

Nov. 14, 1933.

E. BRESLOW

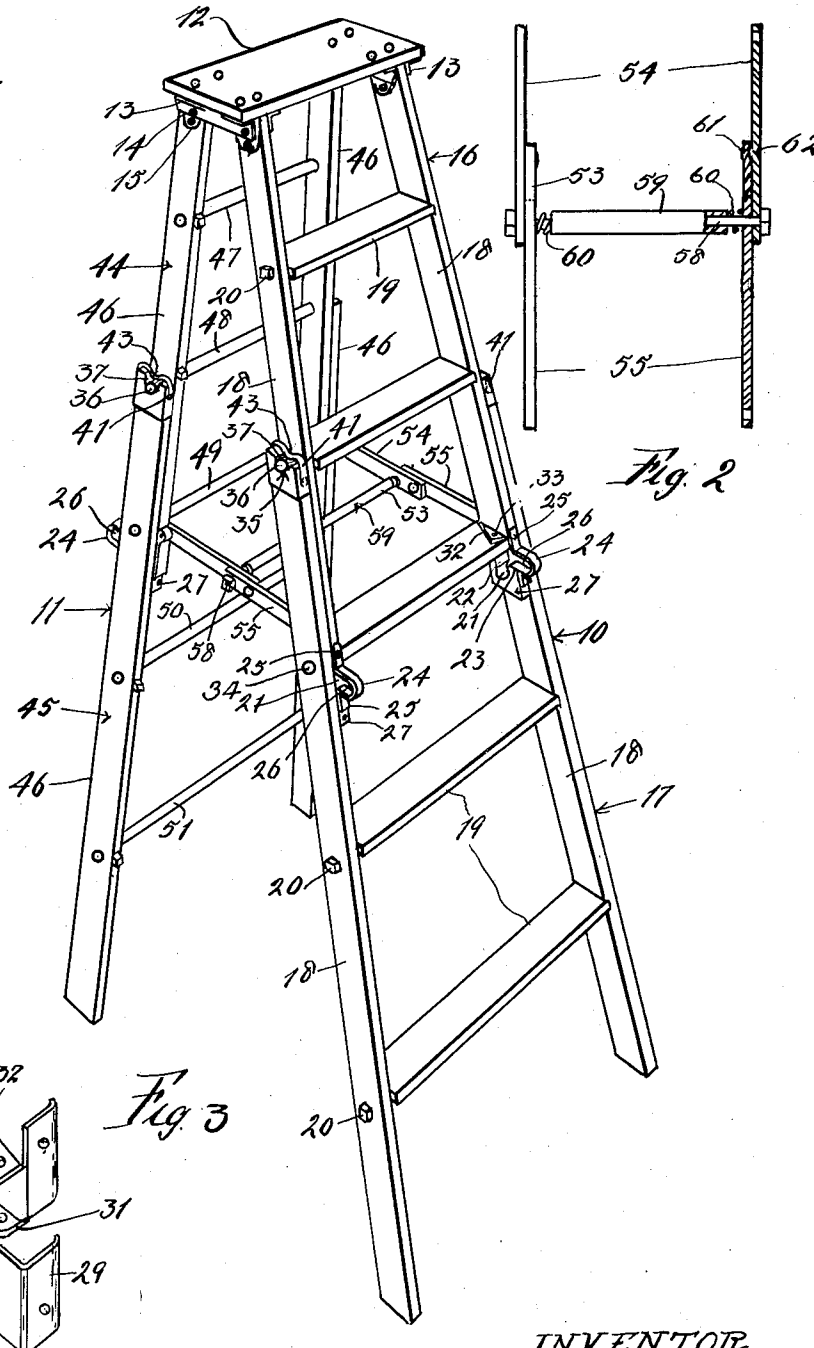
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FOLDING LADDER

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Fig. 1.



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Fig. 4.

