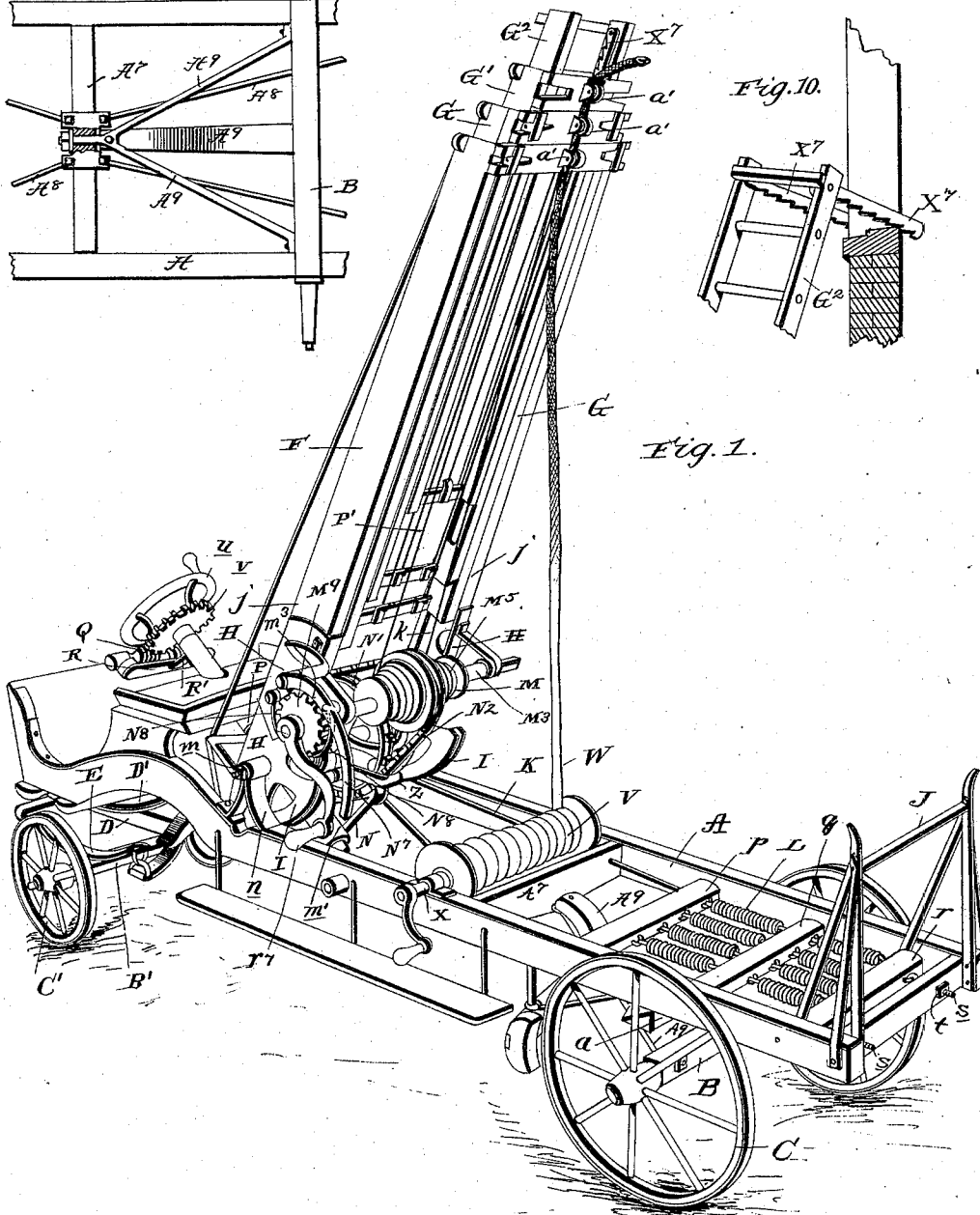
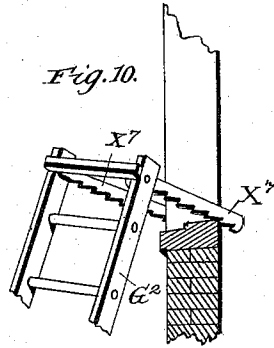


5 Sheets—Sheet 1.

No. 580,295.



