block is also connected to each of the sections by hinges 35 arranged along the rear edges thereof. By reason of this connection, the intermediate section 30 may also be swung rearwardly and upwardly, and by reason of the hinged block 34, when folded, the intermediate section 30 will be disposed in spaced relation from the upper section 28 as illustrated in Figure 5 of the drawing, the space between such sections serving to accommodate the lower leg section 29.

The rear legs 6 are likewise formed into sections and connected to each other in a similar manner as that provided for the front legs and accordingly are adapted to be folded similar thereto. However, instead of connecting the sections of the rear legs 6, for folding rearwardly and upwardly, the hinges are arranged at the front edges of the rear legs, so that the same may fold forwardly and upwardly as clearly illustrated in Figures 3 and 5 of the drawings. Accordingly, when arranging the legs in their folded positions, one of the front legs 5 is moved along the rod 8 toward one edge of the ladder, and the opposite rear leg 6 is moved toward the opposite edge, as illustrated in Figure 4 of the drawings, so that the respective legs may be folded without interfering with each other.

The front and rear legs of the respective sides of the ladder are connected by a brace 36 for securing the same in position for use, said brace being pivotally connected at one end by a pivot pin 37, to a bracket 38, attached to the front leg 5, and having its opposite end formed into a pair of spaced apart spring pressed fingers 39 extending outwardly from each other in opposite directions and arranged for insertion in a channel shaped guide 40, attached to the respective rear leg 6. The walls of the channel shaped guide 40 are formd with a series of inwardly extending clips 41, adapted to restrict the movement of the fingers 39 within the guide.

The end of the brace provided with the fingers 39 is thus prevented from accidentally slipping from the guide, after the same has been placed in position therein, for supporting the legs of the ladder, in spaced relation for use, as shown in Figure 3 of the drawings.

It will be apparent from the foregoing that the various parts entering into the construction of the ladder may be folded in an extremely compact manner as shown in Figure 5 of the drawings, and may be conveniently packed, when so folded, within a suitcase, as shown at 42, for the convenient transportation thereof.

It is obvious from the foregoing that the invention is susceptible of various changes and modifications, without departing from the spirit or scope of the invention or sacrificing any of its advantages, and I accordingly claim all such forms of the device to which I am entitled.

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

1. A folding step ladder comprising a bridge member, spaced apart guides mounted on said bridge member, a ladder unit slidably connected with one of the guides and having foldable steps and a prop unit slidably connected with the other guide, said ladder and prop units consisting respectively of sections hingedly connected to be folded upwardly, and inwardly one upon the other in a compact form, said ladder and prop sections being collapsible respectively at diagonally opposite portions of said guides, whereby the folded sections may be folded laterally of each other.

2. A folding step ladder comprising a bridge member, spaced apart guides mounted on said bridge member, a ladder unit slidably connected with one of said guides and having foldable steps, a prop unit slidably connected with the other guide, said ladder and prop units consisting respectively of sections hingedly connected to be folded upwardly and inwardly one upon the other in compact form, said ladder and prop sections being collapsible respectively against diagonally opposite portions of said guides whereby the units may be folded laterally of each other, a brace on one of the ladder sections, and a brace securing guide on one of the top sections.

3. A foldable step ladder comprising a bridge member having a pair of depending parallel guides, a pair of spaced legs slidably connected with one of the said guides and consisting respectively of sections hingedly connected to be folded one upon the other, foldable steps connecting corresponding sections and collapsible to permit the said legs to be moved relatively into juxtaposition, and a prop depending from the other guide and also consisting of foldable sections.

4. A foldable step ladder comprising a bridge member, guides on said member, a pair of spaced legs slidably connected with each guide, each of said legs consisting of upper and lower sections hingedly connected to permit the folding of the lower sections inwardly and upwardly of the upper sections, foldable elements connecting the corresponding sections of the pair of legs and collapsible to permit the said legs to be moved into juxtaposition, and means for holding the respective upper and lower sections in extended relation, said means comprising a pair of spaced apart spring fingers carried by one of the sections for frictional gripping engagement with an adjacent section.

5. A foldable ladder comprising a pair of legs having openings in the upper ends thereof, a transversely extending guide rod having its ends slidably extended through the openings in the upper ends of the respective legs, stops on the ends of the said rods for limiting the transverse movement of the legs, a plurality of longitudinally spaced plates secured to the opposing inner edges of the said legs, the said plates having a pair of spaced inwardly extending projections at their upper ends and spaced arcuate lugs at their lower ends, step supporting arms pivotally connected at opposite ends to the corresponding projections of opposed plates, said arms respectively consisting of longitudinally slotted and hingedly connected sections, a U-shaped rod associated with each plate with its bight portion pivotally seated in the said lugs of the plates and its arms engaged in the slots of said step supporting arms, and step sections carried by said arm sections.

In testimony whereof I affix my signature.

VICTOR F. FRANÇOIS.