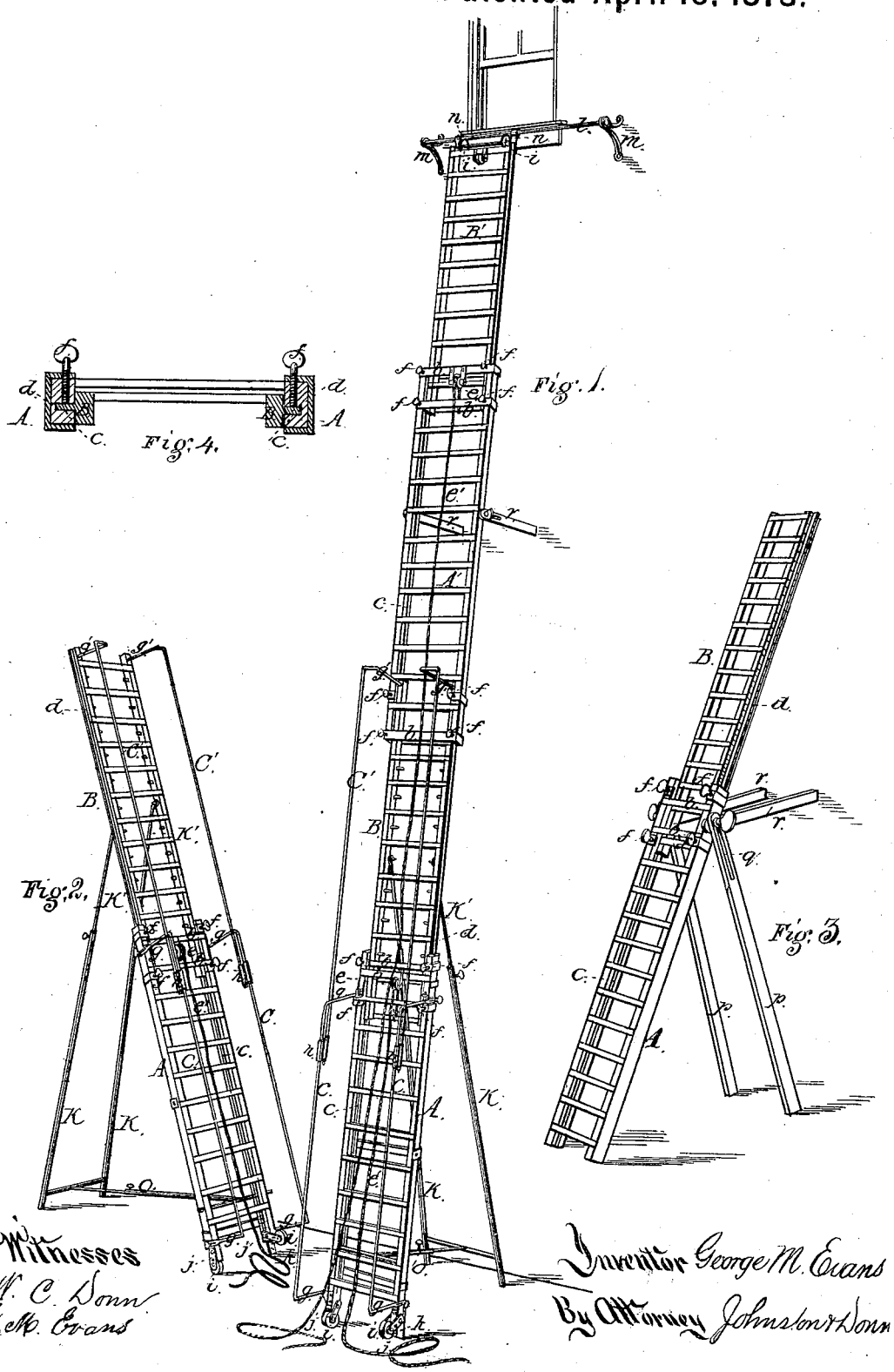
G. M. EVANS.
Extension Ladder.

No. 202,426. Patented April 16, 1878.