C. H. Paeder
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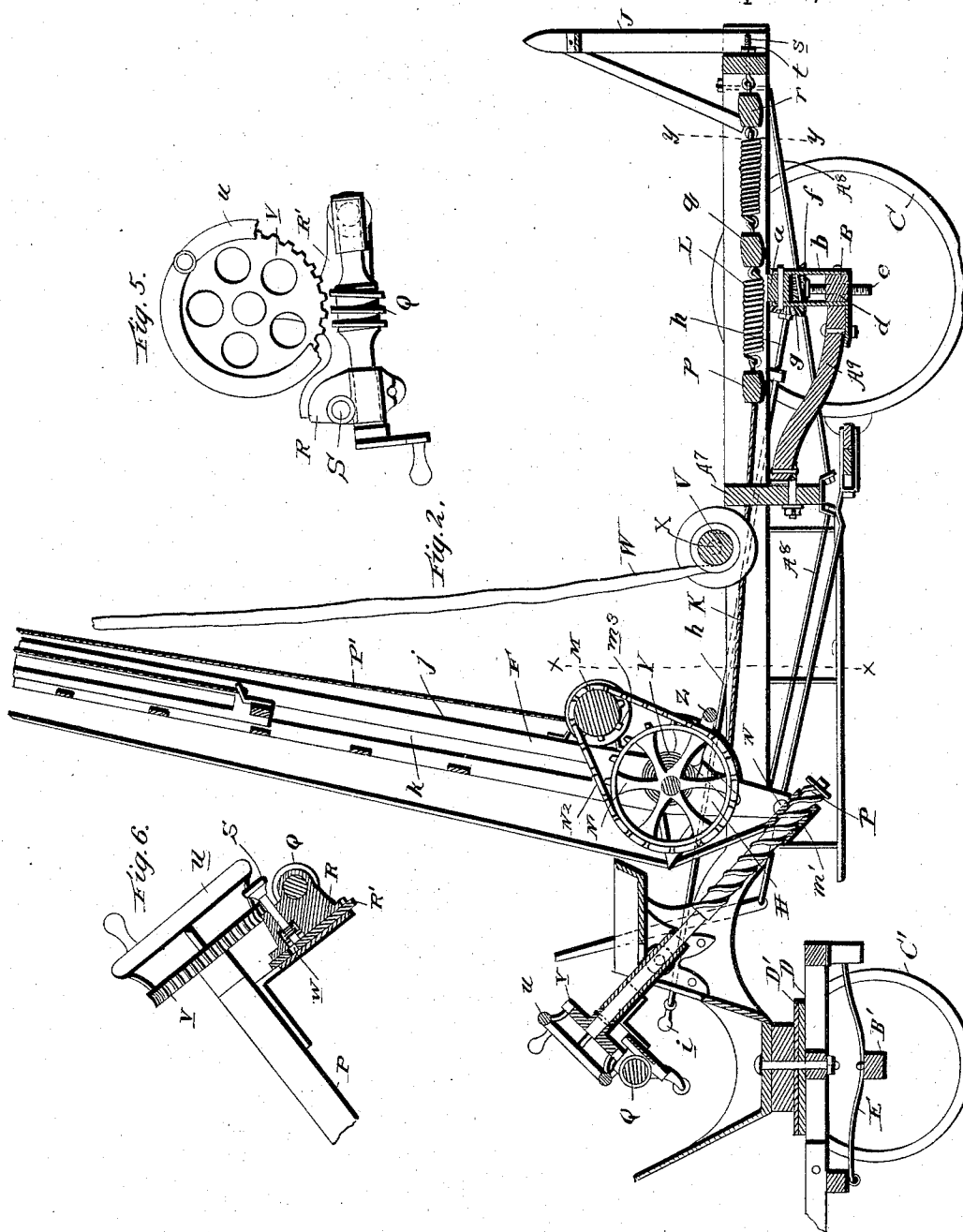
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5 Sheets—Sheet 2.

L. SWENSON.
FIRE ESCAPE LADDER.

No. 580,295.

Patented Apr. 6, 1897.



Witnesses:

