(No Model.) 3 Sheets—Sheet 1.

L. D. KNOWLES.

EXTENSION LADDER AND FIRE ESCAPE.

No. 427,771. Patented May 13, 1890.

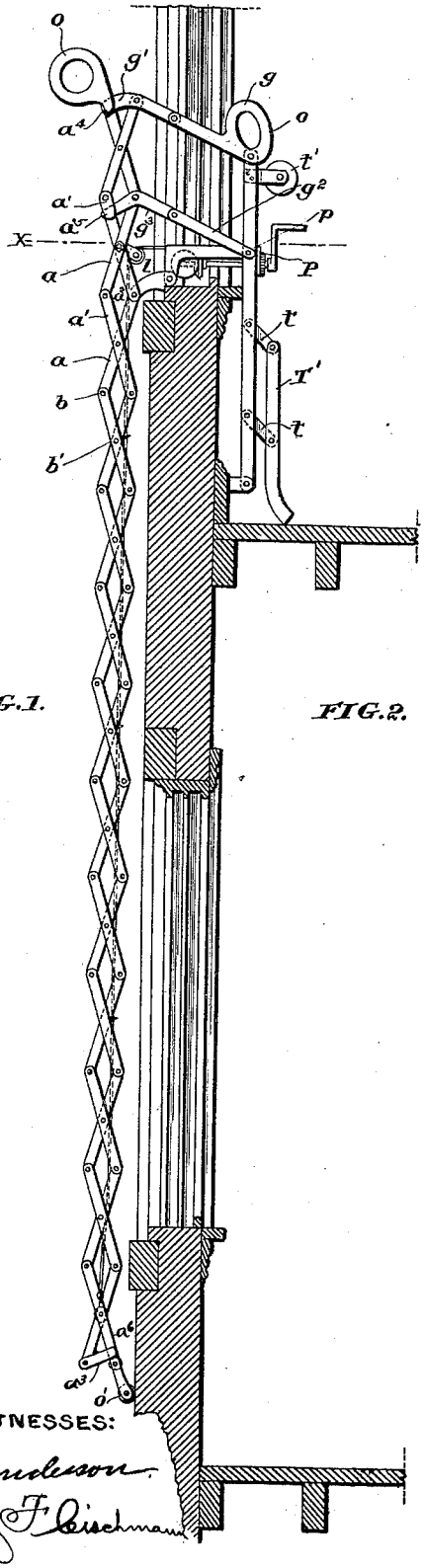


FIG. 1.

