(No Model.)

H. R. SMITH.

STEP LADDER.

No. 304,466. Patented Sept. 2, 1884.

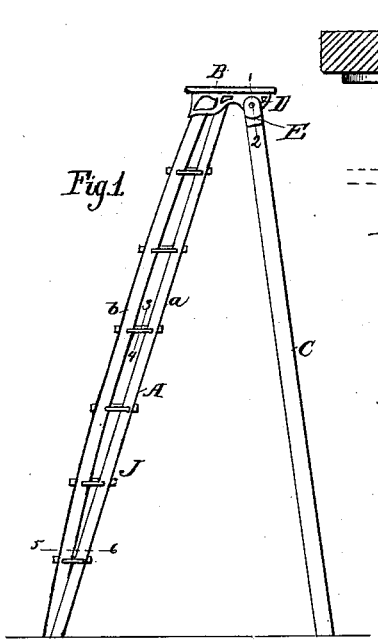

Fig. 1.

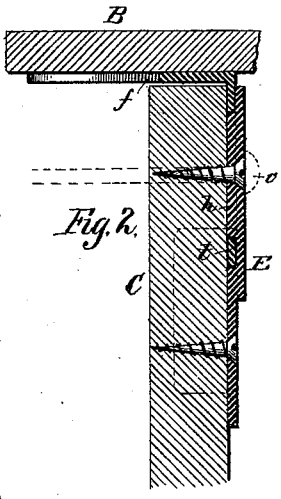

Fig. 2.

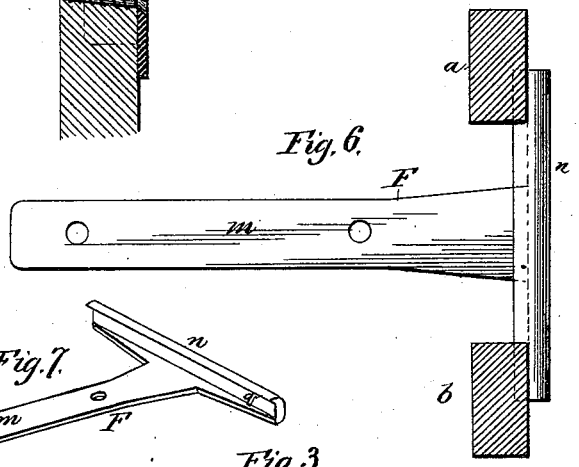

Fig. 6.

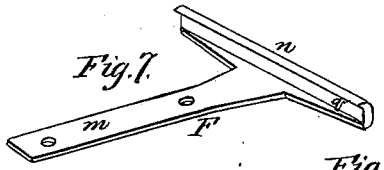

Fig. 7.

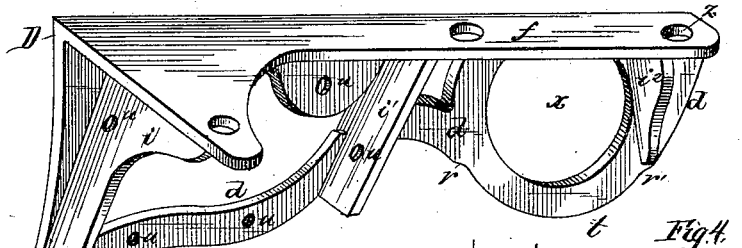

Fig. 3

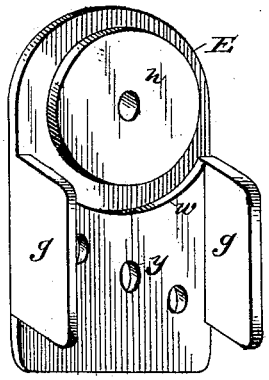

Fig. 4.

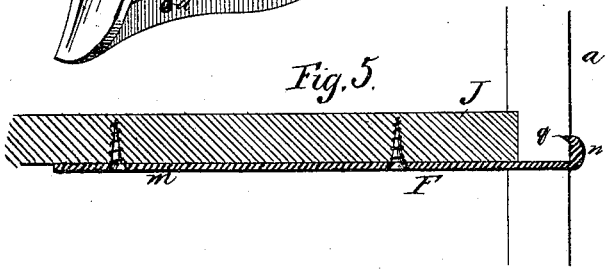

Fig. 5.

Witnesses:
John G. Hinkel
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Attys

UNITED STATES PATENT OFFICE.

HARRY R. SMITH, OF BANGOR, MAINE.

STEP-LADDER.

SPECIFICATION forming part of Letters Patent No. 304,466, dated September 2, 1884.

Application filed June 16, 1884. (No model.)

To all whom it may concern:

Be it known that I, HARRY R. SMITH, a citizen of the United States, residing at Bangor, in the county of Penobscot and State of Maine, have invented certain new and useful Improvements in Ladders, of which the following is a specification.

My invention is a step-ladder constructed, as fully described hereinafter, so as to secure great strength and rigidity and a firm connection of the parts together.

In the drawings, Figure 1 is a side view of a step-ladder having my improvements. Fig. 2 is an enlarged section on the line 1 2, Fig. 1. Figs. 3 and 4 are detached perspective views of one of the brackets and plates. Fig. 5 is an enlarged section on the line 3 4, Fig. 1. Fig. 6 is an enlarged section on the line 5 6, Fig. 1. Fig. 7 is a perspective view of one of the step-brackets.

