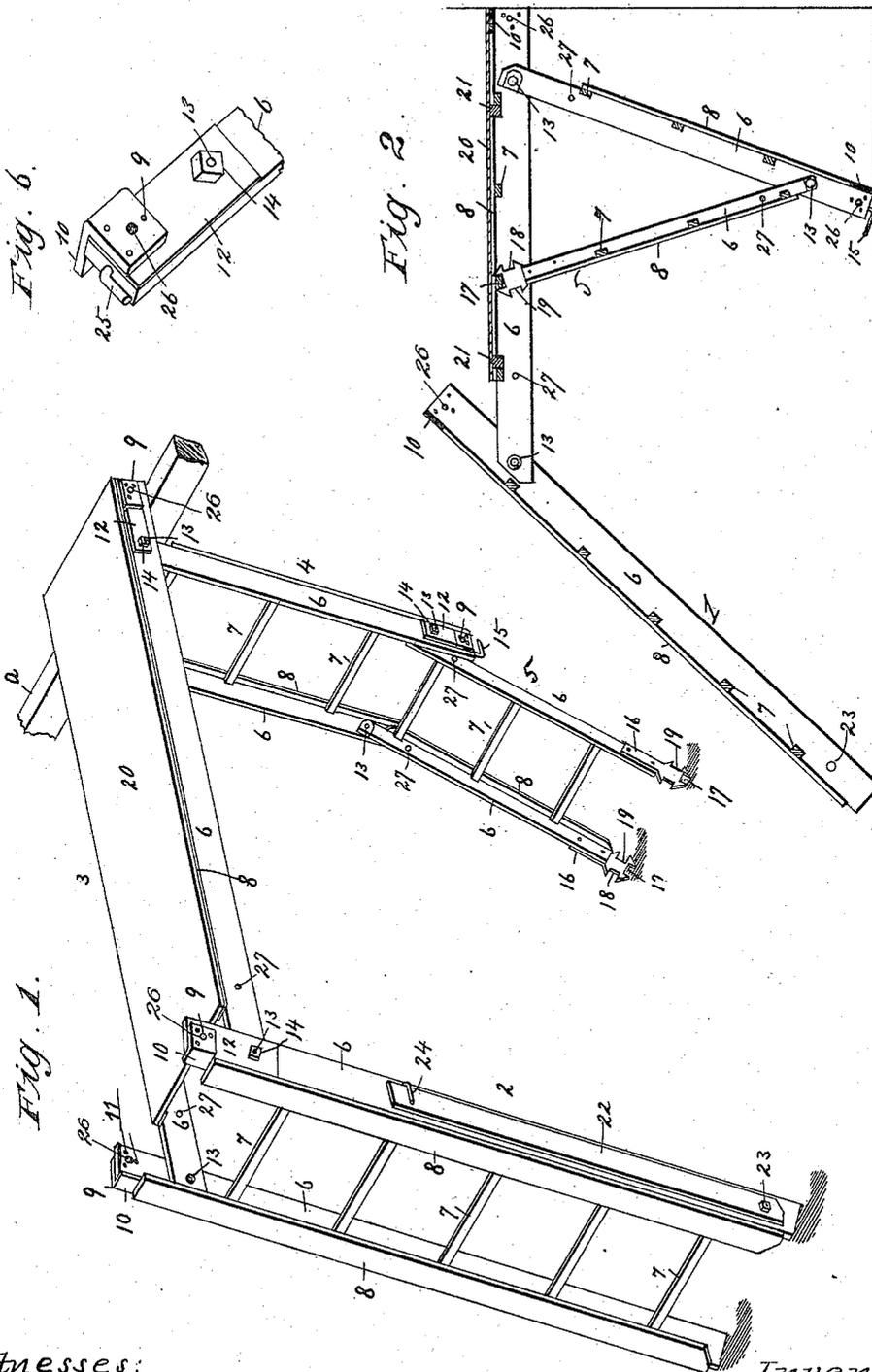


R. W. HILLIKER.
FOLDABLE LADDER.

No. 575,397.

Patented Jan. 19, 1897.



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Fig. 5.