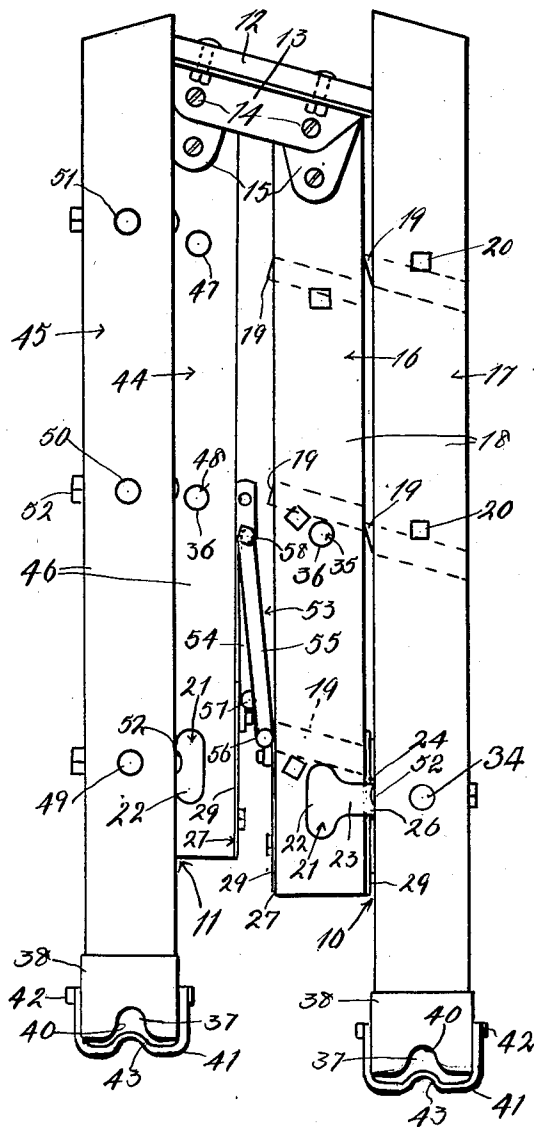
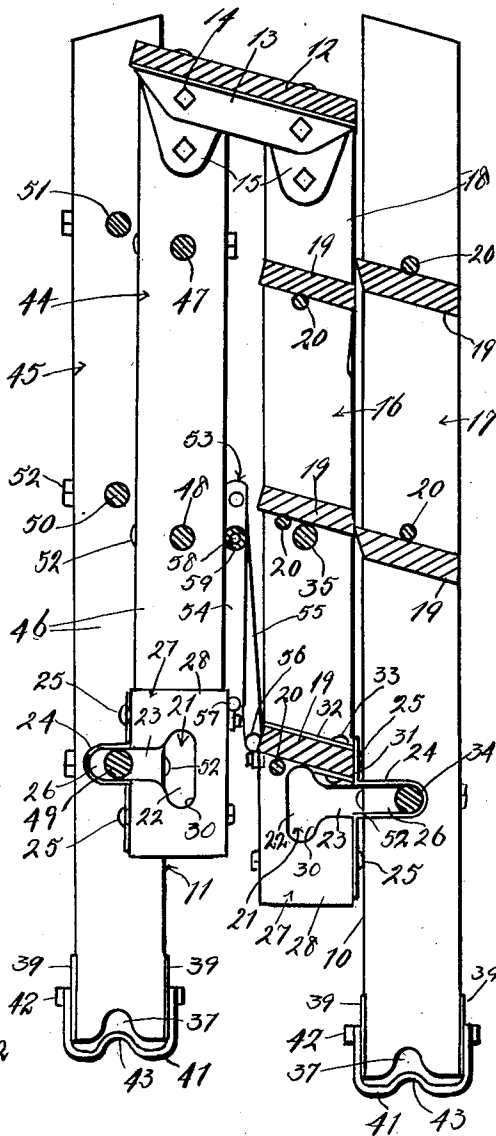


