W. E. KNOLLENBERG.

FOLDING LADDER.

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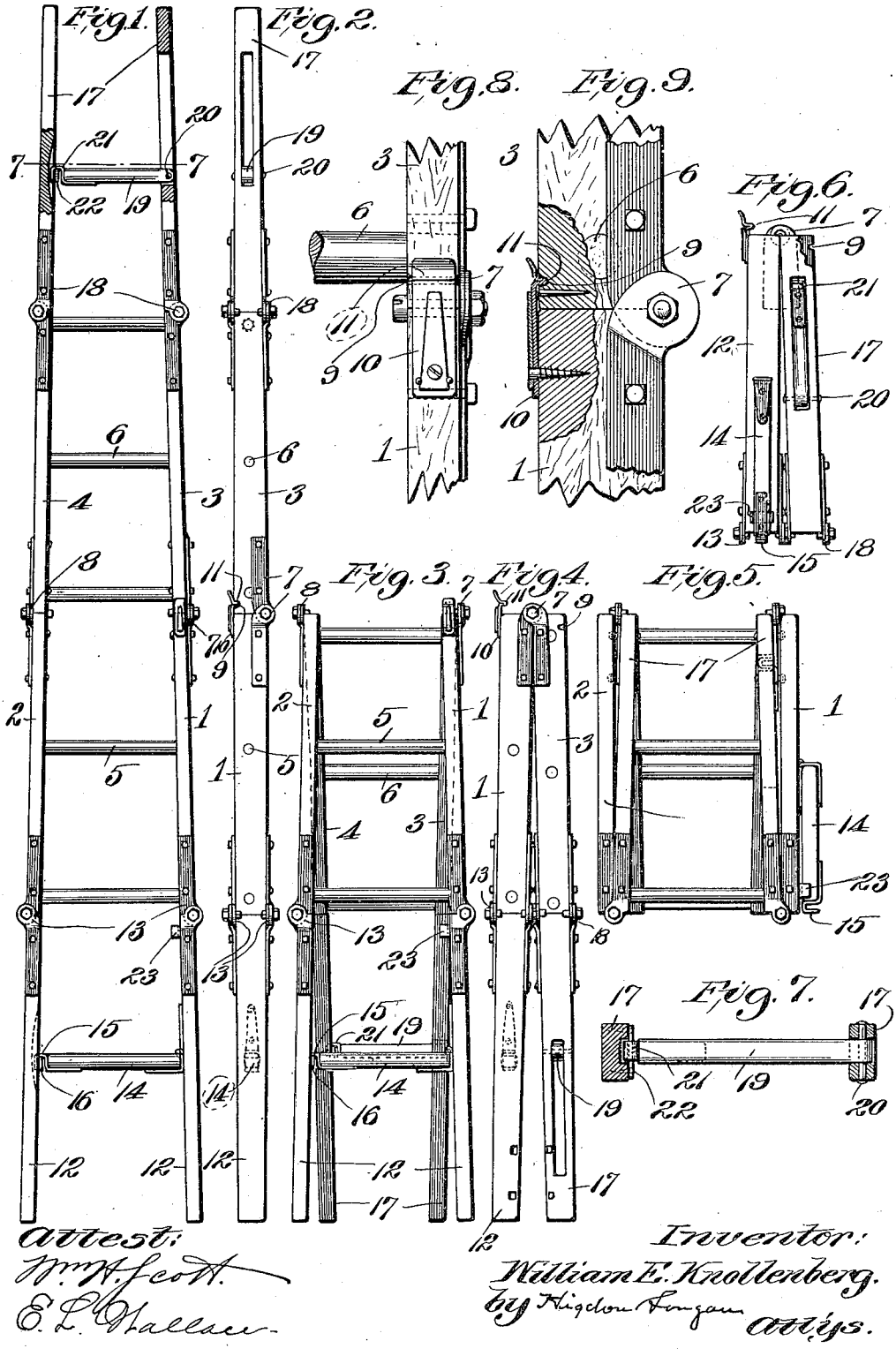
1,004,883. Patented Oct. 3, 1911.



Attest:
Wm. A. Scott.
E. L. Wallace.

Inventor:
William E. Knollenberg.
by Higdon & Langan Attys.

UNITED STATES PATENT OFFICE.

WILLIAM E. KNOLLENBERG, OF ST. LOUIS, MISSOURI, ASSIGNOR OF FORTY ONE-HUNDREDTHS TO ADOLPH KURTZ, OF ST. LOUIS, MISSOURI.

FOLDING LADDER.

1,004,883. Specification of Letters Patent. Patented Oct. 3, 1911.

Application filed April 22, 1911. Serial No. 622,656.

To all whom it may concern:

Be it known that I, WILLIAM E. KNOLLENBERG, a citizen of the United States, and resident of St. Louis, Missouri, have invented certain new and useful Improvements in Folding Ladders, of which the following is a specification containing a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to improvements in folding ladders and has for its object the construction of a ladder made up of a number of sections hingedly connected so that they may be folded in compact form, the end sections being provided with rungs which may be disconnected from one of the side members, and the hinges connecting the end sections with the middle sections arranged to articulate in a direction at right angles to the direction of articulation of the hinges connecting the middle sections so that all of the side pieces may be folded so as to occupy a minimum of space.

