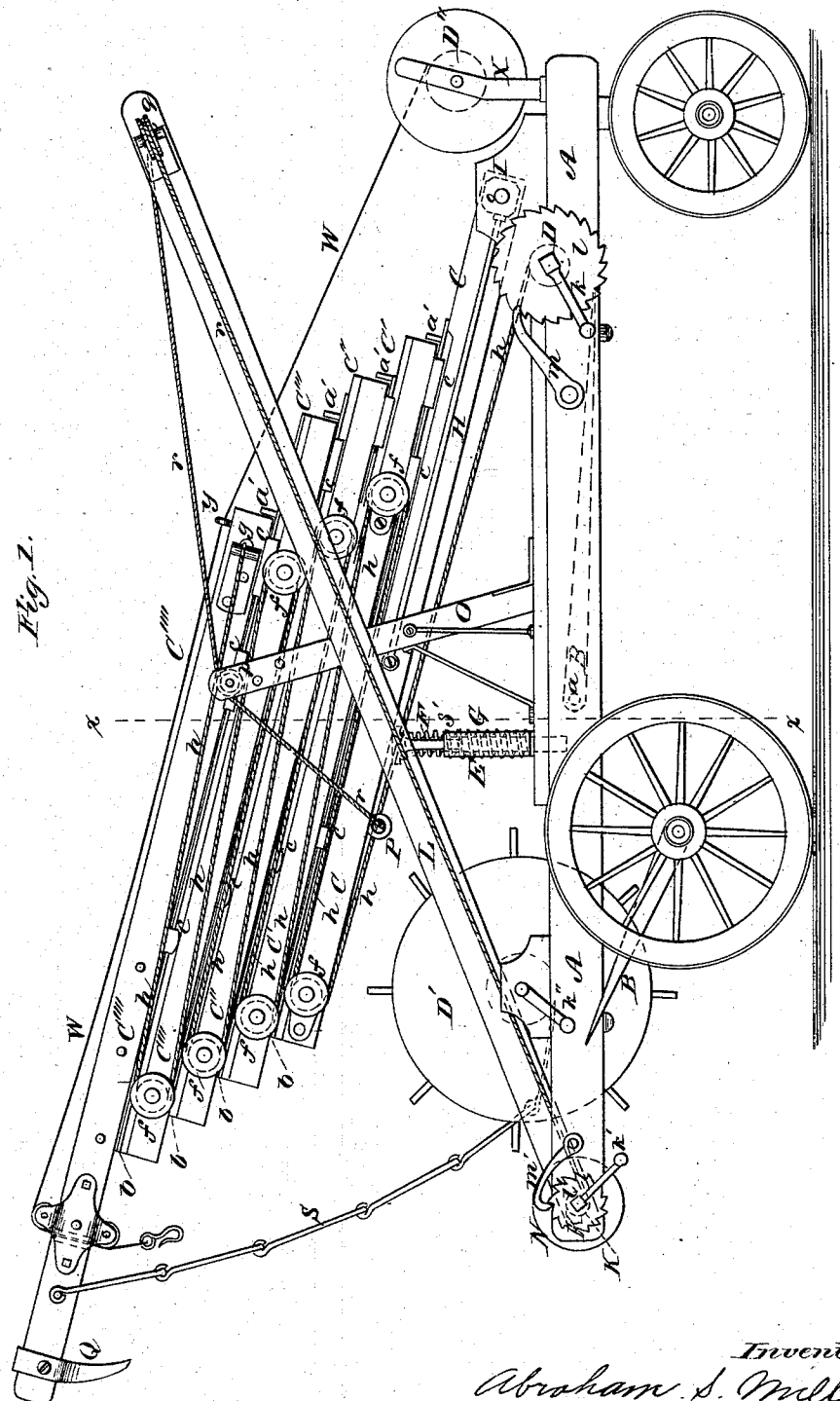
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A. S. MILLER.

FIRE ESCAPE.

No. 291,378. Patented Jan. 1, 1884.

Fig. 1.



Witnesses:
Henry A. Parker
Jno. E. Parker

Inventor:
Abraham S. Miller
by Chas. M. Higgins
Attorney.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 5 Sheets—Sheet 2.

A. S. MILLER.

FIRE ESCAPE.

No. 291,378. Patented Jan. 1, 1884.