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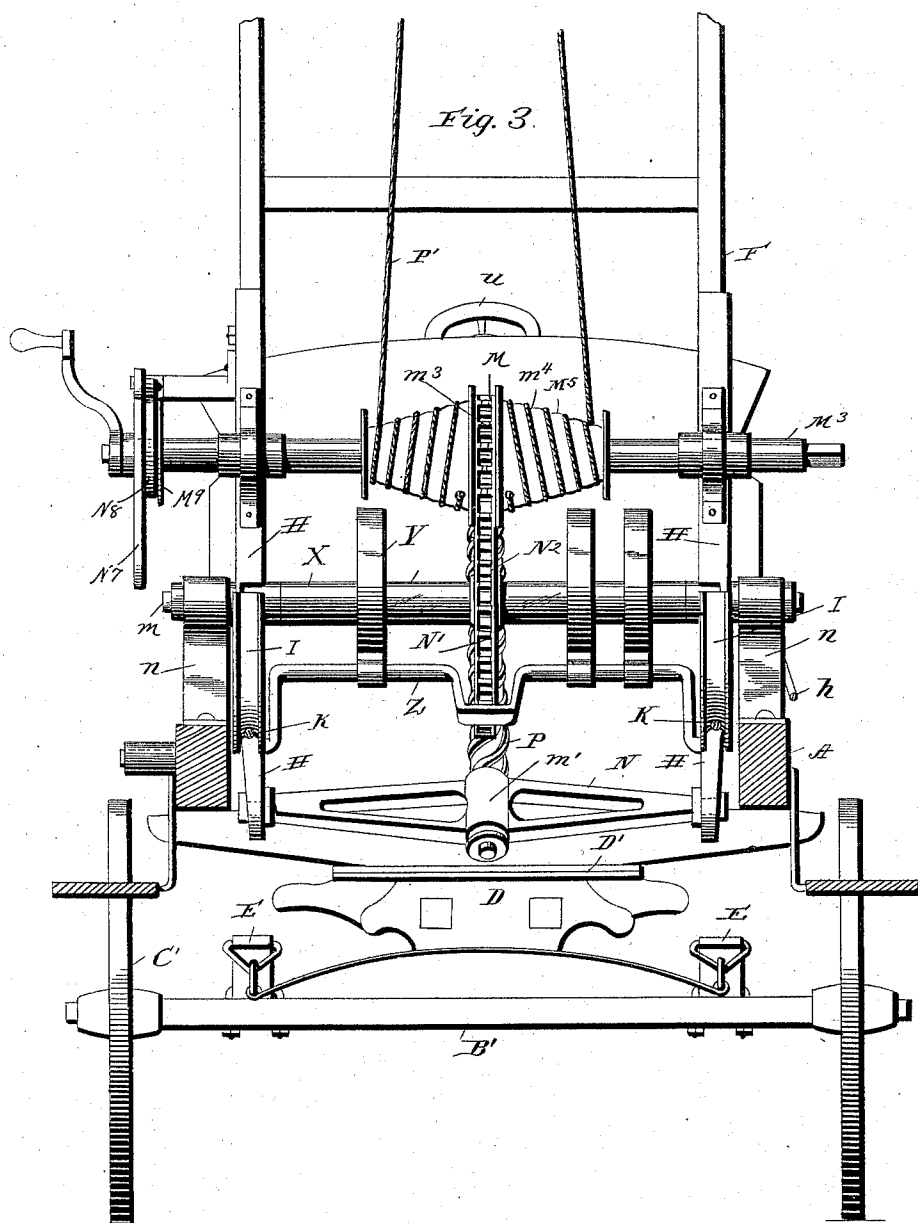
(No Model.)

5 Sheets—Sheet 3.

L. SWENSON.
FIRE ESCAPE LADDER.

No. 580,295.

Patented Apr. 6, 1897.



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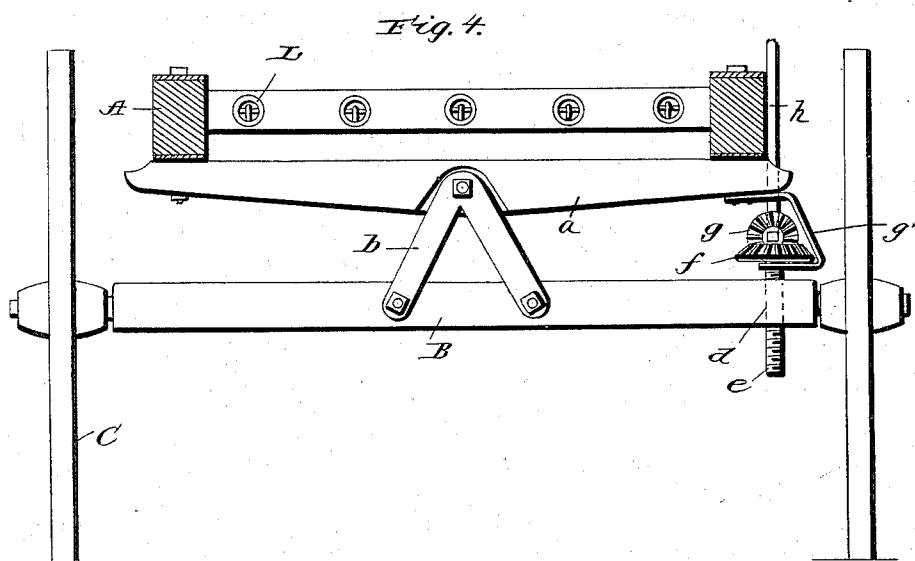
(No Model.)

