

(No Model.)

2 Sheets—Sheet 1.

M. C. McCOLLUM, W. B. MILNES & A. HARTMAN.
STEP LADDER.

No. 372,424.

Patented Nov. 1, 1887.

Fig. 1.

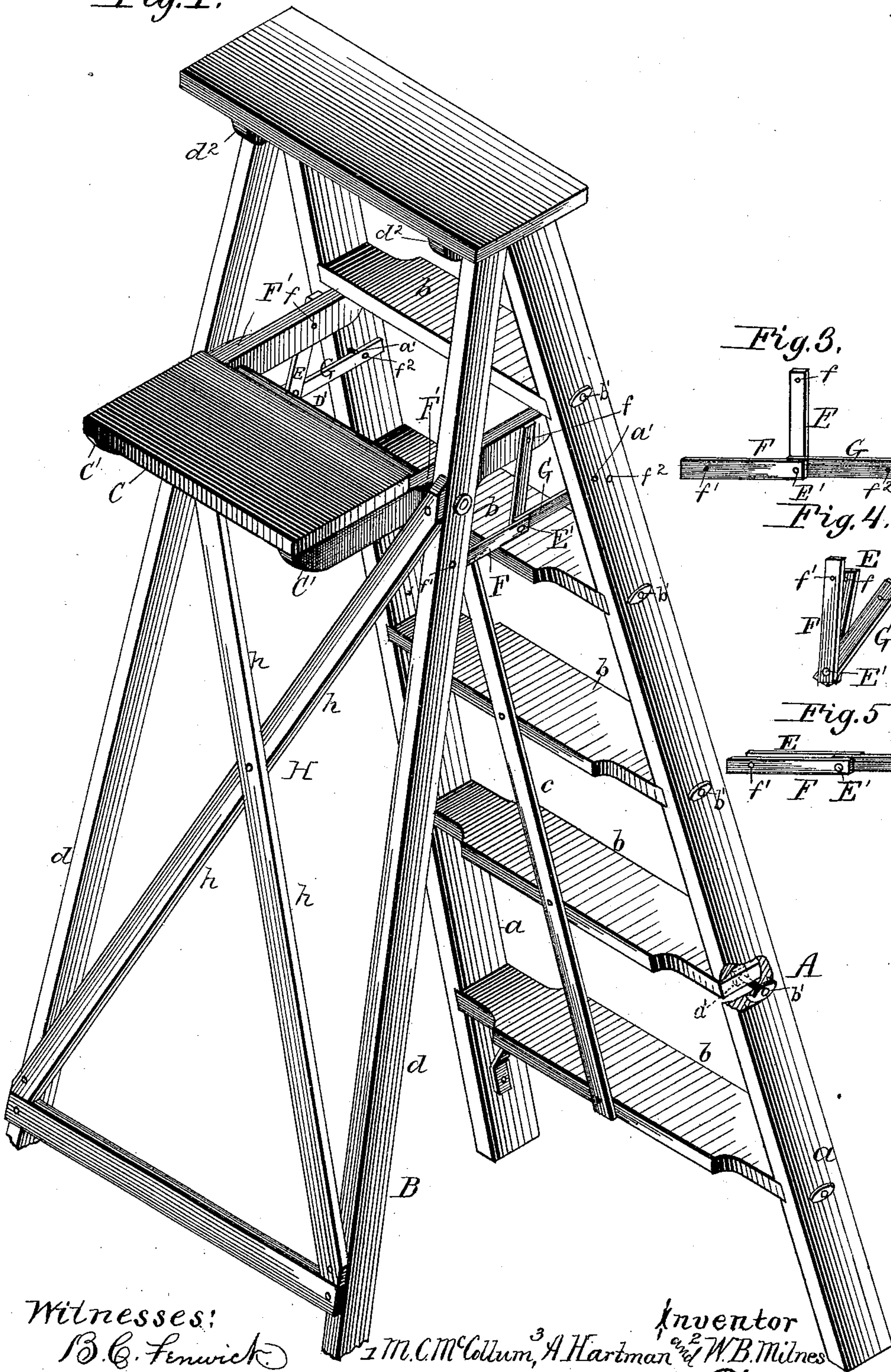


Fig. 3.