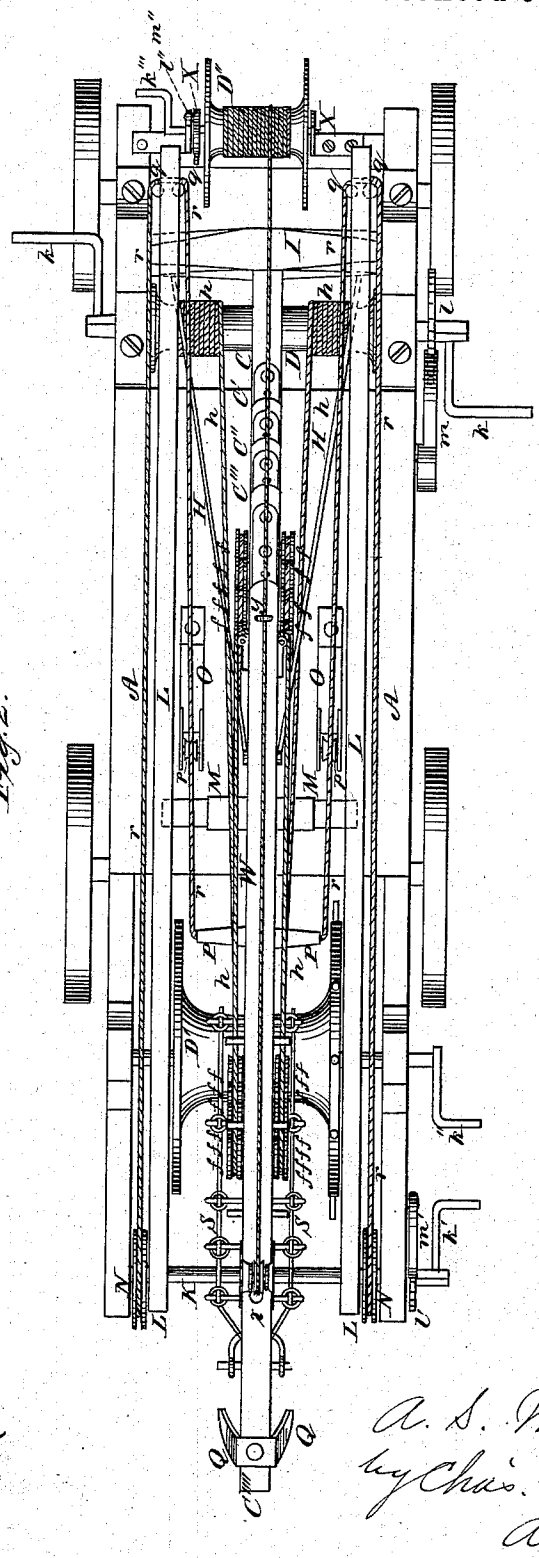


Fig. 2.

Witnesses:
Henry F. Parker
Jno. C. Edwards

Inventor:
A. S. Miller
by Chas. M. Higgins
Attorney

N. PETERS. Photo-Lithographer, Washington, D. C.

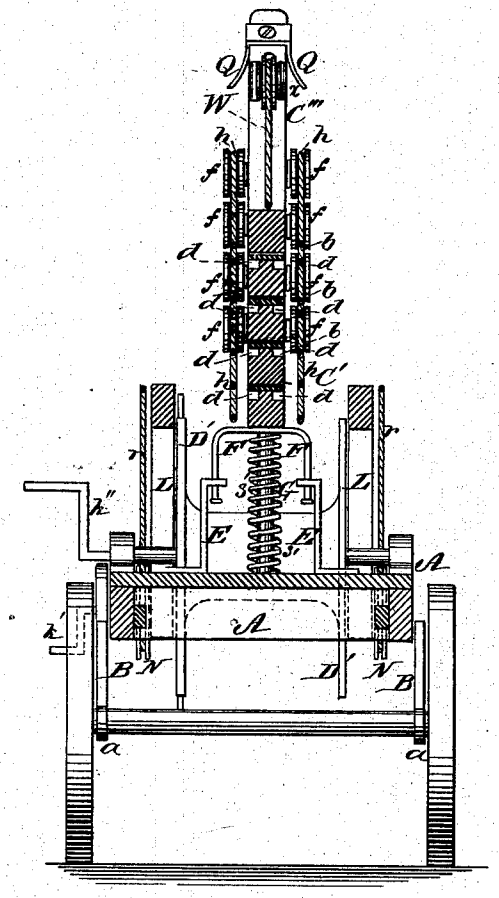
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A. S. MILLER.

FIRE ESCAPE.

No. 291,378. Patented Jan. 1, 1884.

Fig. 3.



Witnesses:
Henry F. Parker.
Jno. E. Wavin

Inventor:
Abraham S. Miller
by Chas. M. Higgins
attorney.