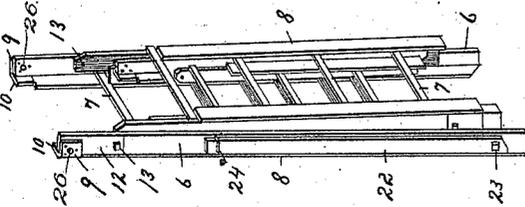
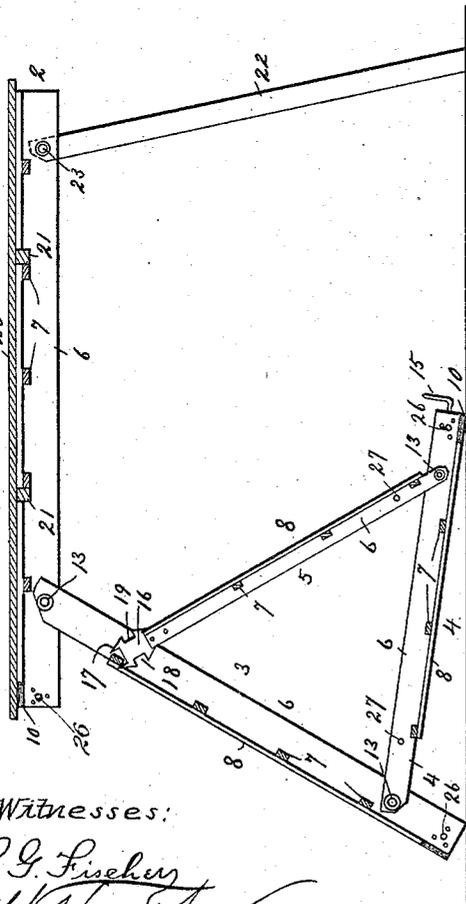


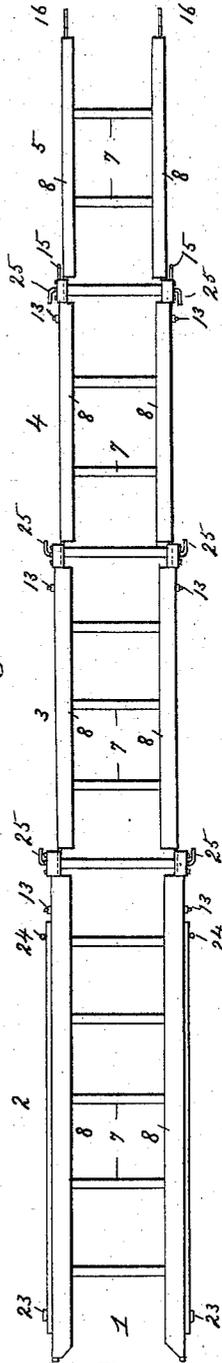
Fig. 3.



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Fig. 4.



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UNITED STATES PATENT OFFICE.

RYERSON W. HILLIKER, OF KANSAS CITY, KANSAS.

FOLDABLE LADDER.

SPECIFICATION forming part of Letters Patent No. 575,397, dated January 19, 1897.

Application filed March 16, 1896. Serial No. 583,389. (No model.)

To all whom it may concern:

Be it known that I, RYERSON W. HILLIKER, of Kansas City, Wyandotte county, Kansas, have invented certain new and useful Improvements in Folding Ladders, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to ladders, and more particularly to folding ladders; and it consists in certain novel and peculiar features of construction and combinations of parts, as will be hereinafter described and claimed.

In order that the invention may be fully understood, I will proceed to describe it with reference to the accompanying drawings.

Referring now to said drawings, which illustrate the invention, Figure 1 represents a perspective view of my improved ladder when arranged as a high scaffold. Fig. 2 represents a vertical section of the same when arranged as a low scaffold. Fig. 3 represents a vertical section of the same when arranged as a table, a work-bench, or a low scaffold. Fig. 4 represents a view of the ladder when open or extended in operative position. Fig. 5 represents a perspective view of the ladder in its folded or closed position.

In said drawings, 1 designates a ladder comprising a plural number of sections. In this instance four sections are shown, (designated, respectively, by the numerals 2, 3, 4, and 5,) though it is to be understood, of course, that in practice any suitable or desirable number of sections may be employed. As each section is substantially a duplicate of every other section, except that they successively diminish in width and length toward the top of the ladder, a description of one will suffice for all. Each section is constructed as follows: That is to say, 6 6 designate parallel strips or bars which form the sides of the section, and said sides are connected at intervals in the customary manner by steps 7, and secured upon the edges of said sides to which the steps are contiguous are cap pieces or strips 8, which project inwardly beyond the inner sides of said sides, as shown clearly in Figs. 1, 4, and 5, and said cap-strips terminate, preferably, a suitable distance from each end of the sides. A pair of angle-plates, of steel or other material possessing great

strength compared to its size and weight, have their side arms 9 riveted, as at 11, or otherwise suitably secured to the outer sides of the bars 6 at their upper ends, and have their front arms 10 projecting inwardly beyond the inner sides of said side bars at the upper ends of said cap-strips for a purpose which will presently be explained.