Fig. 5



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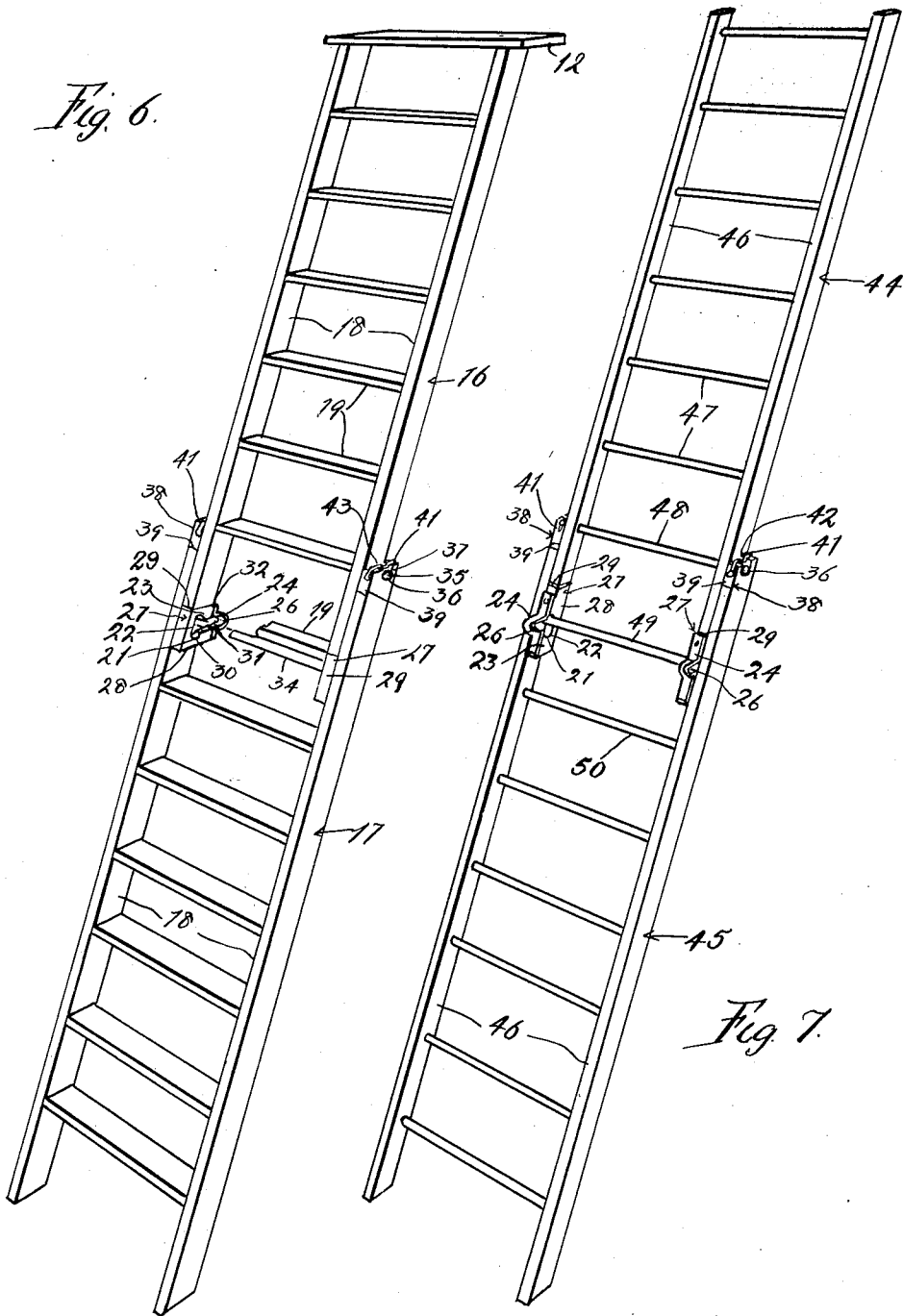
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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FOLDING LADDER

Edward Breslow, Camden, N. J.

Application July 19, 1932. Serial No. 623,311

6 Claims. (Cl. 228—24)

My invention relates to new and useful improvements in a folding ladder, and has for one of its objects to generally improve the construction of such devices whereby parts may be folded upon one another into compact form and which when extended for use will be strong and durable.

Another object of the invention is to provide a folding step ladder in which the sections of both the brace and step portion of the ladder are foldable but inseparable in order to produce a relatively small compact parcel which will occupy a small amount of space lengthwise and thereby permit easy transportation.

A further object of the invention is to provide one section of a ladder element with T-shaped sockets, the stem portions of which project outside of the edges of the ladder element stiles whereby when the sections of a ladder element are folded, said stiles will parallel one another.

Another object of the invention is to provide a ladder having T-shaped sockets wherein the outer ends of the socket stems are formed by generally U-shaped straps mounted on the outer edges of the stiles of one section with which register a rung or the equivalent of the other section, the outer ends of the socket stems being of sufficient length that when a rung is at the extreme outer ends of said sockets the stiles of the ladder sections will be parallel even though the steps project beyond the outer edges of the stiles.