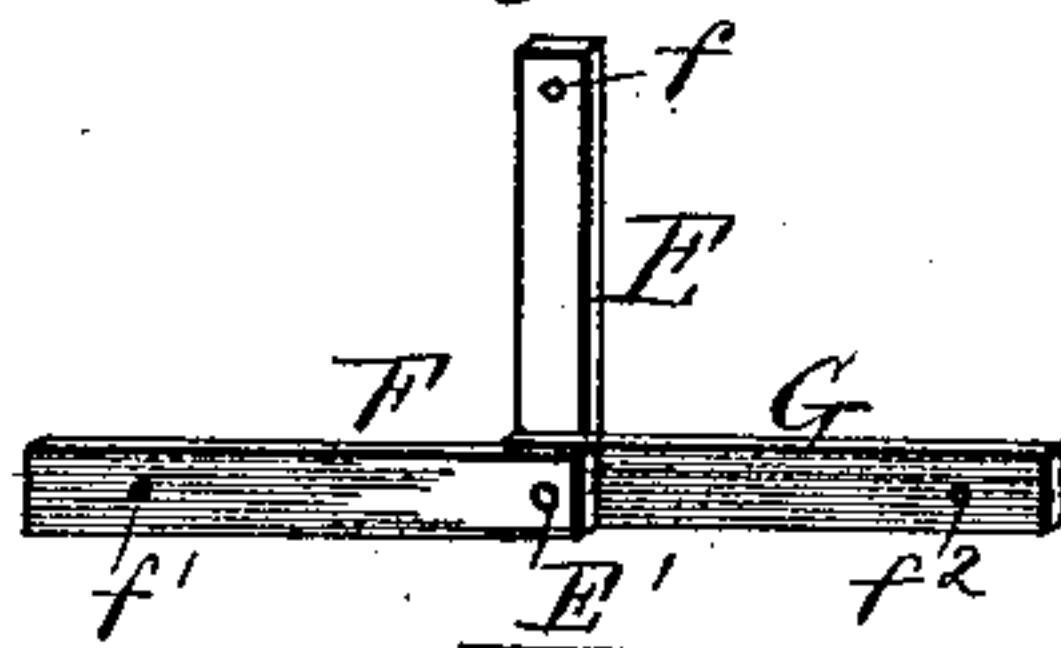


Fig. 4.

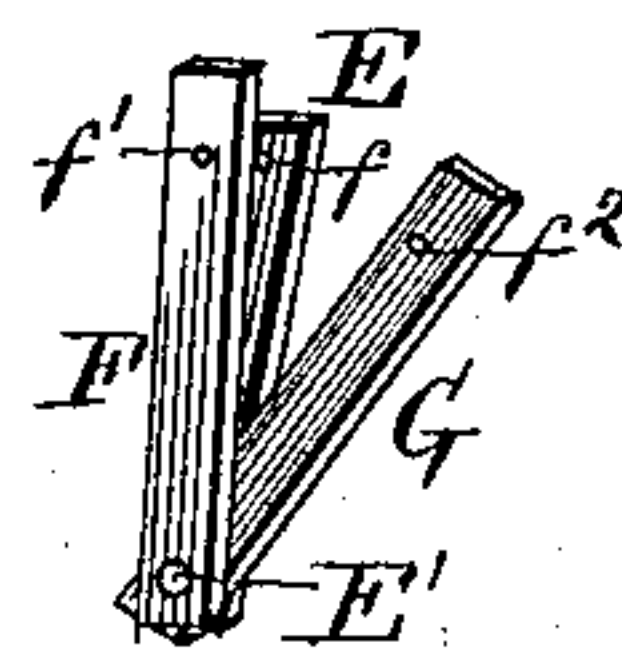
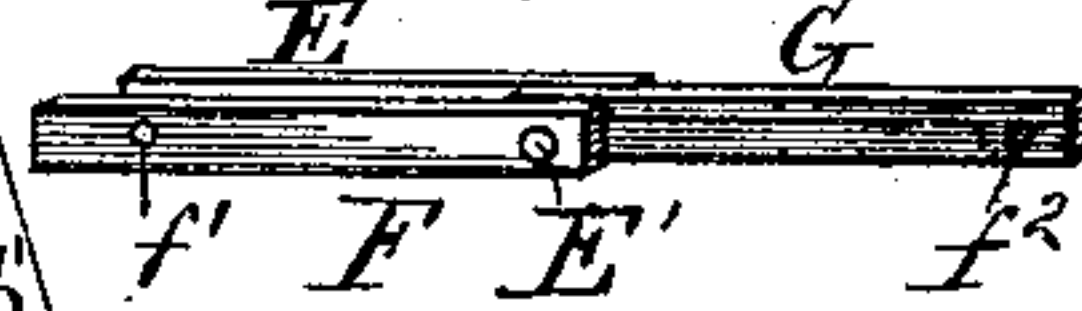


