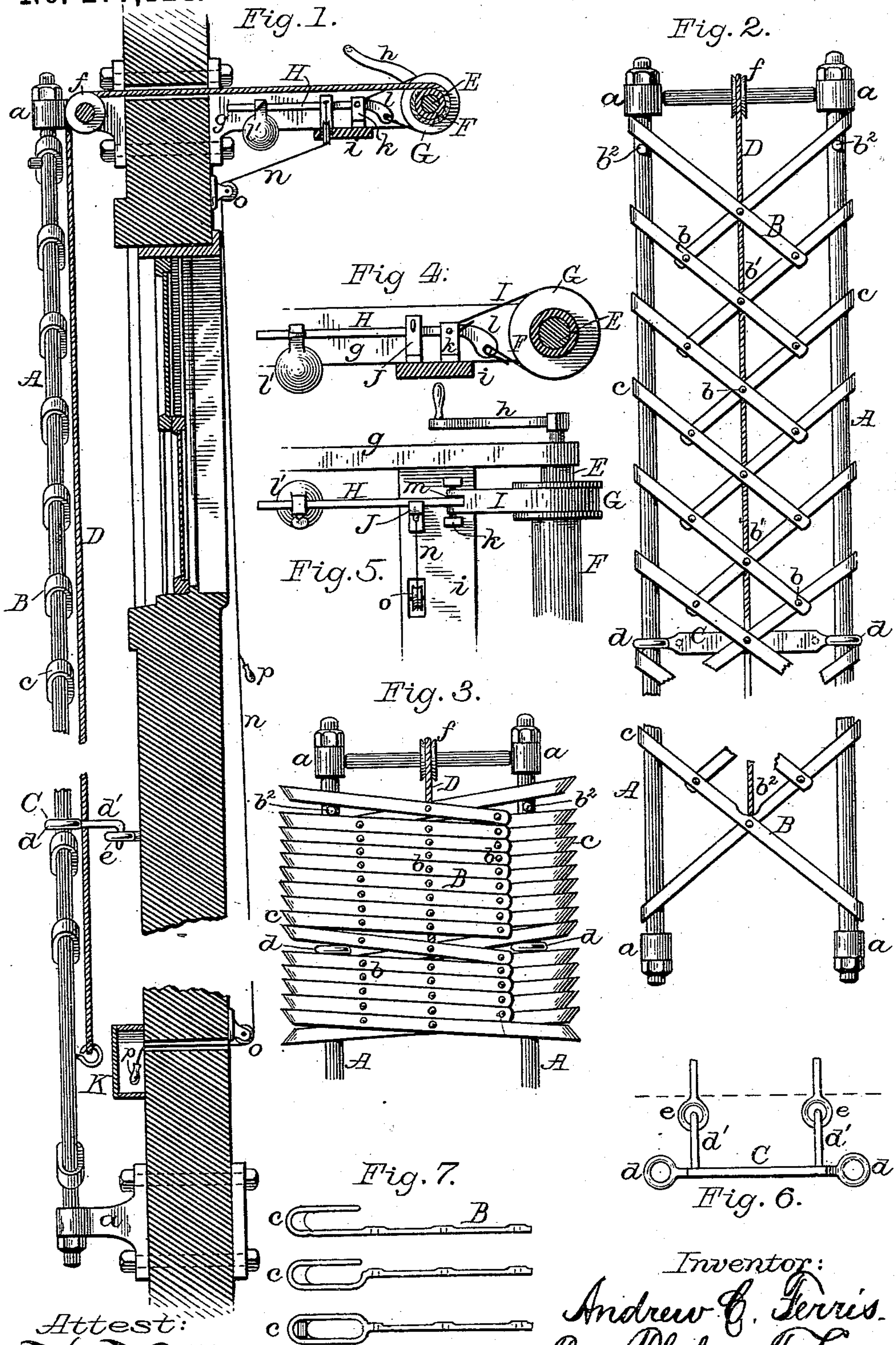


(No Model.)

A. C. FERRIS.
FIRE ESCAPE LADDER.

No. 277,124.