A further object of the invention is to apply my invention to an ordinary step ladder or a foldable straight ladder having steps or a foldable straight ladder having runs.

A still further object of the invention is to provide unique means for fastening the sections of the ladder in an extended position.

With these and other ends in view, this invention consists in the details of construction and combination of elements hereinafter set forth and then specifically designated by the claims.

In order that those skilled in the art to which this invention appertains may understand how to make and use the same, I will describe its construction in detail, referring by numerals to the accompanying drawings forming a part of this application, in which:—

Fig. 1 is a perspective view of a step ladder illustrating one embodiment of my invention.

Fig. 2 is an enlarged view partly in elevation and partly in section, showing one form of spreader.

Fig. 3 is an enlarged perspective view of one of the socket plates.

Fig. 4 is an enlarged side elevation of the step

ladder illustrated in Fig. 1, shown in a folded condition.

Fig. 5 is a longitudinal sectional view of Fig. 4.

Fig. 6 is a perspective view on a reduced scale of a straight step ladder constructed in accordance with my invention with parts broken away to clearly illustrate details of construction.

Fig. 7 is a view similar to Fig. 6, of a ladder having rungs in lieu of the steps.

In carrying out my invention as herein embodied, 10 and 11 represent the step portion and brace respectively, both of which are pivotally connected to the top or platform 12 by suitable brackets 13 and pivoting means 14, such as bolts or their equivalents. If found desirable, wear plates 15 may be interposed between the brackets and contiguous parts of the brace and step portion, particularly when the latter is made of wood.

The step portion 10 is made up of a number of sections, and in the particular embodiment herein illustrated, I have shown said step portion as comprising two sections 16 and 17 and each section includes a pair of stiles 18 between and to which are secured a suitable number of steps 19. While it is not absolutely essential, I prefer that in the step ladder the stiles diverge from their upper ends toward their lower ends.

The stiles and the steps, if found desirable, may be braced by cross rods 20 located directly beneath each step and these brace rods may be in the form of long bolts having nuts threaded on one or both ends thereof.

Each stile of one of the step portion sections, for instance that of the upper section 16, has a portion of a T-shaped socket 21 formed therein with the head 22 of such socket located completely within the body of the stile, while the stem 23 leads to an edge, preferably the outer edge, when considered with the ladder in an upright, extended or open condition as shown in Fig. 1, and on said edge of the stile is mounted a U-shaped strap 24 having its ends bent outwardly to receive fastening devices 25 by which said strap is secured to the stile. The open end of this U-shaped strap aligns or registers with the open end of the stem 23 of the socket and forms an extension 26 of said stem.

In forming the socket 21, considerable of the stile material is removed and in order to strengthen the same, I provide a plate 27, Fig. 3, including a panel 28 to engage the inner face of a stile and from the side edges of which project flanges 29 to engage the edges of the stile. In the panel is formed an opening 30 corresponding

to the shape of the socket 21 and the flange 29 contiguous the smaller part of the opening 30 is cut away so as to give access to the stem 23 of the socket, and during the formation of the opening 30 part of the metal of the panel is only partially severed so that it may be bent up to form a tongue 31 to underlie an adjacent step while the upper part of the panel 23 is partially severed from one of the flanges 29 and bent outwardly to produce a triangular shaped lip 32 to overlie the same step under which the tongue is positioned, and a fastening device 33 is passed through the lip, the coacting step and the tongue. The fastening devices 25 used for attaching the straps 24 to the stiles may also be used for fastening the strengthening plates in position.

The other section, as 17, of the step portion 10 has a bar 34, which may be in the form of a ladder rung extending crosswise between the stiles 18 of said section 17 and spaced from the adjacent or uppermost step 19 of said section 17 a distance approximately equal to the spacing of the steps because said bar is to underlie the lower step of the section 16 when the ladder is extended or in an open position.

The bar 34 is enclosed within the sockets, including the straps 24, and prevents separation of one section from the other but permits one of the sections to be rotated or swung in a semicircle and moved laterally within the limitations of the sockets and also moved longitudinally within the heads of the sockets for purposes which will be presently and more fully described.