N. PETERS, Photo-Lithographer, Washington, D. C.

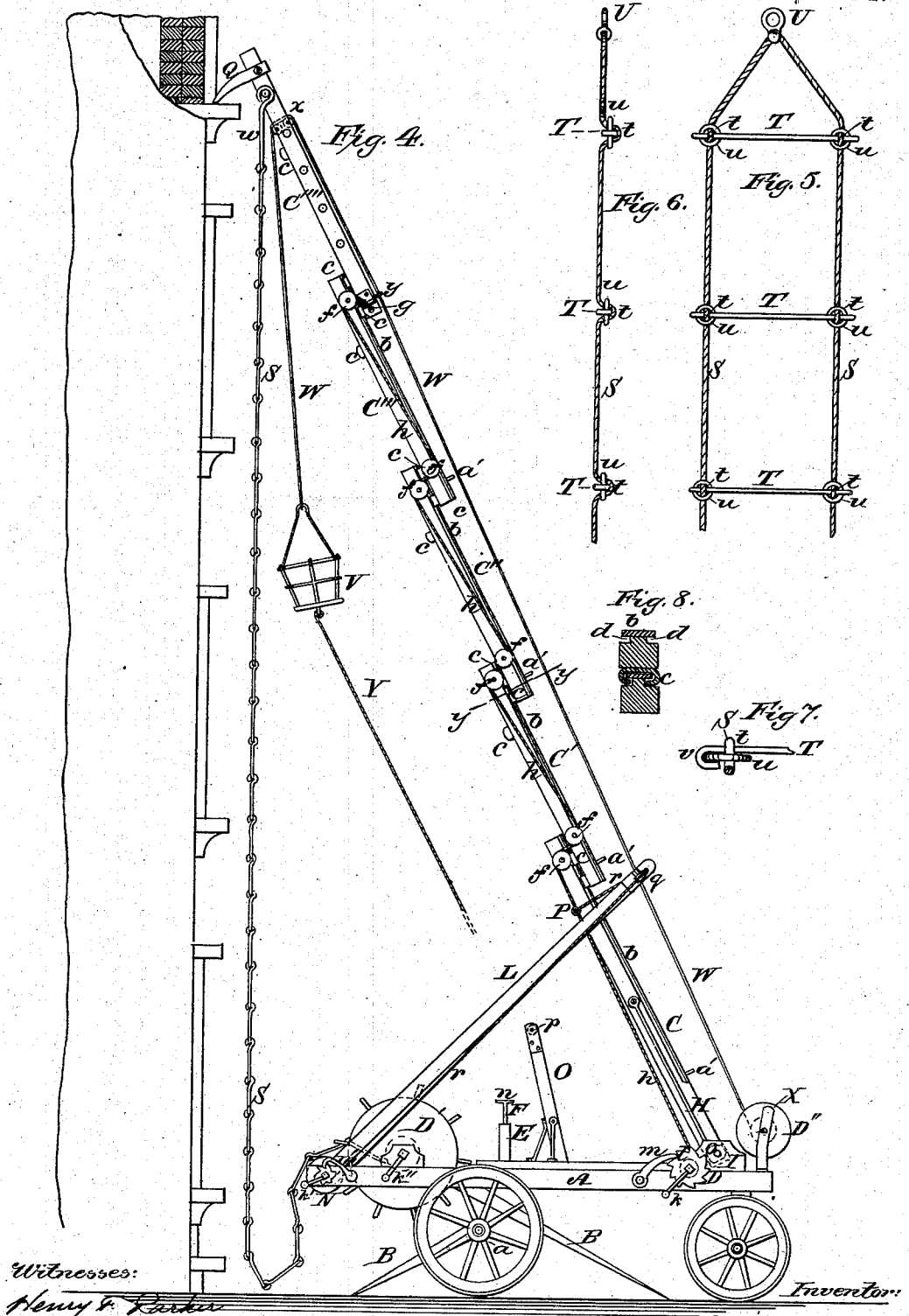
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A. S. MILLER.

FIRE ESCAPE.

No. 291,378. Patented Jan. 1, 1884.