Patented May 8, 1883.



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UNITED STATES PATENT OFFICE.

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FIRE-ESCAPE LADDER.

SPECIFICATION forming part of Letters Patent No. 277,124, dated May 8, 1883.

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To all whom it may concern:

Be it known that I, ANDREW C. FERRIS, of Hackensack, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Fire-Escape Ladders; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming part thereof, is a full, clear, and complete description of my invention.

My invention relates to that class of fire-escape ladders which, while permanently attached to or connected with a portion of a building, are arranged, when not in use, to be elevated in a compact form beyond the reach of unauthorized persons, and when required for the usual and ordinary purposes of a fire-escape can be lowered into proper position.

My invention has for its object the construction of such a fire-escape ladder in a strong and durable form, and capable of certain and speedy operation; and in the construction of my improved ladder the folding steps thereof are arranged to move vertically upon side supports or guides, are firmly held in position by one or more braces when lowered, and in connection with said folding steps there is employed an apparatus for raising and lowering them, which apparatus is controlled by a friction-brake, affording a means for holding the steps in a folded condition when elevated, and also causing their descent when the brake is operated at such times as the ladder is required in position for use.

To more particularly describe my invention, I will refer to the accompanying drawings, in which Figure 1 represents partially in side view and section one of my improved ladders attached to the front wall of a building, and in position for use. Fig. 2 represents the ladder in front view, the steps being extended. Fig. 3 represents a view of the ladder-steps as they appear when folded. Fig. 4 represents a side and partially-sectional view of the hoisting and lowering apparatus with the friction-brake. Fig. 5 is a top view of the same. Fig. 6 represents a detached view of one of the sliding braces with its hooks and receiving-eyes, and Fig. 7 represents detached views of the bars which constitute the steps of the ladder.

A in each instance denotes a bar or rod of metal, of which I employ two, and these constitute the side supports or guides of the ladder. These supports or guides may be of any desired shape or construction, whether square, round, hollow, or solid, which may be found most suitable for the purpose intended, and I design also in some instances to employ, in lieu of the bars or rods referred to, proper lengths of wire rope of requisite strength and thickness to meet the necessary requirements. Each of the side supports or guides A are placed vertically adjacent to the wall of a building, at a suitable and proper distance therefrom, (preferably between the windows thereof,) and are then firmly and tightly secured in position in straight vertical lines by means of suitable brackets or clamps, as at *a*, four in number, placed at top and bottom ends thereof and fastened to the wall of the building. Each support or guide when in position extends from a point adjacent to the roof or cornice of a building to or near the ground.

B denotes the folding steps of the ladder. (Illustrated more clearly in Figs. 2, 3, and 7 of the drawings.) These steps are formed of bars or strips of metal, which are connected by pivots at *b*, as shown in Figs. 2 and 3, in order to form a continuous structure capable of being readily folded and extended. With the exception of the two lower and upper bars, as shown, each bar is at its inner end and at two other points pivoted to the next adjacent bars in such a manner as to provide a series of V-shaped spaces, *b'*, extending from end to end of the ladder for the reception of the feet, as shown clearly in Fig. 2. In some instances, when desirable, I contemplate providing each bar at the bottom of the spaces referred to and adjacent to the pivot with a slight curve, as illustrated at the base of the ladder in Fig. 2, to afford an easier resting-place for the foot than would be the case if the angle at the base of the recesses were more acute. For additional strength and security in the construction of the ladder, each bar or strip is, as shown in Fig. 7, made with an increased thickness of metal at the points through which the pivots pass. Pins *b*² on the supports A and under the outer ends of the two upper bars of the folding steps serve to retain the upper

end of said steps always in position at the top of the supports A.

To afford a means of connection between the folding steps B and the supports or guides A, each of the several bars constituting the steps is provided at its outer end with an elongated loop or hook, *c*, which embraces the supports or guides and permits an easy and free movement of each step-bar during the raising and lowering movements of the folding steps. The outer end of each loop or hook *c* is so curved that the outer end of each bar will maintain proper contact with the guides when the steps are lowered; and on the inside of each loop or hook a small friction-roller may be mounted in an obvious manner, such roller greatly facilitating the movement of the steps upon the guides or supports.