The section 16 of the step portion also has a bar 35, which may be in the form of a rung, extending crosswise between the two stiles of said section and preferably underlies the second step from the bottom of said section although this position is not compulsory. By passing said bar 35 under a step, said bar is less likely to interfere in any way with the use of the ladder.

The ends of the bar 35 project beyond or outside of the outer flat or side faces of the stiles 18 of said step section 16 and provide projections 36 for registration with notches 37 in the inner or normally upper ends of the stiles 18 of the step section 17, and when the projections 36 are seated in the notches 37, the rod 34 will be in the normally upper ends of the heads 22 of the sockets 21, thereby preventing rotary or swinging movement of the lower section 17 relative to the upper section 16.

In order to prevent the stiles from splitting due to the notch ends, plates 38 which are U-shaped in cross section and therefore have flanges 39 are placed over the outside side faces of the normally upper ends of the stiles and said plates have notches 40 in their normally upper edges corresponding with the notches 37 of the normally upper ends of the stiles.

Bails 41 are hinged to the normally upper ends of the stiles of the section 17 by means of fastening devices 42 which pass through eyes at the ends of the bails through the flanges of the plates 38, and edgewise through the stiles for securing together all the coacting parts. By this arrangement, the bails can swing over the normally upper ends of the stiles crosswise of the notches 37 and engage or overlie the projections 36 which will prevent one step section moving longitudinally away from the other step section and in order to provide a binding action of the bails upon the projections or cause said bails to frictionally engage said projections in order to prevent accidental displacement of the bails, the

cross bar portions of said bails are provided with offsets or inwardly projecting bends 43 which because of the spring material from which the bails are made will have a certain amount of resiliency to permit them to be forced over the projections 36.

Like the step portion of the ladder, the brace 11 is made of two sections 44 and 45, each section including a pair of stiles 46 between which are mounted a plurality of bars 47, 48, 49, 50 and 51, all of which may be in the form of ladder rungs but one of them, as 49, is the cross bar for registration with the sockets and component parts formed in the stiles of the upper section 44 identically the same as that described in connection with the step portion of the ladder and all of the other parts being identical, the same numerals will be used on similar parts and by reference to Fig. 4, in particular, it will be obvious that it is the ends of the rung or bar 43 that becomes the projections 36.

Any number of these bars may be used or any other arrangement provided for stiffening and strengthening the stiles of the brace, but if they are equal in number and spaced similar to the steps of the step portion of the ladder then the brace can also be used as a ladder, but of a different type.

Since the cross bars in the brace are considerably smaller in diameter than the width of the stiles, the straps forming portions of the socket stems or the stem extensions of the sockets in the brace, the loop portions of said straps may be much shorter than those used in connection with the step portion of the ladder. This is due to the fact that as soon as the bar 49 is outside of the outer edge of the bar section 44, the bars 50 and 51 can be brought into contact with the outer edges of the stiles of said upper brace section to bring the stiles of both sections into parallelism when one section is folded upon the other as in Figs. 4 and 5.

In order to make the ladder exceedingly strong, all of the cross bars, whether used as rungs or otherwise, may be fastened by suitable securing means 52, such as bolts passing edgewise through the stiles and through the ends of the bars within the stiles.

Any suitable spreader may be used for holding the step portion and the brace in separated positions as shown in Fig. 1, and for convenience of illustration, I have shown a spreader 53 comprising two pairs of levers 54 and 55, one pair being pivoted to the step portion as at 56 and the other pair pivoted to the brace as at 57, while adjacent ends of both pairs of levers are pivoted on a rod 58 surrounded by a sleeve 59 with springs 60 between the ends of the sleeve and the levers of a contiguous pair. In order to hold the levers in an expanded condition against accidental displacement, one pair of the levers is provided with indentations 61 for engagement by projections 62 on the other pair of levers. While the levers will remain expanded under ordinary or normal conditions, a small amount of extra force will disengage the projections from the indentations and permit the spreader to be collapsed, thereby closing up the step portion and brace of the ladder relative to each other.

In Fig. 6, I have shown a modification of the invention adapting it to use as a straight ladder having steps and therefore is identical with the step portion of the ladder illustrated in Figs. 1, 4 and 5, with the exception that the top or platform 12 is immovably fixed to the top section in-

stead of said top section being pivotally connected to the platform or top. The parts for making the ladder a foldable one being identically the same as those used in connection with the step portion of the step ladder, the same reference numerals are applied.