Fig. 5.



Witnesses:

B. G. Fenwick
R. A. Balderson

Inventor

M. C. McCollum, A. Hartman, W. B. Milnes

By C. Storm
their Attorney

(No Model.)

2 Sheets—Sheet 2.

M. C. McCOLLUM, W. B. MILNES & A. HARTMAN.
STEP LADDER.

No. 372,424.

Patented Nov. 1, 1887.

Fig. 2.

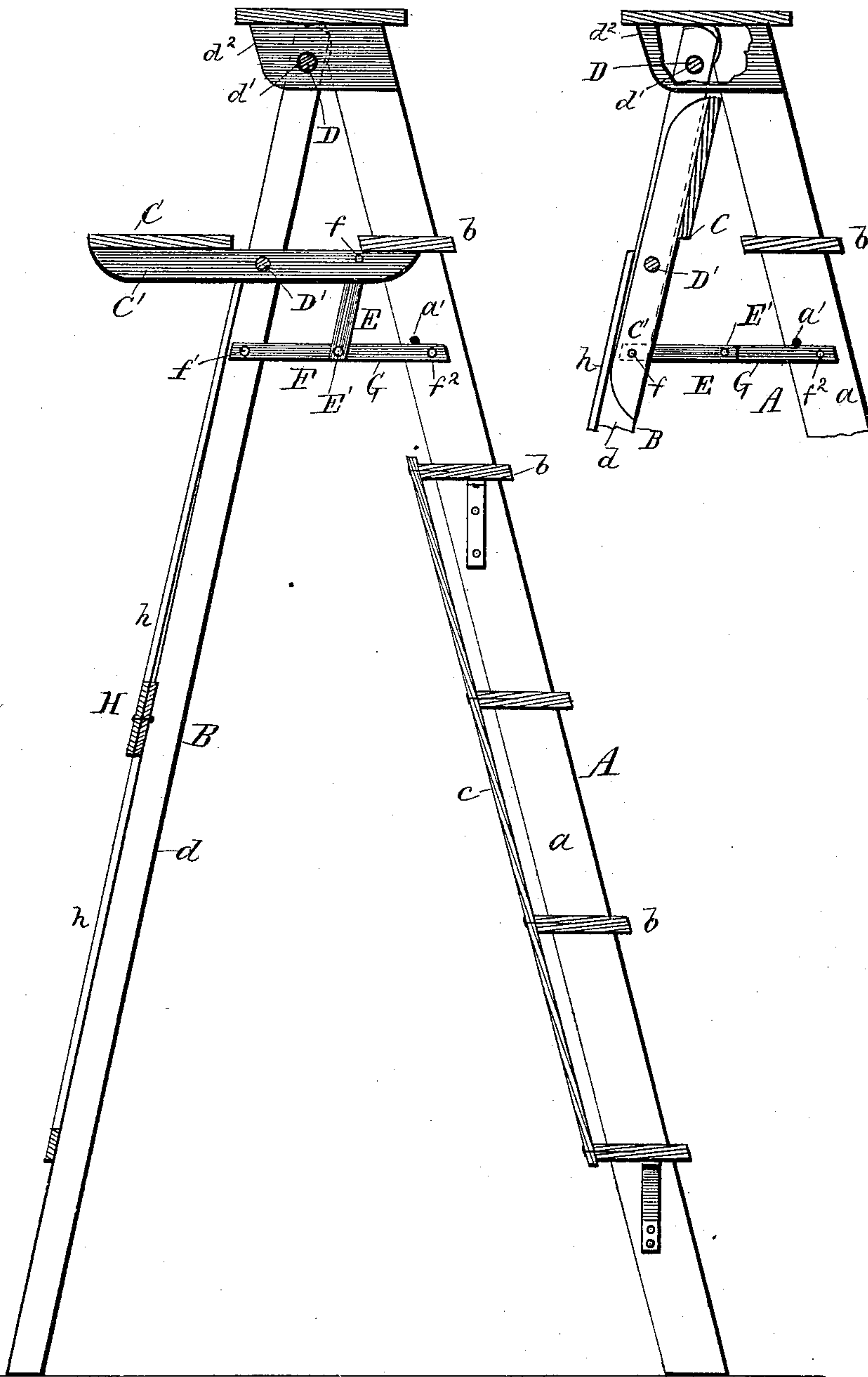
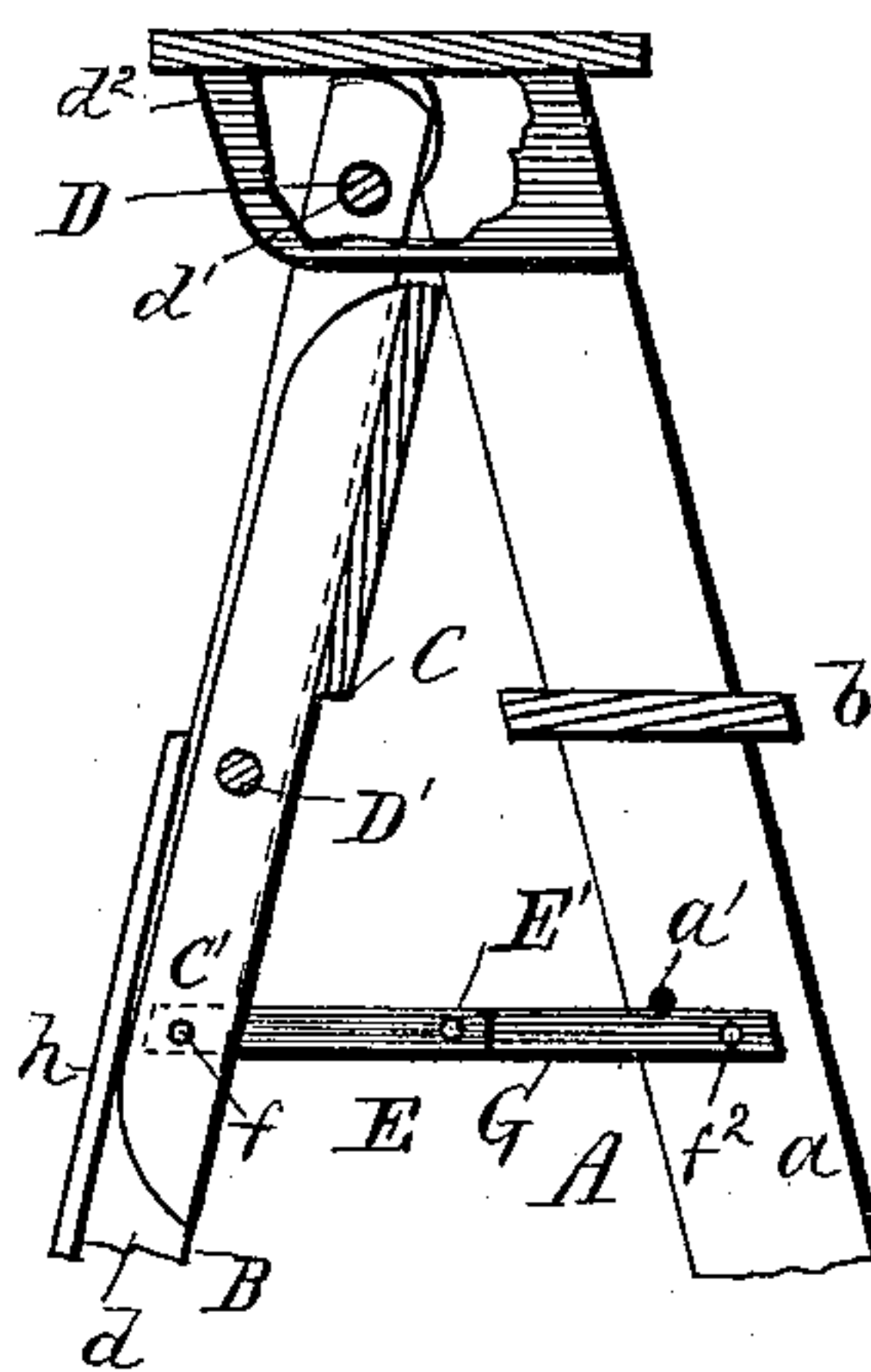