C denotes a sliding brace, for rigidly maintaining the ladder in position during its use. As many of these braces as may be desired are employed in connection with each ladder, their number depending upon the length or height of the ladder. In this instance I have shown but one brace, which consists of a bar of metal attached to the folding steps B at one of the pivots *b*, and provided at each end with a loop, *d*, of sufficient size to embrace the guides A, upon which the brace slides during the operation of the steps of the ladder.

Hooks *d'*, attached to and traveling with the brace-bar, are arranged to connect with a corresponding number of receiving eyes or sockets, *e*, which are fastened to the wall of the building at such points as to permit the ready engagement therewith of the hooks *d'* during the operation of lowering the folding steps of the ladder. Whenever desirable the loops *d* on the brace may be enlarged sufficiently to permit the insertion and employment in each loop of a pair of friction-rollers, which will embrace the guides A and facilitate the movement of the brace thereon during the operation of the steps.

Although I have here shown and described the brace C as connected directly to and moving with the folding steps, it is obvious, if the brace be disconnected therefrom and supported loosely upon the guides or supports A, that during the operation of the step-bars the outer ends of the latter will come into contact with the looped ends of the brace and cause it to be moved therewith, either up or down, as the case may be.

I design, in some instances, when desired, to dispense with the employment of the sliding brace, and substitute therefor fixed braces attached directly to the guides or supports A and to the wall of the building at proper distances apart, in which case the hooks *c* on the folding steps may be so bent or curved at their ends as to readily pass the fixed braces during the movement of the steps upon the supports A.

D denotes a rope or chain attached at one end to the lower end of the folding steps B,

and, extending up throughout the length of the ladder, is carried over a pulley, *f*, properly mounted at the upper end of the supports A between the brackets *a*, and from which said rope passes through an opening in the wall of the building, and is connected with the hoisting and lowering apparatus next described.

Upon the interior of the wall of the building and on a line with the top of the ladder are fastened two brackets, *g*, (of which but one is shown in the drawings,) which may usually be held in position by the same bolts employed in connection with the two upper brackets or clamps *a* upon the exterior of the building, and upon these interior brackets, *g g*, a shaft, E, is rotatively mounted, being provided at one end with a crank, *h*. A drum, F, and flanged friction-pulley G are mounted upon the shaft E, and to the drum the upper end of the rope or chain D is connected. The brackets *g* are also connected at their lower edges by a shelf or platform, *i*, and upon this shelf I place a forked fulcrum-post, *k*, within and upon which a lever, H, is pivoted a short distance from its inner end, as shown clearly in Figs. 1, 4, and 5. The inner end of said lever is preferably slightly enlarged, and provided with a downward extension, as shown at *l*. A friction-band, I, usually of metal, passes around the flanged pulley G, and is attached at one end to the fulcrum-pivot of lever H, and at the opposite end is connected with the inner end, *l*, of said lever by a pin, which passes through it. Each end of the band I is provided with an open slot, as shown at *m* in Fig. 5, which enables the band at its ends to embrace the lever H, and to be wrapped about the pins, as shown. A weight, *l'*, is mounted upon the outer end of the lever H, and made adjustable thereon by means of a set-screw in a manner well known. A flat spring, J, provided with an engaging-lug, is also mounted upon the shelf *i* adjacent to the lever H, and is arranged to engage with and to retain the outer end of said lever in a depressed position until its lug is freed from contact therewith. For the purpose of releasing the spring J from contact with the lever H, I employ a wire or cord, *n*, attached to the upper end of said spring, and, after passing over a series of small grooved pulleys, *o*, in the manner indicated in Fig. 1, down through the several floors of a building, the lower end of said wire or cord is then carried through an opening in the wall at the lower story to the exterior thereof, within convenient reach from the ground, and is there provided with a handle, *p*. A box, K, attached to the wall of the building and inclosing the handle *p*, is provided with a lock and key as a means for preventing tampering or interference by unauthorized persons with the operating devices. Handles *p* may also be attached to the wire *n* at each floor of the building, affording thereby a means for the manipulation of the ladder by persons within the building.