A further modification is illustrated in Fig. 7, wherein rungs are used in place of the steps shown in the modification illustrated in Fig. 6, and therefore said modification illustrated in Fig. 7, is similar to the brace of the step ladder shown in Fig. 1, with the exception that the top or platform is entirely eliminated, although it will be obvious that such platform or top could be utilized if desired and it is to be understood that where parts are interchangeable on the different forms, said parts can be used or left off according to the desires of the person building or using such a ladder.

Since the structure shown in Fig. 7, is similar to the brace of the step ladder, the same numerals are used to designate similar parts and it will be obvious to persons skilled in this art that any number of rungs may be used in each of the sections and that the rungs and steps are equivalents wherever they are used as supports for a person climbing the ladder.

While I have illustrated the various forms of my invention as embodying only two sections in any foldable element of a ladder, it will be readily understood that additional sections may be added and the construction and operation will be the same, although the sections will have to fold in zig zag fashion.

Assuming that the ladder is folded as shown in Figs. 4 and 5, and it is desired to set the same up for use or unfold it to place it in a condition such as shown in Fig. 1, then the lower sections are rotated and at the same time moved laterally until the cross bars or rungs enclosed in the sockets are moved into the heads of the sockets where said bars or rungs will drop into the lower ends of said sockets. The lower sections may now be further rotated until the stiles of the lower section extend lengthwise relative to the stiles of the upper sections which will bring the notches 37 into alignment with the projections 36.

When the parts are in the positions outlined above, the lower sections are moved longitudinally over the upper sections in the telescopic manner until the cross bars or rungs within the sockets are seated in the upper ends of the socket heads and the projections 36 are seated in the notches 37. The interengaging of the parts in this manner will prevent the sections of a ladder element from rotating relative to one another providing neither section is first moved longitudinally and in order to hold the sections against longitudinal movement the bails are swung over the projections 36 thereby temporarily holding all of the sections together. Where the ladder is of the step ladder type as shown in Fig. 1, the two elements 10 and 11 may now be held in outstretched condition as shown in Fig. 1, by properly manipulating the spreader 53 until in its fully extended condition.

By reversing the operations above outlined for unfolding the ladder or any ladder element, the same may be folded up into a shape such as suggested by Figs. 4 and 5, although it is to be understood that where the ladder is of a form such as shown in both Figs. 6 and 7, the appearance thereof when folded, will be that of only one of the elements illustrated in Figs. 4 and 5.

Of course I do not wish to be limited to the

exact details of construction as herein shown, as these may be varied within the limits of the appended claims without departing from the spirits of my invention.

Having thus fully described my invention, what I claim as new and useful is:—

1. A folding step ladder comprising a top, a step portion and a brace both pivoted to said top and each including two sections, one section having T-shaped sockets, projections extending beyond the sides of said section and spaced from the sockets, the other section having notches for registration with said projections, a cross bar carried by said other section and movable within the sockets to permit longitudinal, lateral and rotary movements of one section relative to the other, and bails pivotally connected to said other section for swinging movement crosswise of the notches for engagement with the projections when the latter are seated in the notches, said bails having offset portions for frictional engagement with the projections.

2. The structure set forth in claim 1, in combination with plates for strengthening the socketed portions of the ladder sections and having cut away portions therein corresponding to the shape of said sockets, and other plates partially surrounding the section of the ladder having notches therein, said last named plates having cut away portions corresponding in shape to the notches.

3. A ladder comprising an upper section consisting of stiles and steps, said stiles having T-shaped sockets formed therein, the stems of which terminate at an edge of the stiles, U-shaped straps secured to the same edges of the stiles where the socket stems terminate with the space within the straps communicating with the stems of the sockets and forming extensions of said stems, a cross bar mounted in the stiles with their ends extending beyond the outer side faces thereof to form projections, a lower section also consisting of stiles and steps, said stiles having notches in their normally upper ends for registration with the projections, a cross bar mounted in and extending between the stiles and embraced by the sockets and the straps whereby said lower section may be moved longitudinally, laterally and rotatably to permit said lower section to be positioned endwise relative to the upper section or folded upon in parallelism to said upper section, and means for disposition crosswise of the notches and for engagement with the projections when the latter are seated in the notches to temporarily hold the ladder sections against accidental displacement.