Fig. 6.



Witnesses:

B. C. Fenwick.
R. A. Balderson.

Inventor
1 M. C. McCollum, 3 A. Hartman, 2 W. B. Milnes
By C. S. Stone
Attorney.

UNITED STATES PATENT OFFICE.

MATTHEW C. McCOLLUM, WILLIAM B. MILNES, AND ARTHUR HARTMAN, OF
ESPY, PENNSYLVANIA, ASSIGNORS TO THE SUSQUEHANNA MANUFACTURING COMPANY, OF SAME PLACE.

STEP-LADDER.

SPECIFICATION forming part of Letters Patent No. 372,424, dated November 1, 1887.

Application filed March 17, 1887. Serial No. 231,315. (No model.)

To all whom it may concern:

Be it known that we, MATTHEW C. McCOLLUM, WILLIAM B. MILNES, and ARTHUR HARTMAN, citizens of the United States of America, residing at Espy, in the county of Columbia and State of Pennsylvania, have invented certain new and useful Improvements in Step-Ladders, of which the following is a specification, reference being had therein to the accompanying drawings.

Our invention consists in so constructing step-ladders with a shelf attached that it will fold automatically into the ladder, and that the connecting devices shall not bite or lock with the side bars of the main ladder or supporting-frame, and by various devices combining the highest degree of practical strength and durability with lightness, cheapness, simplicity, and beauty of construction; also, so to construct a ladder that by a slight and easy manipulation the shelf will remain folded into the ladder or drop down to its place when the ladder is open for use, all of which will more fully appear by inspecting the accompanying drawings.

Figure 1 is a perspective view of a ladder when in use, showing the shelf in its proper place, some of the devices connecting it with the main ladder and the supporting-frame, and the method of joining the supporting-frame and the main ladder at their upper ends and other parts of the ladder. Fig. 2 is a sectional view of the ladder when open, showing the shelf in position for use, the devices connecting it with the main ladder and supporting-frame, and which operate to fold it into the ladder or bring it to a horizontal position. Figs. 3, 4, 5, and 6 are detail views of portions of the main ladder, supporting-frame, and their various connecting and operating devices.