The ladder consists of the side pieces, steps, top board, bracing-strips, and the connections hereinafter set forth. The side pieces, A, instead of consisting of a single strip of material, consist each of a thin straight strip, *a*, and heavier arched or curved strip, *b*, the two strips, when secured together, as shown, constituting a truss of the usual construction. The top board, B, is connected with each side piece and with the adjacent brace-strip C by the metal bracket D. Each bracket is formed, preferably, in one piece, with a side flange or plate, *d*, cut away in any suitable manner to reduce the weight, top flange, *f*, and brackets or buttresses *i i' i²*, which extend from the side to the top flange, as shown. The space between the buttresses *i i'* and side *d* constitutes a socket adapted to receive the upper end of the side piece, A, which fits snugly therein, and is thus braced, so that it can be most effectually secured by means of screws passed through openings *u* in the bracket. When the side piece consists of more than one strip, the pieces are retained in relative position in and by the socket, so that the structure is braced and strengthened, while it is unnecessary to perforate and weaken the side piece to receive nails or bolts passing from front to rear.

To the upper end of each brace C is secured a plate, E, preferably formed with side flanges *g g* to receive between them the brace and aid in retaining the plate in its place, so that it may be securely held by screws passed through openings *y* in the plate. The plate E is provided with a circular projection, *h*, at the inner side adapted to a circular opening, *x*, in the side *d* of the bracket, and with a curved bearing-edge, *w*, adapted to bear upon the curved edge *t* of the bracket, the curved bearing-edges *w t* coinciding with parts of circles, the center of which is the center of the opening *x* and projection *h*. The plate E is placed against the outside of the flange *d* with the projection *h* in the opening *x*, and the brace C is placed between the flanges *g g* and against the inside of the flange *d*, and a screw, *v*, is passed through an opening at the center of the projection *h*, so as to draw the plate E and brace together to clamp the flange *d* between them, and thus hold the brace to the bracket with such friction that while it can be moved to any desired position it will not swing loosely at any time. It will be seen that the strain or weight of the ladder is sustained by the bearings formed by the edges *w t*, and the projection *h* and recess *x*, so that there is little or no strain upon the screw *v*. The flange *d* is provided with shoulders *r r'*, which limit the swing of the plate E and the movement of the brace C. The brackets are secured to the top board, B, by screws passed through openings Z in the flanges *f*.

To prevent the spreading apart of the side pieces, A A, and the loosening of the treads or steps J, and to further secure additional bearings for the latter and brace the structure, I use T-brackets F, each consisting of a stem, *m*, perforated to receive screws or to be otherwise attached to the under side of a step, and of a cross-bar, *n*, which has a sharp inner edge, *q*. Each bracket F is placed in the position shown in Fig. 6 with its stem between the strips *a b* and driven in until its sharp edge *q* has penetrated the outer sides of the strips and has a firm hold thereon, and the step is then put in place and secured to the stem *m*, when the side piece will be firmly clamped to the step, the latter securely supported in its place, and the whole structure is braced and prevented from twisting, and this is effected without boring or perforating and weakening the side strips, as is necessary when the steps are supported by nails driven through said

strips, or by a connecting-piece provided with nails cast with it and passing through the side strips as heretofore.

It will be evident that the brackets F may be connected to the steps in any suitable manner, and that the brackets D may be differently formed, provided there are flanges *d* with sockets for the side pieces and recesses *x* for the projections *h*. It will also be evident that the projections *h* may be on the side pieces, *d*, and the recesses *x* in plates E.

The buttress *i'* may in some cases be dispensed with, as may the bearings *t w* upon the bracket and plate.

Without limiting myself to the precise construction and arrangement of parts shown, I claim—

1. The combination, in a ladder, of side pieces consisting of strips *a b*, steps and T-shaped brackets secured to the steps, and having cross-pieces with edges penetrating the outer faces of the side strips, substantially as described.

2. The combination of the side pieces consisting of strips *a b*, and brackets having side flanges, *d*, and buttresses *i i'*, receiving and clamping together between them the ends of said strips *a b* of the side pieces, substantially as described.

3. The combination of the top board and brackets D, provided with side flanges, *d*, and recesses *x*, and the braces C, provided with plates E, having circular projections adapted to said recesses, substantially as described.

4. The combination of the bracket D, secured to the top board, and provided with a recessed side flange, and the plate E, having a projection adapted to said recess, and the brace C, the flange *d* being clamped between the brace and the plate, substantially as described.

5. The combination of the bracket having a recess, *x*, and curved edge *t* and shoulders *r r'*, and the plate E, having a projection adapted to said recess and a curved bearing, *w*, and the brace C, between which and the plate the side of the bracket is clamped, substantially as described.

6. The bracket D, adapted for attachment to the top board of a ladder, and having flanges *d f* and buttresses *i i'*, and recess *x*, and bearing-edge *t*, in combination with the plate E, adapted for attachment to the brace, and having a circular projection, *h*, and bearing *w*, and flanges *g g*, substantially as described.

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

HARRY R. SMITH.

Witnesses:
C. E. BLACK,
H. AUKWARD.