N. PETERS. Photo-Lithographer. Washington, D. C.

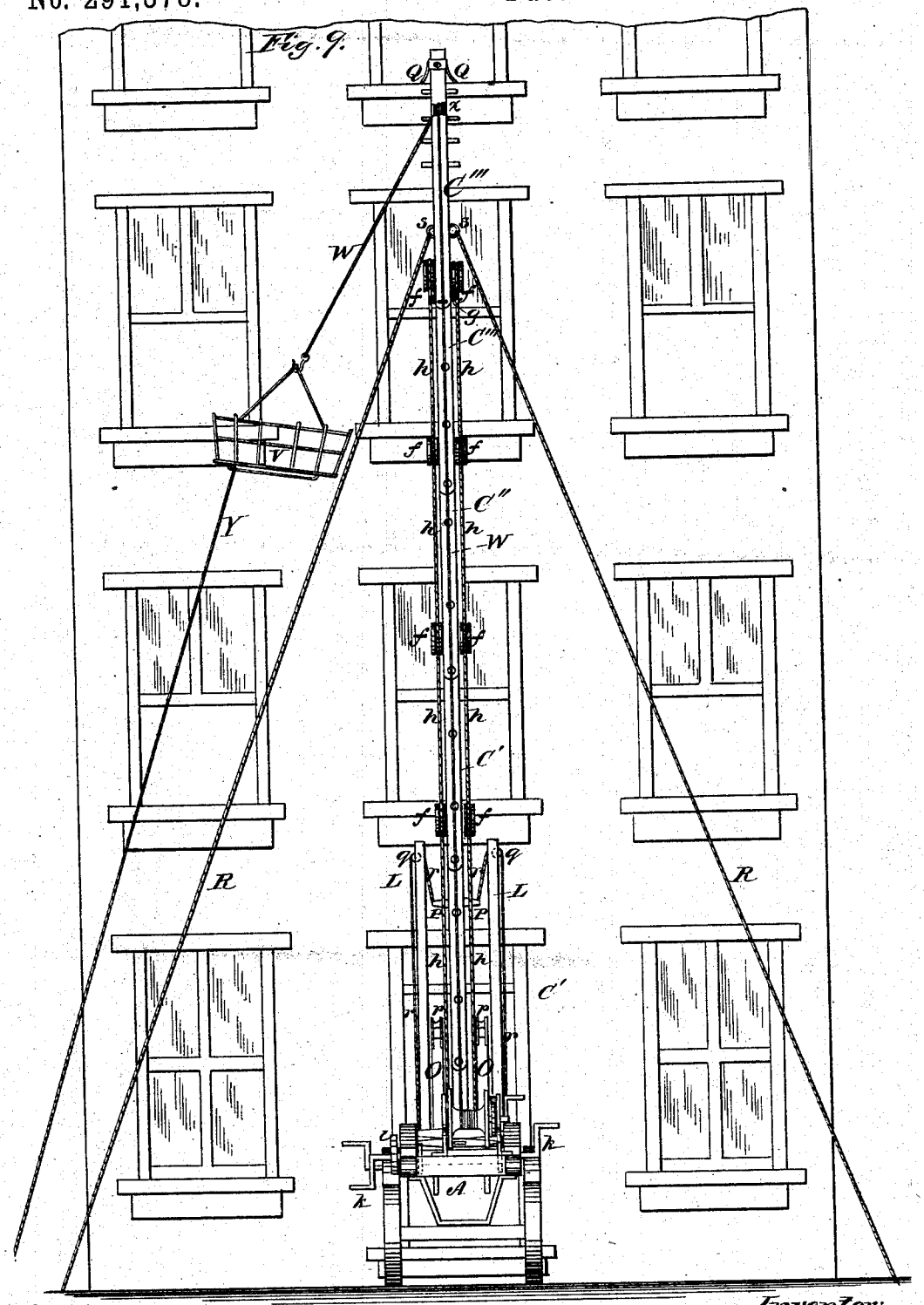
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A. S. MILLER.

FIRE ESCAPE.

No. 291,378. Patented Jan. 1, 1884.

Fig. 9.



Witnesses:
Henry F. Parker.
Jno. E. Davis

Inventor:
A. S. Miller
by Chas. M. Higgins
attorney

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

ABRAHAM S. MILLER, OF REPUBLIC, OHIO.

FIRE-ESCAPE.

SPECIFICATION forming part of Letters Patent No. 291,378, dated January 1, 1884.

Application filed May 14, 1883. (No model.)

To all whom it may concern:

Be it known that I, ABRAHAM S. MILLER, of Republic, Seneca county, Ohio, have invented an Improvement in Portable Fire-Escapes; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to that class of portable fire-escapes designed to be transported to and from fires on trucks, and usually placed in charge of and worked by the regular firemen of municipal fire-departments.

My invention also relates to that class of portable fire-escapes which employ extension-ladders, booms, telescoping tubes, &c., for reaching considerable heights above the ground, in any desirable direction oblique to a perpendicular from the horizontal plane of the truck, base, or support for the same.