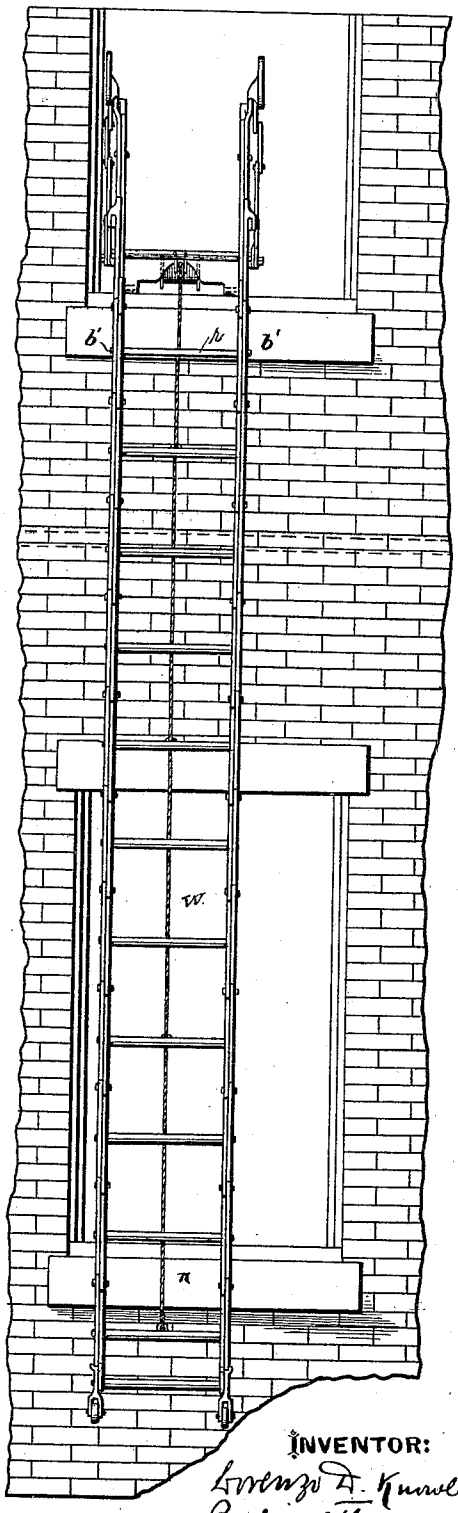


FIG. 2.

WITNESSES:

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Howard Pell

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(No Model.) 3 Sheets—Sheet 2.

L. D. KNOWLES.

EXTENSION LADDER AND FIRE ESCAPE.

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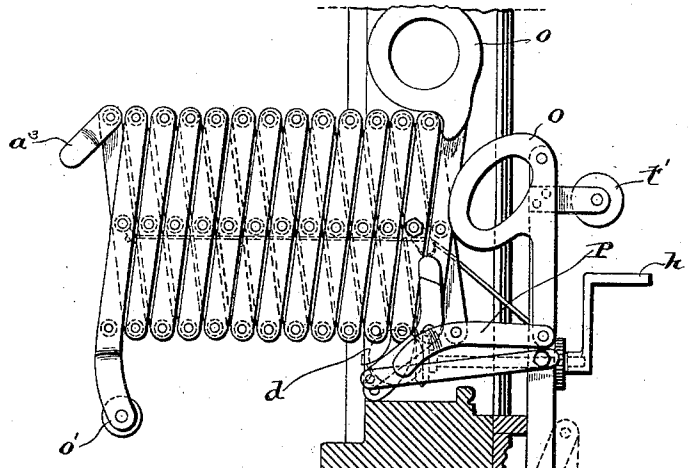


FIG. 3.

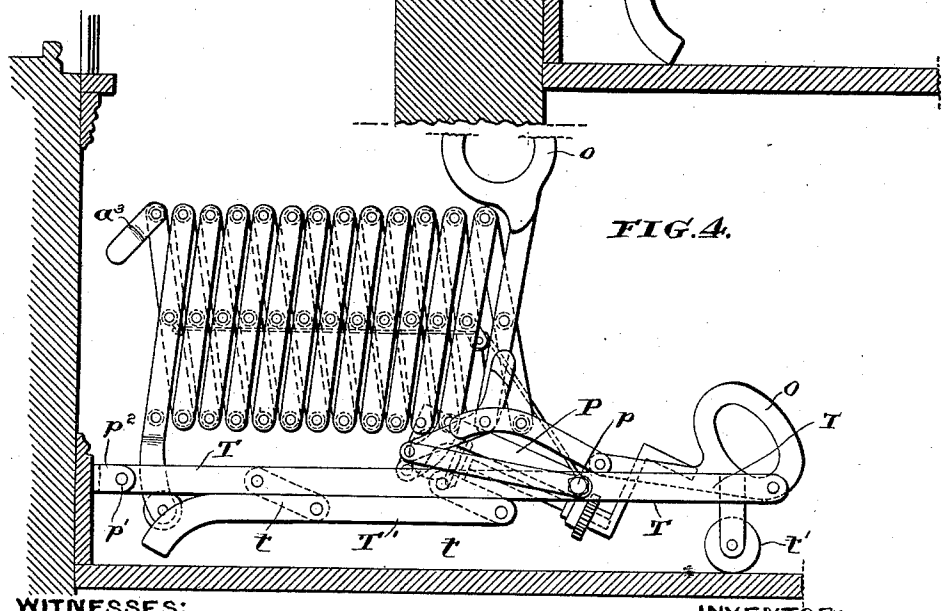


FIG. 4.

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(No Model.) 3 Sheets—Sheet 3.

L. D. KNOWLES.

EXTENSION LADDER AND FIRE ESCAPE.

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FIG. 5.