In order to make the ladder absolutely reliable when in use under any strain that may be placed upon it, I preferably interpose between the side arms 9 of the angle-plates and the side bars of the ladder the metallic plates 12, and said plates are so secured by means of the rivets or securing devices 11 at one end and near their opposite ends by the transverse bolts 13, which extend through said plates and the side bars of the section under consideration, and also through registering apertures or holes in the side bars 6 of the next section of the ladder, as to constitute a pivotal connection between them, and said bolts are reliably secured in this relation by means of retaining-nuts 14 upon their outer ends.

The second section of the ladder just referred to is of width to fit snugly within the side bars of the first-named section, and each successive section diminishes in width sufficiently to fit snugly between the side bars of the preceding section to which it is pivoted, and all of the sections are coupled together, as just described, so that the ladder may be folded into very small compass. In practice the first or bottom section of a ladder for household use is about forty inches long and the side bars of the same are about four inches in thickness, and the remaining sections are of such proportion that when the ladder is completely folded said sections will lie snugly and compactly within said first section, so that the entire ladder practically takes up a space of about forty inches in length, four or five inches in depth, and about four inches in width, and therefore may be easily and conveniently handled. In a ladder of fifty feet in length the first section will be only about eight feet in length by twenty-four inches in width and about five inches in depth or thickness. All the other sections may be folded easily within said section, so that a ladder of this size may be kept in a hall or an upstairs

room, and by reason of its peculiar construction may, under proper manipulation, be easily opened section by section and lowered to the ground from an upstairs window by a single person without any possible danger to such person, owing to the fact that he keeps control of and balances the ladder easily as it is lowered by resting the upper section approximately in a horizontal position upon the window-sill, which practically relieves him by giving him a great leverage on the weight of the ladder taken as a whole. A decided advantage in this style of ladder for fire-escape purposes will be apparent from the fact that a ladder of fifty feet or more in length may be manipulated and opened out and projected through a window within a ten or twelve foot room, and may by a single fireman be easily carried up or down a stairway in case of emergency. An ordinary ladder, it is obvious, could not be so handily carried up or down stairways or projected through a window from a small room unless the window and door of the room happened to be in alinement with each other, as not always happens in residence-houses. When this ladder is straightened out and weight placed upon it, the strain is equally distributed throughout the entire ladder, and is borne particularly by the side bars of the various sections bearing edgewise against the under sides of the overlapping angle-plates, which in turn are secured firmly to the longitudinal metallic plates 12, which thus form throughout the length of the ladder links through which extend the pivot-bolts of the sections. This construction provides, therefore, in each ladder a continuous chain of wood and metal; the metal reinforcing the wood at the points where the strain is most directly imposed, and a ladder is thus produced which will support any weight which can be placed upon it in a legitimate manner. In fact, a sixteen-foot ladder for household use thus constructed, with one end resting upon a window-sill and the opposite end resting upon a chair or table and opened out, as illustrated in Fig. 4, will easily support at any point throughout its length a weight exceeding four hundred pounds. In such ladder the side bars are about three-fourths of an inch in thickness and three inches in depth, so that the ladder is apparently frail, but in reality, by the addition of the metallic plate connections, exceedingly strong.

In the practical construction I preferably secure to the upper ends of one of the intermediate sections—say, for instance, section 4—hooks 15, for a purpose hereinafter explained, and secure to the upper end of the top section-plates 16, which plates are provided with end notches 17 and side notches 18 and 19, which play important parts, accordingly as the ladder is disposed in one position or another, when used for various purposes. For instance, if it be desired to provide a temporary scaffold of a height about equal to one

or more sections of the ladder it may be unfolded and arranged in the position as illustrated in Fig. 1, where it will be observed that the first and longest section 2 of the ladder is arranged as a brace and a ladder for the second section 3, which is disposed horizontally and rests at its opposite end upon a window-sill or any other suitable support. If this be a long ladder, it can be thus disposed externally of a building. If it be a short ladder, affording a base-section 2 only about three feet long, it is obvious that it may assume the same position and will be sufficiently high only to reach a window-sill from the inside of the building, or if a second-story window need be reached from the outside the base-section 2 and one or more succeeding sections may be extended in alinement, while the next section or sections may be arranged horizontally and supported at their opposite ends upon the sill of the second-story window. No matter how it is arranged, I place upon the horizontal section or sections of the ladder the platform or platforms 20, which are provided with depending strips 21 at their under sides, which bear at opposite sides of certain of the steps to prevent longitudinal movement or slipping, and between the cap-strips 8 to prevent lateral movement of said platform, so that a person standing on the same may be relieved entirely of any danger due to the slippage of such platform or table.

When the ladder is arranged as shown in Fig. 1, with certain of the upper sections, for instance, sections 4 and 5, depending inoperatively as shown in said figure, or when said upper sections form the horizontal portion of the ladder, it is equally obvious that the same may be employed as a convenient platform or scaffold in picking fruit by supporting one end of said horizontal portion upon or against the tree. After the fruit adjacent to the ladder is picked the operator can descend to the ground easily and conveniently by means of the section or sections arranged as a brace or support, can grasp the same, and, pivoting it at its opposite end upon the tree or support, swing it to any position easily and quickly, so that he can circle around beneath and relieve the lower branches, at least, of the tree of their fruit in a comparatively short time and with great convenience to himself.