A, Fig. 1, is the main ladder, of which *a a* are the side bars, into which, in the ordinary manner, are framed the steps *b b*. In the case of long ladders, where the strain is great, to prevent the steps from working loose and slipping from their places, a metallic nut, *a'*, may be framed into the under side of each step near the end, and pass through it, if necessary. Into this a small screw-bolt, *b'*, is

fitted, passing through the bars *a a* along the line of the step, as shown in patent of Matthew C. McCollum, No. 283,004, issued August 14, 1883. To prevent the splitting of the bars *a*, and to serve as a washer for the bolt *b'*, a metallic clasp, *b''*, furnished with nail-like claws, may be driven into the outside of the bars opposite each step, reference being made to Figs. 2 and 4 of patent issued to Matthew C. McCollum, dated August 14, 1883, No. 283,004. To further strengthen the steps and overcome the liability of their working loose, a wooden or metallic stay, C, Fig. 1, is firmly fastened to the rear edge of each step and perpendicular to it, running from the lower step as high up as may be desired. By these devices the durability and safety of the ladder are materially increased.

B, Fig. 1, is the supporting-frame with side bars, *d d*, which sustain the shelf. This frame is pivoted to the main ladder at its upper end *d'' d''*, just under the top step, by passing a round wooden, or, if preferred, a metallic, shaft, D, through the upper ends of bars *d d*, in which, at their ends, the shaft is firmly fastened, and through the short arms *d'' d''*, in which the shaft freely revolves. These arms *d'' d''* are securely fastened to the upper ends of side bars, *a a*, and flush with them, projecting sufficiently rearward for practical use and strength. In case of long ladders, when broad bars *d d* are needed for strength, it may be necessary to cut away somewhat the upper ends of bars *a a* on the inside, so as to permit the bars *d d* of the supporting-frame, Figs. 1 and 2, to move freely.

C, Figs. 1, 2, and 6, is a wooden shelf located near the top of the ladder, and of sufficient area to afford standing-room for a person or common bucket, but not to extend the space between the two upper steps. This shelf is mainly supported by the supporting-frame, and consists of a frame constructed of a wooden or metallic floor of suitable thickness, firmly fastened at its ends to two nearly parallel shelf-bars, *C' C'*, of sufficient dimensions to sustain any required weight, and is connected to the supporting-frame by an iron rod, *D'*, Figs. 1, 2, and 6, on which the shelf revolves, of such diameter as to give the re-

quired strength, the ends of which pass through the bars $d d$ and are secured on the outside by nuts. The inner ends of the shelf-bars $C' C'$ extend under one of the steps, or other support framed into the bars or sides of the main ladder, and when the shelf is burdened such step or support is the resisting force; and a further resisting force is secured by inserting short stout screws or bolts $a' a'$, Figs. 2 and 6, into the inside of bars $a a$ of the main ladder, and passing through, if desired, at such point in the bars that when the inner ends of the shelf-bars are met by the resisting force of the steps $b b$, as just described, the straps $G G$ will be met by the bolts $a' a'$. This is precautionary provision in case the steps should work loose or be accidentally removed. The shelf-bars are not precisely parallel, but converge somewhat in the direction of the supporting-frame, and if sufficiently extended would ultimately meet. On the outside of the shelf-bars $C' C'$, at the point where rod D' passes through them, slight bosses $F' F'$, Fig. 1, are raised, in length about equal to the width of the bars or sides of the supporting-frame, to serve as washers to the shelf-bars and prevent any unnecessary friction or biting of those bars with the side of the supporting-frame. These bosses are raised by slightly cutting away the outside of the shelf-bars from their ends toward their center, according to use. The shelf is further attached to the main ladder and supporting-frame by means of three metallic straps, E , F , and G , (shown by each figure,) of moderate width and thickness, which are pivoted to each other at the common center E' . These straps in their mechanical function, as connected with this ladder, form a parallel-motion joint. The ladder being open and the shelf in a horizontal position, E designates the upright strap, whose outer end is pivoted to the outside of the shelf-bars $C' C'$ at f . F designates the strap whose outer end is pivoted to the inside of the bars $d d$ of the supporting-frame at f' . G designates the strap whose outer end is pivoted to the inside of the bars $a a$ of the main ladder at f'' . The ladder being open and the shelf in position, $f, f',$ and E' form a straight line, and this line is parallel with shelf-bars $C' C'$. This is an essential feature in the construction of the ladder. The shelf being in the position just mentioned, strap E is exactly parallel with the bars of the supporting-frame, and the length of the strap between its pivotal points E' and f is just equal to the length of that section of the bars of the supporting-frame which lies between the iron rod D' and the point f' . In like manner, the shelf being in the same position, strap F is parallel with the shelf-bars, and the length of said strap between the pivotal point E' and f' is precisely equal to the length of that section of the shelf-bars between the iron rod D' and the pivotal point f —that is, the four sections of the ladder just described, the shelf being down, form a quadrilateral whose