With the above purposes in view my invention consists in certain novel features of construction and arrangement of parts as will be hereinafter more fully described, pointed out in the claims and illustrated by the accompanying drawings, in which—

Figure 1 is a front elevation of the ladder in a fully extended condition, portions of the side pieces of the upper section being broken away; Fig. 2 is a side elevation of the ladder in an extended position; Fig. 3 is a front elevation of the ladder partially folded; Fig. 4 is a side elevation of the ladder as shown in Fig. 3; Fig. 5 is a front elevation of the ladder in a fully folded condition; Fig. 6 is a side elevation of the ladder as shown in Fig. 5, a portion of one of the side pieces being broken away to reveal the notch for the latch to hold the ladder against collapsing; Fig. 7 is an enlarged, detail, sectional plan taken on the line 7—7 of Fig. 1; Fig. 8 is an enlarged, detail view of one of the hinge connections between the middle sections of the ladder and the latch for holding the sections against collapsing; and Fig. 9 is a side elevation, partly in section, of the hinge connection and the latch illustrated in Fig. 8.

Referring by numerals to the accompanying drawings: 1, 2, 3 and 4 designate the side pieces of the two middle sections of the ladder which are connected by rungs 5 and 6, the sections and rungs being of ordinary ladder construction. The sections 1 and 3 are hingedly connected by means of a hinge 7, and the sections 2 and 4 hingedly connected by a hinge 8. These hinges are preferably arranged adjacent the rear edges of the side pieces so that when the ladder is extended and in use the abutting ends of the sections will serve as knuckles to prevent articulation of the sections beyond a straight line. Formed in the front edge of the side piece 3 is a transverse notch 9, and carried by the front edge of the side piece 1 is a leaf spring 10 having a transverse rib 11 arranged to engage in the notch 9 so as to hold the side pieces 1 and 3 in alinement with each other and against collapsing.

12 designates the side pieces of the lower section of the ladder which are hingedly secured to the lower ends of the side pieces 1 and 2 of the lowermost middle section by means of the hinges 13 which are substantially like the hinges 7 and 8 except that they are positioned at right angles relative the hinges 7 and 8. Hingedly secured to one of the side pieces 12 is a rung 14, at the free end of which there is a hook 15 arranged for engagement with a strap 16 carried by the opposite side piece 12.

17 designate the uppermost side pieces which are hingedly secured to the upper ends of the side pieces 3 and 4 by means of hinges 18, which are identical in construction and operation with the hinges 13. One of the side pieces 17 is slotted, the length of the slot being substantially equivalent to the spacing apart of the side pieces and is arranged to receive a rung 19 which is hingedly secured upon a pin 20 extending through the slot. At the free end of the rung 19 there is a hook 21 for engagement with a strap 22 carried by the opposite side piece 17, the side pieces 12 and 17 being channeled above and below the straps 16 and 22 so that the straps may be applied directly to the inside face of the side pieces. The rungs 19 are held in place parallel with the side piece 17 by the frictional engagement of the hook 21 with the end of the slot opposite the hinged end, and the rung 14 of the lowermost ladder section is held in place parallel with the side piece 12 by means of a spring clip 23.

To fold the ladder the leaf spring 10 is drawn outwardly thus releasing its rib 11 from the notch 9 of the opposite side piece. The two middle sections together with the two end sections are then folded over each other, as shown in Figs. 3 and 4. The rungs 14 and 19 are released by withdrawing the hooks 15 and 21 from the straps 16 and 22, the rung 14 being swung to a position where it will be engaged by the clip 22 and the rung 19 swung to a position where it is held parallel with the side piece 17, the side pieces 12 and 17 may then be swung on their hinges, as illustrated in Figs. 5 and 6.

It is to be observed that in Figs. 5 and 6 all of the side pieces are folded to occupy a minimum of space. Such a ladder may be constructed of very light material, may be readily folded or unfolded as required, and occupies a minimum of space when folded so that it may be readily carried or transported.

The particular construction of hinges shown is not essential to my invention, but it is essential that hinges be employed in the positions shown, the hinges of the uppermost sections arranged to articulate in directions at right angles to the direction of articulation of the hinges connecting the two middle sections.

While I have shown the outer sections as having only one rung each and the middle sections as having two and three rungs, it is obvious if a larger or longer ladder is desired its side pieces may be made longer and a greater number of rungs employed.

I claim:

1. In a folding ladder, a pair of sections having their side pieces connected by fixed rungs, hinges connecting said pair of sections, a side piece hingedly connected with the free ends of each of the side pieces of said pair of sections, the hinges of the last mentioned side pieces arranged at right angles to the hinges connecting said pair of sections, and folding rungs connecting said last mentioned side pieces.

2. In a folding ladder, a pair of sections having their side pieces connected by fixed rungs, hinges connecting said pair of sections, a side piece hingedly connected with the free ends of each of the side pieces of said pair of sections, the hinges of the last mentioned side pieces arranged at right angles to the hinges connecting said pair of sections, folding rungs connecting said last mentioned side pieces, and means carried by the hinged end of the pair of sections to prevent their articulation in one direction upon their hinges.

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

WILLIAM E. KNOLLENBERG.

Witnesses:
E. L. WALLACE,
N. G. BUTLER.