The invention is designed to supply a cheaply-constructed, light, yet strong, durable, safe, easily and rapidly operated means for rescuing persons exposed to danger from fires in buildings, especially from lofty positions inaccessible by ordinary means. Its more important features are as follows: An extension-boom, the details of which are hereinafter fully explained, is employed in combination with a derrick-boom or derrick-booms, extension rope or ropes, windlass or windlasses, and a peculiar support for the ropes of the derrick-boom, the office of which support is to act as a fulcrum for the derrick-ropes and relieve their tension in hoisting the extension-boom, as more fully hereinafter explained. The tip of the extension-boom is furnished with a claw, which, in use, engages the window-sill, cornice, or even the solid side of the building to which it is presented. The functions of this claw are to take the principal part of the strain otherwise put upon the extension-boom and due to leverage when weights are suspended from the upper part of the boom, and also to prevent any swaying of the tip of the boom, due to the springing of its materials or to want of rigidity in its supports at the bottom. In combination with the derrick boom or booms and the extension-boom are also employed a flexible extension-ladder, (the construction of which is in itself a feature of the invention,) and a cradle for the lowering of timid, feeble, or invalid persons unable to make use of the extension-ladder, and both of these elements of the invention are supplied with windlasses and other devices for safely and quickly operating them, as hereinafter fully explained. A spring-support upon which the extension-boom rests when unextended, and which prevents injury from shocks in transporting the apparatus over rough pavements, &c., also forms a feature of the construction.

Other specific features of the invention exist in the details of construction and operation of the apparatus, as will further appear in the description, and upon reference to the drawings, in which—

Figure 1 is a side view of the entire apparatus, as seen folded together upon its truck for transportation or housing. Fig. 2 represents a top view of the apparatus with the parts in the same relative position as shown in Fig. 1. Fig. 3 is a vertical section through the entire machine, the parts being in the same relation as in Figs. 1 and 2, and the section being made on the line *x x* in Fig. 1. Fig. 4 is a side view of the apparatus, as seen when in actual use. Figs. 5, 6, and 7 illustrate details of construction in the flexible extension-ladder. Fig. 8 is a slightly enlarged section made on the line *y y* in Fig. 4, and illustrates a detail of construction in the extension-boom. Fig. 9 is a front view of the apparatus, as seen with the parts of the extension-boom extended and in use, the parts being in substantially the same relation as in Fig. 4.

The base of the entire apparatus is a strong wheeled truck, A, Figs. 1, 2, 3, 4, and 9, made as rigid as practicable, and provided with suitable anchoring-braces, B, for holding it immovably in position whenever the nature of the ground requires such anchoring, as will be the case on icy or slippery pavements, &c. Both the truck and the anchoring-braces, which latter are pivoted to the truck, as shown at *a*, Fig. 1, may be of any approved materials or construction.

Upon the frame or body of the truck is carried the extension boom or pole C C′ C″ C‴ C⁗. This boom is shown in this example of my in-

vention as composed of the five sections C C′ C″ C‴ C⁗; but it is obvious that this number, within practicable limits, may be increased indefinitely to lengthen the pole or boom, according to the height it is desired to reach. Each of these sections is preferably made of light, strong, and elastic timber, and each, except C⁗, has a stiffening-piece, *b*, of metal, which also acts as a slide, bolted to its upper surface, as shown in Figs. 2, 3, 4, and 8, the timber being rabbeted on its upper surface underneath the metal piece *b*, as shown at *d* in Figs. 3 and 8. Each of the stiffening-pieces *b* is embraced by sliding clips *c*, also made of metal, as shown in Figs. 2, 4, 8, there being preferably three of these clips to each section, except the lower one, the two lower clips on each section being so placed as to be always in engagement with the slide *b* of the next lower section, and at a distance apart sufficient to insure easy sliding of the sections one over the other. The section C′ has pivoted at opposite sides of its upper extremity sheaves *f*, and each other section, except C⁗, has sheaves pivoted to opposite sides at both the upper and lower extremity of the same, as shown in Figs. 1, 2, 3, 4, and 9. The section C⁗ has an eye at its lower end, as shown at *g*, Figs. 1, 4, and 9, for the passage of the extension-rope *h*, Figs. 1, 2, 3, 4. This rope is preferably made of wire of suitable size and strength. From the eye *g* in the lower end of the part C⁗ of the extension-boom, this rope passes upward on both sides of C⁗, and over the first pair of sheaves *f* at the upper part of C‴, thence downward and over the pair of sheaves *f* at the lower end of C‴, thence over the pair of sheaves *f* at the upper end of C″, thence downward and over the pair of sheaves at the bottom of C″, thence in the same zigzag manner over the sheaves on C′, thence over the sheaves at the upper end of C, and thence downward and around the barrel of a windlass, to which the ends of said extension-rope are attached. Stops *a′* are attached to the lower parts of all the extension-boom sections, which limit their downwardly-sliding motion. The upward motion of the sections ceases when the bights in the rope *h* assume a right-angled form, as shown in Fig. 4, in which this boom is shown fully extended, the function of the rope *h* being, when wound upon the windlass D, to extend the boom to any desired point within its range of elevation.