diagonal angles are equal. These are essential conditions in the construction of the ladder to secure the complete folding of the shelf into the ladder and to prevent friction and the biting of the parts. The straps E and F must be equal in length from point to point; and E and F being fixed in length and in their proper positions, strap G is necessarily fixed in its proper position. It completes the line of which F forms a part, and is the mechanical complement of that strap.

From the above conditions it results that when the ladder is closed straps E and F fold upon each other and form two parts of a parallel-motion joint, and strap G the opposite or antagonistic part of the same joint; and from these conditions it further results that when the shelf is folded into the ladder and is not required for use a slight pressure upon the back upon it will open the ladder, leaving the shelf folded into the main ladder.

H , Fig. 1, is a metallic or wooden brace, constructed of wire or slats, of such length as use may require, crossing at their center, in four pieces of equal length. The upper and lower ends, $h h$, are fastened to the inside or edges of the supporting-frame bars, at will, at or near their extremities. As this brace is designed to strengthen the supporting-frame, the particular points of attachment may be determined by necessity or choice. The method of attachment may be such as to aid in preventing their splitting, by the use of plates or clasps riveted, or simply fastening the ends to the edges of the frame.

When the ladder is open, the joints E' should be slightly depressed, and the shelf automatically folds into it.

In order that the main ladder and the supporting-frame fold one upon the other, they must be constructed with similar dimensions each to the other in their corresponding parts.

This application is designed as an improvement upon Patent No. 283,004, issued to M. C. McCollum, one of the inventors in this application, dated August 14, 1883.

We would disclaim the action illustrated by the parallel-motion joint in exclusion of the same motion claimed by Edmund L. Staples in his patent, No. 265,173, issued September 26, 1882.

We claim—

1. The shelf C , folding automatically into the main ladder, having the parallel-motion joint E' , as described, and the shelf-bars $C' C'$, having bosses $F' F'$, to prevent the shelf biting or locking with the supporting-frame, as and for the purpose specified.

2. A step-ladder having shelf-bars $C' C'$ and the supporting-frame B , sections of which, as described, with straps E and F , form a quadrilateral whose diagonal angles are equal, in combination with the shelf C , folding automatically into the main ladder, as described, as and for the purpose specified.

3. A step-ladder having a shelf, C , folding automatically into the main ladder, in com-

5 bination with the three metallic straps, E,
F, and G, pivoted at the common center E',
forming a parallel-motion joint, as described,
whereof E and F are parts equal in length
and exactly fold upon each other when the
shelf is folded into the main ladder, and whose
outer ends are respectively pivoted at the
points *f* and *f'*, and G the opposite or antag-
onizing part of said joint, whose outer end is
10 pivoted at point *f''*, as and for the purpose
specified.

In testimony whereof we affix our signatures
in presence of two witnesses.

MATTHEW C. McCOLLUM.
WILLIAM B. MILNES.
ARTHUR HARTMAN.

Witnesses:

LEMUEL EDGAR,
J. N. MILNES.