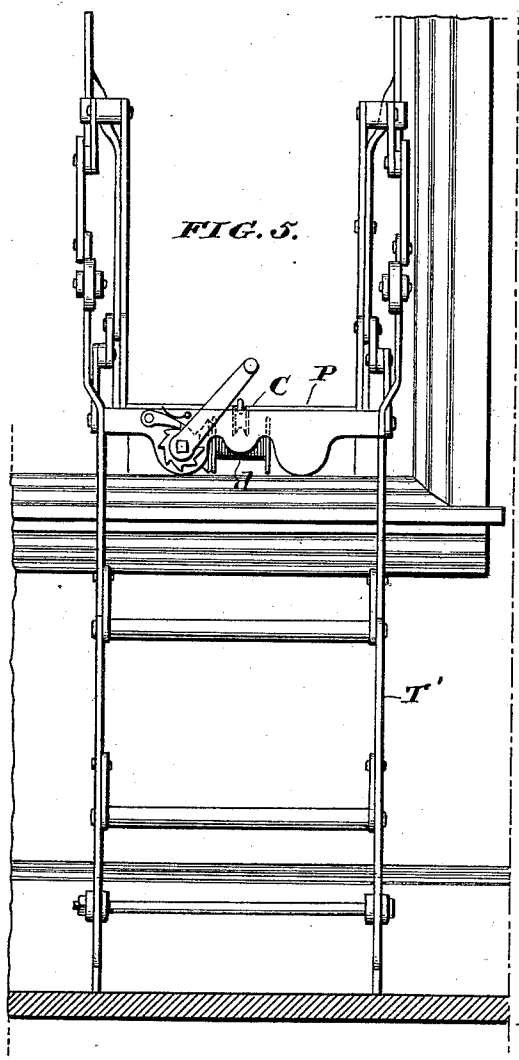


FIG. 6.

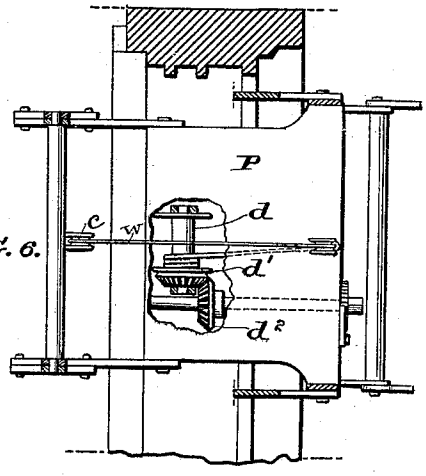


FIG. 7.

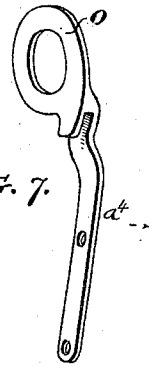


FIG. 8.

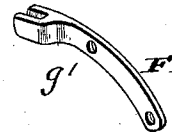


FIG. 9.

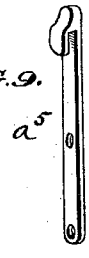


FIG. 10.



FIG. 11.

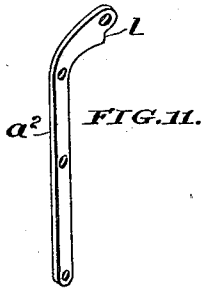
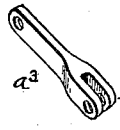


FIG. 12.



FIG. 13.



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UNITED STATES PATENT OFFICE.

LORENZO D. KNOWLES, OF PHILADELPHIA, PENNSYLVANIA.

EXTENSION-LADDER AND FIRE-ESCAPE.

SPECIFICATION forming part of Letters Patent No. 427,771, dated May 13, 1890.

Application filed February 18, 1890. Serial No. 340,950. (No model.)

To all whom it may concern:

Be it known that I, LORENZO D. KNOWLES, of the city of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Extension-Ladders and Fire-Escapes; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification.

My invention has relation to extension-ladders and fire-escapes; and it consists in a portable ladder adapted to be expanded and contracted, of a construction as hereinafter particularly set forth and described.

The object of my invention is to provide a light compact portable ladder which may be stored in a compact form in a small space, readily transported, and quickly expanded to its full length when desired.