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GEORGE M. EVANS, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN EXTENSION-LADDERS.

Specification forming part of Letters Patent No. **202,426**, dated April 16, 1878; application filed January 23, 1878.

To all whom it may concern:

Be it known that I, GEORGE M. EVANS, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Ladders; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of the same.

The object of my invention is to provide a compact and easily-handled ladder, specially adapted as a fire-escape, which is capable of being rapidly extended and adapted to use.

My invention relates to that class of extension-ladders which are constructed in sections, provided with tongues and grooves; and consists in certain improvements in the construction of such ladders and certain attachments thereto, adapting them more especially for use as fire-escapes, as hereinafter shown and described.

In the accompanying drawings, forming part of this specification, Figure 1 is a perspective view of my improved ladder extended and in position to serve as a fire-escape. Fig. 2 is a view of a shorter ladder, with one form of brace or support. Fig. 3 is another view of my improvement, showing another form of brace or support. Fig. 4 is a transverse section of the ladder, showing the connection of the two sections and the manner of securing them in position.

Similar letters of reference indicate corresponding parts in all the figures.

Referring to the drawings, A is the lower section of the ladder, made in the usual manner, with side bars and rungs, but braced and strengthened by the metallic bands *b*, clasping the sides together. On the inside of each of the side bars is a longitudinal groove, *c*, which runs the entire length of the side bars of this section. The lower section serves as a casing for the second or upper section B, which is similar in construction to the section A; but, instead of a groove, the exterior of each side bar is provided with a tongue, *d*, running its entire length. This tongue enters the groove in the section A, and the upper section slides in and out of the lower section. Sections thus fitted together, two and two, are connected together, as shown in Fig. 1, to such length as may be necessary to reach the upper stories of high buildings, said sections A′ being grooved, and sections B′ being tongued, and constructed in all respects like the sections A and B, respectively. When these several sections are joined together, the tongued section B or B′ serves as the splice for joining the sections A A′, as clearly shown in Fig. 1. When put together in this manner, as the tongued sections slide into the grooved sections the length of the ladder when folded need never exceed the combined lengths of the grooved sections used. Also, this mode of connecting the sections does not diminish the width of the upper end of the extended ladder, (as when each section is inclosed by the section below it,) thereby adding to the security of persons using the ladder and enabling persons to pass each other.

To extend the ladder, I provide each grooved section A A′ with a pulley, *e*, secured to the upper rung thereof. Over this is run a cord, *e′*, which is carried down and attached to the lower rung of the tongued sections B B′. The free end of the cord reaches to the ground, and by means of it the tongued section is drawn out, and when drawn out as far as needed it is secured by means of the set-screws *f*, which are passed through the side bars of the lower section and bear upon the tongues of the upper section, as shown in Fig. 4.

The operation of this part of the device is as follows: The folded ladder is run up against the side of the house or wall. By means of the rope the first tongued section is drawn out and secured by the set-screws. Next, the second tongued section B′ is drawn out and likewise secured, and so on until the ladder is extended its full length.

To facilitate the ascent and descent of the ladder, and to furnish a support to persons coming down or going up, it is provided with folding and extensible hand-rails C C and C′ C′, the former for the grooved section A, and the latter for the tongued section B. The rails C C are either hinged or pivoted to the section A, and the uprights or standards *g g* are extended below the pivot or hinge, the extended portion being provided with a slot,

through which is passed a set-screw for holding the standards upright. By this construction, on releasing the extension of the standard from the set-screw the rails may be folded down on the ladder. The hand-rails C′ C′ on the tongued section are attached at the lower end to the rails C C by means of a loose sleeve, *h*, which slides freely on the rail, and at the upper end they are supported by the standards *g′*, which pass through the side bars of the tongued sections, and are secured by a nut on the end or other suitable device.

When the two sections are closed together the rails of the tongued sections run over those of the lower section; and if it is desired to fold them down the upper fixed ends must be released. Each double section must be arranged in this manner. Instead, however, of using a sleeve to connect the two rails together, rings may be substituted; or the rails of the lower sections may be of pipe, and the upper rails may slide into them.