The windlass referred to is shown at D, Figs. 1, 2, 4. It is rigidly attached to the truck-frame, provided with a winch, *k*, a ratchet-wheel, *l*, and a pawl, *m*, after the usual manner of windlasses; but this part of the apparatus, as shown in this example of my invention, is designed to be merely typical of any approved means for winding or taking up, unwinding or extending, and securely fastening and holding the rope *h* when the extension-boom is extended or unextended. I reserve the right to use any means for performing this function of the extension-boom in combination with the sliding parts C C′ C″, &c., having the sheaves *f* attached thereto in the described relation, and the rope *h* used in conjunction with said sheaves in the manner specified. When the extension-boom is unextended, it rests upon a spring-support of novel construction carried upon the upper side of the frame or body of the truck, the latter, in order to secure the proper rigidity, not having springs intermediate between it and the axle-trees. Said spring-support is formed of two stanchions or uprights, E, Figs. 1, 3, and 4, the upper ends of which are bent inwardly toward each other and perforated, as shown in Fig. 3, or otherwise formed to receive the ends of the bow F, Fig. 3, which has approximately the shape and position of an inverted letter U, and which has formed on the top a step, *n*, as shown in Fig. 4, upon which the part C, supporting all the other parts of the extension pole or boom, rests when in the position shown in Figs. 1, 2, and 3.

From the middle of the U-shaped bow descends a vertical guide-bar, G, Figs. 1 and 3, and surrounding this guide-bar, intermediate between the U-shaped bow and the frame of the truck, is placed a strong but easy helical spring, *s′*, which absorbs all shocks which would otherwise be transmitted to the extension-boom and its attachments during rapid progress over rough roads and pavements.

It will be observed that the spring-support is arranged substantially central under the boom, by which means not only is one spring-support sufficient, but there is less liability of the ladders sagging down in the center than there would be if the ladders were supported at their ends only, as has heretofore been practiced. The extension boom or pole is further supported, both during transportation and actual use, by strong braces H, Figs. 1, 2, and 4, preferably of wrought-iron or steel, which are obliquely and rigidly attached to the lower section, C, of said boom, and to the stout horizontal axle I, to the middle of which the said section C is stoutly framed or otherwise attached, and upon which the whole of the extension-boom turns radially when operated, as hereinafter set forth, the said axle being pivoted by strong pintles to the frame of the truck, as shown at *o*, Figs. 1 and 4. This radial movement of the extension-boom is designed to elevate the same to any desired angle with the horizontal plane of the body or frame of the truck, and is effected by means of a derrick-boom and other appliances constructed, in this example of my invention, as follows:

To the end of the truck opposite that to which the axle of the extension-boom is pivoted is attached a strong axle, K, preferably of wrought-iron or steel, upon which the derrick-boom is supported, and upon which the latter turns when used to elevate the extension-boom. The derrick-boom is preferably formed of two strong pieces or booms, L, of

light elastic timber, which are held at the proper distance apart by a cross-piece, M, (shown in Fig. 2,) the whole turning upon the axle K, as aforesaid, when it is used to raise the extension-boom. The function of the derrick-boom is principally to elevate the extension-boom, and not wholly to support the latter when persons are ascending or descending by appliances attached to the extension-boom, as hereinafter described, and in this it is distinguished from derrick-booms hitherto used not only to elevate extension-booms, but also wholly to support them when raised. It receives no additional strain from the weight of persons ascending or descending, and cannot only be made much lighter, but can be much more easily manipulated than derrick-booms hitherto used; also, by a distinctive device hereinafter to be described, the extension-boom is relieved of all strain due to leverage, which would otherwise be put upon it by the weight of persons ascending or descending. The entire weight of the parts to be lifted can on this account be made very much less than in other fire-escapes which employ extension booms or ladders, while at the same time several persons may, with entire safety and confidence, descend by means of the attachments yet to be described. This security, with lightness of parts, enabling the apparatus to be manipulated with extreme rapidity, is one of the chief advantages of my invention, often enabling people to be rescued who might otherwise be lost or seriously injured through want of timely facilities for escape.

To the axle K are keyed pulleys N, between the lower ends of the booms L and the frame A of the truck, as shown in Figs. 1, 2, 3, and 4. The shaft or axle K is also provided with a winch, *k'*, a ratchet-wheel, *l'*, and a pawl, *m*, in the usual manner.

Rigidly attached to the frames A of the truck are two oblique supports, O, Figs. 1, 2, 4, and 9.