In the accompanying drawings similar letters of reference refer to similar parts throughout.

Figure 1 is a sectional view representing the extension-ladder extended at full length, as from a window of a building. Fig. 2 is a front view of the ladder in the position shown in Fig. 1. Fig. 3 represents the ladder in its compact closed form adjusted in a window, as in the position to be dropped or as in the position after having been raised. Fig. 4 is a sectional view of the extension-ladder contracted and on its truck, ready to be raised to the position shown in Fig. 3. Fig. 5 is a sectional view from the rear of the ladder in position as in Fig. 2. Fig. 6 is a plan sectional view of the platform and raising and lowering mechanism. Fig. 7 is an upper end section of the ladder detached, with a handle or loop provided on the upper end thereof to be grasped in ascending or descending. Fig. 8 shows a detached section or joint constituting a part of the upper hand-rail. Fig. 9 shows one of the upper sections of the ladder with a lug at one end, into which the mortise end of section shown in Fig. 10 engages for locking purposes. Fig. 10 is a section of the lower cross-rail with a mortised end adapted to engage in the lug shown in Fig. 9 when the ladder is expanded. Fig. 11 is another of the upper sectional joints of the ladder, the upper end of which is pivotally secured to the platform and tends to support the ladder. Fig. 12 is the extreme lower sectional joint of the ladder, the lower end of which is provided with a roller to facilitate the raising and lowering of the ladder as it may rest against the wall of the building. Fig. 13 is a lock-joint provided on one of the lower sectional joints to engage upon the corresponding joint and prevent the sectional joints throughout from binding.

The ladder proper is composed of two series of cross short sectional joints $a\,a'$ on each side of the rounds, pivoted to each other by means of pivots or bolts $b\,b'$. The sectional joints $a\,a'$ are of equal length and pivoted at their center, one on top of the other, preferably by a tap-bolt b', running through the round r. A like series of sectional joints $a\,a'$ are provided on each side of the rounds r. To each end of the sectional joints $a\,a'$ are pivotally secured other like sets of joints by the pivots b, similarly constructed, and thus the main length of the ladder is constructed to the length desired, so that by reason of the short sections thus jointed the ladder may be contracted, when closed, into a space equal in length to about half the combined width of the sections and in height to the length of the sections, as shown in Figs. 3 and 4.

In order to readily transport the ladder and to place it into and depend it from a window quickly in case of fire, I provide a frame or truck T, upon which the ladder is pivotally secured by means hereinafter described, as shown in Fig. 4. To the truck T a short platform P, to which the ladder is secured, is pivoted at the point p. The ladder may then be raised, when the truck is in the position shown in Fig. 4, to an angle which will direct it out of an open window when the inner end of the truck is raised to the position shown in said Fig. 3, the other end of the truck being preferably adjustably pivoted to the wall, as shown at p' in Fig. 4. The weight of the ladder will then drop it to its full length.

In order to regulate the dropping of the ladder, a wire rope w is secured to the lower end, passed over a pulley c, provided in the upper round, and unreeled from a reel or drum operated by the wheels d' d^2, or by any

desirable construction of gearing provided underneath the platform P, turned by an adjustable crank-handle *h*. One of the upper sectional joints a^2 is provided with an extension or lug *l*, which is pivoted to the lower outside end of the platform P, and the ladder thus hung or supported when extended, and allows of the ladder, when contracted, to be drawn by means of the rope *w* into the window in the position shown in Fig. 3. An upper guard-rail composed of jointed sections *g* *g'* is provided above the platform P, and is secured to the outer end of the truck T at one end and to the upper sectional joint of the extension-ladder at its upper end, jointed so as to fold in with the ladder when contracted. A lower sectional guard-rail composed of the sections g^2 g^3 is also preferably employed, pivoted in like manner to the truck T to a section of the ladders.