If it be desired to employ this ladder as a platform without providing any support for the same but the ladder itself, it is caused to assume the position shown in Fig. 2, with one section, as shown, or more, arranged horizontally and provided with the platform or table 20, with the base-section or additional sections arranged at an inclination to form a brace and also a means for reaching the platform or scaffold, and with the remaining sections arranged in substantially V shape with relation to each other and with the end notches 17 of plates 16 of the uppermost section engaging a step or round of the horizontal section or sections. By this arrangement

the horizontal section or sections are provided with an absolutely reliable support.

In case it be desired to employ a low scaffold I will preferably arrange the ladder as shown in Fig. 3. In case a work bench or table is needed a household ladder arranged in the same position will provide a substantial support at the required height. In this latter case I preferably arrange the base-section of the ladder horizontally and support it at one end by means of the legs 22, pivoted at their upper ends to the sides of the section, as shown at 23, and said legs, when folded to their inoperative position at the outer side of the section, as shown in Figs. 1, 4, and 5, are supported thereat by the hooks 24, projecting from said sides. The opposite end of said section is supported by arranging the second section divergingly downward with relation to the bars 22, and then arranging the third section 4 with its upper end resting loosely upon the floor and with the upper notched end of the plates 16 of the fourth section 5 engaging one of the rounds of said section 3, so as to provide a strong and substantial support for the horizontal section. It is obvious, also, that the ladder may be caused to assume various other positions, particularly when provided with a greater number of sections than are shown in the drawings, and in such cases the notches 18 and 19 of the plate 16 and the hooks projecting from the upper end of the section 4 play important parts, as will be readily understood.

Thus it will be seen that I have produced a ladder possessing the advantageous features enumerated in the statement of invention, and which will be found to be more easily operated and much stronger and more serviceable than the customary sliding or extension ladder composed of sections, by reason of the fact that it can be caused to assume different positions. It is also obvious that this ladder will be of great service to fire departments, owing to the fact of its portability and short length, it being well known that the ordinary hook-and-ladder wagons require a space of about one hundred feet in diameter to turn in, which causes considerable loss of time and is also exceedingly dangerous to people and conveyances upon the streets of crowded cities, while a number of these ladders may be carried easily upon a wagon but from six to ten feet long, and when reaching the scene of operations a fireman can grasp one of these ladders, pass up a stairway, and in less than three minutes lower it easily and quickly to the ground from an upper window.

Before lowering or taking down the ladder it is necessary that it be converted into a rigid ladder; otherwise it would be practically impossible to lower it by a person upon the surface upon which the ladder rests. This is accomplished by ascending the ladder and dur-

ing such ascent by pulling the pins 25 out of the holes in the upper ends of the side bars and slipping them through registering-holes 26 in the overlapping ends of the side bars, as shown in Fig. 4, thereby converting the folding ladder into a single rigid structure which may be handled as easily as an ordinary ladder of equal weight and size. By removing said pins from such registering-holes the ladder may now be easily shortened by first folding the topmost section within the section next below, and then both sections folded in the third section from the top, and so on until all of the sections above the base-section are folded closely and snugly within the latter.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. A folding ladder comprising a number of sections provided at their upper ends with angle-plates which project inwardly beyond the side bars of the sections; said sections diminishing in width from the base or lower section successively to the topmost section, and the lower end of each section being pivotally connected to and within the side bars of the section immediately below, and below the plane of the inwardly-projecting arms of said angle-plates whereby when the ladder is straightened out or unfolded the said angle-plates will provide bearings above their pivots for said sections, substantially as described.

2. A folding ladder comprising a number of sections provided at their upper ends with angle-plates which project inwardly beyond the side bars of the sections; said sections diminishing in width from the base or lower section successively to the topmost section, and the lower ends of each section being pivotally connected to and within the side bars of the section immediately below, and below the plane of said angle-plates, whereby when the ladder is straightened out or unfolded, the said angle-plates will provide bearings above the pivots for said sections, and reinforcing-plates of metal interposed between said angle-plates and the outer sides of the side bars of the sections, through which pivotal bolts or connections extend, substantially as described.

3. A folding ladder, consisting of a number of ladder-sections of successively-diminishing width, and pivoted together so as to be conveniently folded to various positions, and plates secured to the sides of the topmost section and provided with notches 17, 18 and 19; substantially as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

RYERSON W. HILLIKER.

Witnesses:

T. A. SKERD,
ROSS SORENSON.