In the operation of a ladder constructed in accordance with my invention, as herein shown and described, it will be obvious that (the steps being in the position shown in Figs. 1 and 2) if power be applied to the crank *h* upon the outer end of shaft *E* the drum *F* is thereby rotated, causing the rope or chain *D* to be wound thereon. Said rope or chain acting upon the steps *B* from the lower end thereof, they are gradually elevated upon the side supports, *A*, as the rope is wound upon the drum, until they are compactly folded and assume the position indicated in Fig. 3, which, in practice, is usually immediately under the cornice of a building. The steps having been thus elevated and folded, the outer end of the lever *H* is then depressed, causing the friction-band *I* to tightly clasp the pulley *G*, and, having adjusted the weight *l'* upon the lever *H* to such a position as will maintain a proper degree of tension of band *I* upon said pulley, the spring *J* is then caused to engage with the lever and hold the outer end of the latter in its depressed position, by which means the steps of the ladder are retained in their elevated or folded condition. To lower or unfold the steps *B* into the position indicated in Figs. 1 and 2, it is simply necessary to exert a pulling action upon the wire or cord *n*, whereupon the spring *J* is drawn from the lever, causing the tension of the band *I* upon pulley *G* to be lessened sufficiently to permit the steps *B*, by their own weight to gradually descend upon the supports *A*, and the hooks *d'* upon the sliding brace *C* engaging with the receiving eyes or sockets *e*, the ladder is firmly fixed in position, ready for use.

It may be found desirable in some instances to so construct the spring *J* that it may be adjustable with relation to the lever *H*, in order to compensate for any wear which may occur to interfere with the proper operation of the lever and friction-band. The positions of the hooks *d'* and eyes or sockets *e* may also be changed, the latter taking the place of the former upon the brace *C*, while the hooks are secured to the wall, the action being similar to that before described.

A ladder constructed as herein shown and described is not only strong, durable, and comparatively light, but can be easily and rapidly operated, as occasion may require. When the stops are elevated and folded they are placed beyond the reach of burglars and all unauthorized persons who may desire to enter the building, and can only be operated from the exterior by persons in possession of keys to the box *K*, which may be placed in the hands of policemen and firemen.

I have found in practice that a ladder constructed as described, and having a length of forty feet, will sustain a weight of four thousand pounds, and when the steps thereof are elevated and folded they occupy a space of but about thirty-two inches; and I also find that by varying the adjustment of the friction-brake the steps may be lowered at either a slow or fast rate of speed.

Many of the well-known forms of balconies may be employed in connection with my ladders, and thereby facilitate their use in cases of emergency.

I am aware that prior to my invention, bars of metal have been joined together by riveting or bolting, so as to form a frame-work that would close or fold up or extend in a manner somewhat similar to that shown and described by me; but such bars have not heretofore been employed in connection with side supports or guides.

I am also aware that it has heretofore been proposed to employ a single guide-rod which passed through the center of a series of flat ladder-steps mounted thereon; and I am also further aware that it is not new to employ ropes and winding mechanism for raising and lowering the steps of a fire-escape ladder, and such I do not claim, broadly.

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

1. The combination of the side supports or guides, the folding steps connected at their outer ends with and moving upon said supports or guides, and mechanism for folding and unfolding said steps, substantially as described.

2. The combination of the side supports or guides, the folding steps connected at their outer ends with and moving upon said supports or guides, the sliding brace or braces having hooks engaging with receiving eyes or sockets, and mechanism for raising and lowering said steps and braces, substantially as described.

3. The rotary shaft provided with the drum and flanged pulley, the friction-strap, the pivoted lever having a weight adjustably mounted thereon, the spring, and its operating wire or cord, in combination with the folding steps, the side supports or guides, the brace or braces, and the rope or chain connecting said shaft and drum with the steps, substantially as described.

ANDREW C. FERRIS.

Witnesses:

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S. VAN BENSCHOTEN.