At the upper ends of the supports O are fixed sheaves *p;* also, at the upper ends of the booms L are attached other sheaves, *q*.

To the under side of the section C of the extension-boom is rigidly attached a hollow cross-bar, P.

To the pulleys N on the shaft or axle K are attached the ends of a rope, *r*, preferably of wire, and continuous from each of said pulleys to the other, in order that the pulleys may exert an equal tension. This rope also passes over the sheaves *q* at the ends of the booms L, and through the hollow cross-bar P, attached to the under side of the section C of the extension-boom.

When the apparatus is folded together, as shown in Figs. 1 and 2, the rope *r* also rests upon the sheaves *p* in the upper ends of the supports O, forming bights in said rope on each side of said boom, as shown in Fig. 1.

On comparison of Fig. 1 with Figs. 4 and 9 it will be seen that as soon as the extension-boom is raised sufficiently to clear the rope *r* from its contact with the sheaves *p*, said rope assumes a position nearly parallel with the booms L, and were it not for the supports O this rope and the said booms would have the same relative positions each to the other when the extension-boom is lowered into the position shown in Fig. 1.

By forming the bights through the action of the supports O and sheaves *p*, I gain a much greater purchase on the extension-boom in raising the same by the winding of the rope *r* upon the pulleys N than I could have without said supports, and at a time when said purchase is most needed, the leverage of the weight of the extension-boom being much greater when recumbent than when partly elevated. This also adds to the facility and rapidity of manipulation, which are primary and fundamental objects in my invention.

I come now to a most important and distinctive feature of my invention—to wit, the claw Q, rigidly attached to the upper extremity of the section C'''' of the extension-boom, and when in use acting, in combination with the extension-boom and its attachments, to support weights in such manner that no additional strain due to leverage is put by such weights upon said boom. I prefer to make this claw of good wrought-iron with two hardened steel points, and to attach it rigidly to the terminal section of the extension-boom in the manner indicated in the drawings; but I do not limit myself to any precise form or material in its construction. It will be observed that this claw is formed in one piece and embraces the upper end of the boom on three sides, whereby said claw is securely fastened to the boom and the latter strengthened. The primary function of this claw is to engage a window-sill or a cornice or the side wall of any building whether of wood or masonry or the outer edge of a roof, and thus to support the upper and outer end of the extension-boom, and so relieve the latter from the strain due to leverage that would otherwise be put upon it when weights are suspended therefrom, as hereinafter described. It also performs a secondary function in assisting to hold the extension-boom from moving laterally or rocking on its base, its points or edges being sharp enough to bite or penetrate somewhat, even into brick or stone, and when weights are brought to bear upon the tip of the boom their action is to make the claw engage anything with which it is brought into contact all the more firmly. It will, however, be most commonly practicable to engage the claw upon a window-ledge, as shown in Figs. 4 and 9, in which case said claw will support nearly all the strain of weights suspended from the boom, as hereinafter explained, the truck being required to do scarcely more than support the weight of the boom, each section of the boom being required to support little more than the weight of the higher sections.

It is thus made clear that the parts can be much lighter than has hitherto been the case

in this class of fire-escapes, and that they can be raised into position with much greater facility and rapidity on this account.

As a further precaution against lateral movement of the extended boom, guy-ropes R may be attached to eyes *s*, fixed in the section C'''' of said boom, as shown in Fig. 9.

Various hoisting and lowering appliances may be used in connection with the apparatus, as thus far described; but, as part of my improvement, I herewith describe a flexible ladder of peculiar construction, which enables it to be made very light and secure.

The construction of this ladder is illustrated in Figs. 5, 6, and 7, to which the following description is referred: The sides S of the ladder are of rope, made, preferably, of the best quality of fine steel wire, laid in the best manner. Of such material, they can be made of great tensile strength, and of sufficient flexibility, without undue weight. At the proper intervals metal rungs or steps T are inserted through the bights *t* in the ropes S, formed by pressing portions of the ropes through rings *u*, the rungs being passed through the bights between the rings and the ropes. Lastly, the ends of the rungs are turned, bent, or clinched over the rings on the outer side, as shown at *v* in Fig. 7, in such manner as to confine the ring in its place on the end of the rung, and prevent the slipping of the bight, which is tightly bound by the ring. This ladder has important merits besides cheapness. It is very strong as compared with its weight, and extremely flexible, yet possessing such firmness of structure as to inspire confidence in the minds of timid persons who would hesitate to attempt a descent upon less secure footing. I prefer to make the side ropes continuous at the top, to form a loop or bight, passing through an eye, U, as shown in Figs. 5 and 6. This eye is employed to suspend the ladder from a hook, *w*, Fig. 4, or other supporting device attached to the section C'''' of the extension-boom near the claw Q; but I do not limit myself to the flexible ladder I have described, as I may use other constructions of flexible ladders in combination with the various parts of the apparatus hereinbefore specified and hereinafter described, as indicated in Figs. 1 and 4. For the sake of brevity, I shall hereinafter refer to this ladder by the single letter S.