To facilitate the raising and lowering of the ladder, each end thereof is provided with friction-rollers *i i*, &c. These enable the ladder to be raised more easily against the sides of the house or against a wall. For instance, when it is desired to raise the ladder the upper end is placed against the wall at a slight elevation; then by pushing it from the foot or lower end the friction-rollers carry it up against the side of the wall without further lifting.

As the foot of the ladder should rest firmly, without liability to slip, the friction-rollers at this point are made adjustable by pivoting them in yokes *j*, which are in turn pivoted to the ends of the side bars. When the ladder is being moved these yokes are secured in line with the side bars, so that the ladder will rest on the rollers; but when it is placed the set-screws or pins which secure them in position are removed, the friction-rollers thrown out, and the ladder is allowed to rest on the ends of the side bars, as shown in Fig. 1.

To equalize the side bars when the ladder is standing on uneven ground, I provide the foot of each side bar with an adjustable shoe of iron, K, Fig. 2, which is made to swing in and out, and is secured in the desired place by a set-screw. By this arrangement, when the ladder is elevated on the side of a hill or other uneven ground, the side of the ladder which is to stand on the lower side of the ground can be increased in length, so as to maintain the ladder in a perpendicular position.

To secure the ladder in position so that it will be at all times available as a fire-escape for hotels, public buildings, and houses, I arrange it as clearly represented in Fig. 1. On a line with the sill of the second-story window I place a rod, *l*, supported by the brackets *m m*. Two sections—say, A′ and B′—are attached to the rod *l* by means of sockets *n n* on the upper end of the section B′. At the third story a similar arrangement is adopted, and so on for every story above the first. When the ladders are not used the lower grooved section A′ is drawn up so as to fold over the section B′, and is secured by a hook to the upper ring of the section B′. The ladder is then pushed to one side, so as not to be immediately under the window. When a fire occurs the ladder is drawn to the window, the section A′ unhooked and let down, and it should be so long as to reach below the sill of the window beneath, where it will connect with and overlap the ladder put up from the ground, if such should be necessary. In all the stories above the second a similar course is pursued, so that the ladders from one story will connect with and overlap the ladders of the stories below, and thus a continuous ladder will extend from the ground to the highest story in the building, and an escape be provided for the occupants of every story.

To prevent the ladder from sagging, an extensible and adjustable brace is provided. One form of this brace is shown in Figs. 1 and 2, and another form is shown in Fig. 3. The brace shown in Figs. 1 and 2 is composed of the hollow rods K, into which slide the rods K′, which are connected with the side bars of the ladder in any convenient manner and at any suitable point. A horizontal extensible bar, *o*, connects the upright brace K K′ with the foot of the section A. By this arrangement the ladder is supported from underneath, and is thus enabled to withstand any weight that may be placed upon it. As the brace is extensible both vertically and horizontally, the point of support may be moved along the ladder to correspond to its altered length.

In Fig. 3 is shown another form of brace. It is composed of the standards *p*, secured to the side bars of the ladder by set-screws passing through the slots *q*, and the arms *r* likewise secured to the side bars, which extend outward at right angles to the standards. When the ladder is elevated the standards rest on the ground, while the arms bear against the side of the house or wall, furnishing a brace that supports the ladder when any weight is put upon it.

The arms *r* may be used, in connection with the adjustable and extensible brace, to support the upper sections, when several are used, as shown in Fig. 1.

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

1. The ladder constructed in sections, each alternate section having tongues formed on the sides to slide in grooves in the side pieces of adjoining section, so that each alternate section shall inclose the adjacent sections, as herein set forth.

2. The hand-rails C and C′, adjustable lengthwise and coupled to the ladder, as shown, and provided with the standards *g* and *g′*, and sleeve-connections *h*, as and for the purposes described.

3. The adjustable rollers *i*, provided with yokes *j*, pivoted to the foot of the ladder, and provided with pins to fix them in position, as herein set forth.

4. The bar *l*, supported by the brackets *m*, in combination with the sectional ladder herein described, whereby the ladder may be swung in close proximity to a window, and used as occasion may require, substantially as described.

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