In order to prevent the sections *a* *a'* from binding against each other and getting on a dead-center when extended, I provide at the lower end of the ladder lock-sections a^3 and at the upper end lock-sections a^4 a^5, which are pivoted to the end of one section *a* and engage by means of a shoulder or recess upon its corresponding jointed section *a* or *a'*, as the case may be, which, it will thus be seen, prevents the sections from further expanding and binding. The truck T is provided at one end with small wheels or rollers *t'*, so that the extension-ladder when contracted may be stored in a hall convenient to the windows of any floor and readily rolled when needed to any window and quickly secured in position, as shown in the drawings. Lugs or joints p^2 are secured to the wall a short distance above the floor, to which the handle ends of the truck T are adjusted and a rod or pivot *p'* run through the same to pivotally secure the frame of the truck T thereto. I also provide a short ladder-section T' to the under side of the truck T, adjustably secured thereto by the joints *t* *t*, so that it may be forced compactly up against the truck T when not in use and pulled down, when desired, in position shown in Fig. 3, to allow of easy access to the platform P. The handles *o* *o* are provided on the sectional joints for security, so that they may be readily grasped by the hand. A roller *o'* is provided on the end of the lower section a^6 of the ladder, so that the ladder may be raised or lowered smoothly against the wall.

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

1. In an extension-ladder, the combination of two series of short jointed sections, one series of sections on each end of the round and pivotally connected with the said round at their central point, said sections connected pivotally at their ends with other like-jointed sections pivotally connected at their center to the round, one set on each end of said round, and so continued and carried out to the desired length, a portable platform to which the said extension-ladder is hinged, supported, and adapted to be dropped therefrom in the act of expansion and elevated thereto in the act of contracting, a portable truck to which said frame and structure is pivotally secured, and jointed guards or hand-rails secured to said truck and to the upper section of the extension-ladder, the whole adapted to be operated and adjusted by the means substantially as hereinbefore set forth and described.

2. In a portable extension-ladder, in combination with a truck or frame adapted to be secured removably to the inside of the wall of a building, a portable frame or platform P, pivotally secured to the said truck or frame, and a jointed extension-ladder having a set of jointed sections *a* *a'* pivoted about their center to a ladder-round, one set on each end of the said ladder-round, and pivotally jointed at their ends to a like set substantially similarly constructed, said extension-ladder adapted to be dropped for purposes of extension from said platform and elevated when contracted by the means substantially as hereinbefore set forth and described.

3. In a portable extension-ladder, a truck or frame provided with rollers, in combination with a frame or platform P, pivotally secured to said truck, and a jointed extension-ladder having a set of jointed sections *a* *a'* pivoted about their center to a ladder-round, one set on each end of said ladder-round and pivotally jointed at their ends to a like set substantially similarly constructed, locking-lugs a^3 a^4, said extension-ladder adapted to be dropped when in use from said frame or truck and elevated and contracted thereto and thereon when not in use by means of a rope or cord *w*, winding-drum *d*, and mechanism, as hereinbefore set forth and described.

4. In a portable extension-ladder, a series of pivotally-jointed sections, in combination with a series of ladder-rounds, two of said sections pivotally jointed at their centers to the end of said ladder-rounds and pivotally jointed at their ends to another pair, and one series provided on each side of said rounds, the whole adapted to be expanded and contracted at will by means of the lowering and elevating device operated from above, substantially as described, a platform or standard to which said extension-ladder is hinged and supported, a portable truck to which the structure is pivotally secured and jointed, and guards at hand-rail, pivotally secured to the said truck and to the upper sections of the extension-ladder, the whole adapted to be operated and adjusted in the manner and by the means substantially as hereinbefore set forth and described.

5. In a portable extension-ladder, a truck or frame T, provided with a roller *t'*, a handle end adapted to be secured removably to the wall of the building, and a platform or standard P, pivotally secured to said truck T,

in combination with a jointed extension-ladder having a set of jointed sections a a' pivoted about their center to a ladder-round, one set on each end of said ladder-round, and pivotally jointed at their ends to a like set similarly constructed, locking-lugs a^3 a^4, guard-rails g g' g^2 g^3, and winding-drum d, operated by the handle h through the medium of the gearing d' d^2, substantially as hereinbefore set forth and described.

In witness whereof I have hereunto set my hand.

LORENZO D. KNOWLES.

Witnesses:

REESE M. FLEISCHMANN,

HORACE PETTIT.