Whatever construction of flexible ladder I may employ, I suspend the same from the section C'''' of the extension-boom, substantially in the manner already indicated, and the lower extremity of the ladder is attached to the barrel of a windlass, D', as shown in Figs. 1, 2, 3, and 4. Said windlass is rigidly attached to the truck-frame, and is provided with a winch, *k''*, and its function is simply to take in the slack of the ladder, and to wind the same on the windlass D' when the extension-boom is lowered or brought into the position shown in Figs. 1 and 2.

As a type of other appliances suspended from the extension-boom, I have shown in Figs. 8 and 9 a basket or cradle, V, for lowering from burning buildings, or other positions of danger, timid, infirm, or invalid persons. A rope, W, is attached to this basket, and passes over a double sheave, *x*, in the upper part of the extension-boom; thence downward through an eye, *y*, on the upper side of the lower end of section C'''' of said boom; thence downward to and around the barrel of a windlass, D'', which has its bearings in uprights X, rigidly attached to and supported by the truck-frame A. Said windlass is provided with a winch, *k'''*, and a ratchet and pawl, *m'' l''*, (shown lettered in Fig. 2, and unlettered in Fig. 9.) The ratchet and pawl serve to secure the windlass from turning should the winch be accidentally or inadvertently left unmanned, in which case the basket V and its contents would be held suspended.

In use this apparatus may be rapidly drawn to a burning building. A few rapid turns of the winch *k'* will raise the folded extension-boom to the proper angle, as shown in Figs. 4 and 9. Then, the winch *k* being turned, the extension-boom is rapidly elevated, and the hook Q engaged with some projecting or other part of the building. At the same time the extension of the boom unwinds the ladder S from the windlass D', ready for its proper use, and also carries up the rope necessary for the subsequent elevation of the bucket. The latter being provided with a guy-rope, Y, as shown in Figs. 4 and 9, may be used not only for lowering sick and feeble persons, but for conveying persons from windows or ledges at considerable distances, right or left, from the ladder, either to the latter at some distance from the ground, whence they may descend by their own efforts, or to lower them entirely down.

It will be seen that no person can get out onto this fire-escape until the claw Q anchors its extension-boom to the building.

Having thus described my improvement in fire-escapes, what I claim is as follows:

1. The combination, with a fire-escape boom, of the bifurcated claw Q, made in one piece and embracing the upper end of the boom on three sides, substantially as described.

2. The combination, with a base or support, an extension-boom pivoted to said support, provided with means for raising and extending the same, and a hook at the upper or outer extremity for engaging some part of a building and taking from said boom strains otherwise due to leverage, as herein described, of a pendulous flexible extension-ladder attached to the upper part of said boom, and adapted to hang therefrom parallel with the wall of the building, or nearly so, substantially as and for the purpose specified.

3. A boom for fire-escapes, provided with plates *b* on one section and C-shaped clips *c* on another section, said clips having their ends turned around and under the edges of and embracing the facing-plates, and forming bear-

ings for said plates, thus performing the double function of holding two sections of the boom together, and forming the bearing-surface of the upper section, substantially as described.

4. The combination, with a base or support, an extension-boom pivoted to said base, a derrick-boom also pivoted to said base, and adapted to raise said extension-boom by shortening a bight in a rope passing under the extension-boom, and operated by a windlass pertaining to the derrick-boom, of a support, O, attached to the base, and arranged to bend the branches of said bight and lessen the power required to be applied to said windlass during the early stages of the act of elevating said extension-boom, substantially as and for the purpose specified.

5. As a detail of construction in a portable fire-escape, the spring-support intermediate between the extension-boom and the frame of the truck, consisting of the uprights E, the bow F, having thereon the step *n*, the vertical guide-bar G, and the helical spring *s'*, all constructed, arranged, and operating substantially as described.

6. In a fire-escape comprising an extension-boom and a flexible ladder attached thereto, the flexible ladder herein described, formed of the ropes S, rings *t*, and rungs T, passed through bights in the ropes S and between the ropes and the rings, and bent or clinched on or around the rings, substantially as and for the purpose specified.

ABRAHAM S. MILLER.

Witnesses:
SAMUEL C. MCLAUGHLIN,
CHAS. M. HIGGINS.