4. The structure set forth in claim 3, in combination with plates secured to the ends of the stiles in the region of the sockets, each of said plates comprising a panel having a cut away portion therein shaped similar to a socket, flanged at the front and back edges of said panel, a tongue formed from a part of the metal partially cut from the cut away portion and bent outward, and a triangular shaped lip formed by partially severing a part of the panel from the upper portion of one of the flanges and bending said part of the panel outward along a diagonal line, and a top secured to the upper ends of the stiles of the upper section.

5. A ladder comprising an upper section consisting of stiles and rungs, said stiles having T-shaped sockets formed therein adjacent an end thereof with the stems of said sockets opening to an edge of the stiles and with the heads running longitudinally of the stiles so that the lon-

longitudinal centers of said heads are in imaginary
 lines intersecting the axes of all of the rungs
 and spaced from the next to the lowermost rung
 a distance substantially equal to the spacing be-
 5 tween the several rungs, U-shaped straps secured
 to the same edges of the stiles where the socket
 stems are left open with the spaces within the
 straps communicating with the stems of said
 sockets and forming extensions of said stem, pro-
 10 jections formed on the ends of the said next to the
 lowermost rung and extending beyond the outer
 side faces of the stiles, a lower section also con-
 sisting of stiles and rungs, one of said rungs be-
 15 ing surrounded by the sockets and straps where-
 by said lower section may be moved longitudinal-
 ly, laterally and rotatably to permit said lower
 section to be positioned endwise relative to the
 upper section or folded upon in parallelism to
 20 said upper section, the ends of the stiles adja-
 cent the socketed rung having notches formed in
 the end edges thereof for registration with the
 projections, and means carried by the notched
 ends of the stiles of said lower ladder section
 25 for disposition crosswise of the notches and for
 engagement with the projections when the latter
 are seated in the notches to temporarily hold
 the ladder sections against accidental movement
 relative to one another.
 6. A step ladder comprising a top, a step por-
 30 tion and a brace both pivoted to said top and
 each including upper and lower sections, both of
 the sections of the ladder portion consisting of
 stiles and steps, a cross bar underlying one of
 the steps of the upper section of the step portion
 35 and mounted in the stiles with its ends protrud-
 ing beyond the outer side faces to form projec-
 tions, the stiles of the said upper section of the
 ladder portion having T-shaped notches formed
 therein below another step, U-shaped straps se-
 40 cured to edges of the stiles of said upper sec-
 tion of the ladder portion and forming exten-
 sions of the sockets beyond the edges of the stiles,
 a cross bar mounted in the stiles of the lower
 section of the ladder portion and enclosed with-
 in the sockets and straps to prevent separation
 of the sections while permitting the lower sec-
 80 tion to be moved longitudinally, laterally and ro-
 tatably relative to the upper section for folding
 and opening the sections relative to each other,
 the stiles of the lower section of said ladder por-
 tion having notches formed in their normally
 upper ends for registration with the projections,
 85 and means carried by said normally upper ends
 of the stiles of said lower section of the ladder
 portion for engagement with the projections to
 temporarily hold the sections against accidental
 movement relative to one another, both of the
 90 sections of the brace including stiles and rungs,
 the stiles of the upper section of the brace hav-
 ing T-shaped sockets formed therein, U-shaped
 straps secured to edges of the stiles of the upper
 section of said brace and forming extensions of
 95 said sockets, said sockets and straps embracing
 one of the rungs of the lower section of said
 brace whereby the two sections are permanently
 connected together and the lower section is per-
 mitted to be moved longitudinally, laterally and
 100 rotatably for opening and folding the sections of
 said brace, projections formed by ends of one
 of the rungs in the upper section of the brace
 protruding beyond the outer side faces of the
 stiles, the stiles of the lower section having
 105 notches formed in the normally upper ends for
 registration with said projections, and means car-
 ried by said normally upper ends of the stiles
 of the lower section for engagement with the
 projections to temporarily prevent accidental
 110 movement of the sections relative to one an-
 other, and a spreader connected with the up-
 per sections of both the ladder portion and the
 brace to temporarily hold the ladder portion
 and brace in out-stretched positions. 115

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