5 Sheets—Sheet 4.

L. SWENSON.
FIRE ESCAPE LADDER.

No. 580,295.

Patented Apr. 6, 1897.



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5 Sheets—Sheet 5.

L. SWENSON.
FIRE ESCAPE LADDER.

No. 580,295

Patented Apr. 6, 1897.

Fig. 4.

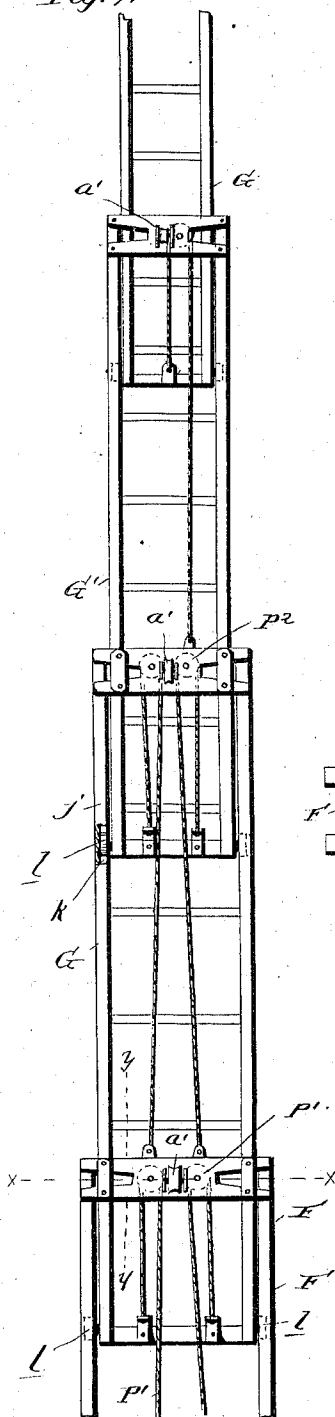


Fig. 9.

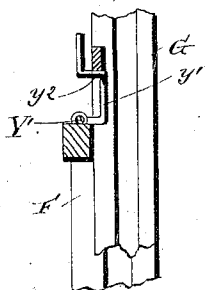
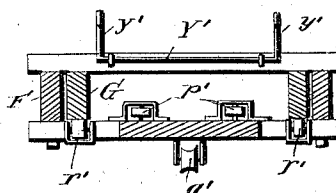


Fig. 8.



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UNITED STATES PATENT OFFICE.

LORENS SWENSON, OF CRESCO, IOWA.

FIRE-ESCAPE LADDER.

SPECIFICATION forming part of Letters Patent No. 580,295, dated April 6, 1897.

Application filed October 26, 1896. Serial No. 610,071. (No model.)

To all whom it may concern:

Be it known that I, LORENS SWENSON, a citizen of the United States, residing at Cresco, in the county of Howard and State of Iowa, have invented certain new and useful Improvements in Fire-Escape Ladders; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has relation to portable fire-escape ladders and hose-elevators of that class in which a sectional extensible ladder is employed; and it consists in the peculiar construction, adaptation, and novel combination of parts hereinafter described, and particularly pointed out in the claims appended.

An important desideratum in this class of devices has been the provision of means for expeditiously elevating or extending the sectional ladder. To this end I propose to utilize the resiliency of one or more coiled or other suitable springs to rotate or to assist in the rotation of a windlass to wind a ladder-hoisting cable or cables thereon, the windlass being of varying diameter, so as to equalize the power of the springs, and thereby prevent the springs from expending all their power on the initial movement of the ladder and enable it to extend the ladder at an even speed throughout such extension.

Another object of the invention is to mount the ladder in such a manner that it may readily be raised to a perpendicular position, extended, and adjusted to various angles of inclination in the direction of the length of the truck and at right angles to the same.

Another object of the invention is to provide means for counterbalancing the ladder when it is adjusted in the direction of the length of the truck, so as to assist the operator in raising the ladder to a perpendicular position.

Another object of the invention is to provide an extension-ladder comprising a series of sections adapted to be compactly nested, so as to obviate the necessity of a truck of extraordinary length.

Other objects and advantages of the invention will be fully understood from the following description and claims when taken in

conjunction with the annexed drawings, in which—

Figure 1 is a perspective view of my improved portable ladder, the ladder being shown with the sections nested and resting in an approximately perpendicular position. Fig. 2 is a vertical longitudinal section of the same. Fig. 3 is a vertical transverse section taken in the plane indicated by the line xx of Fig. 2 looking forwardly. Fig. 4 is a similar view taken in the plane indicated by the line yy of Fig. 2 looking forwardly. Fig. 5 is a detail front elevation of the wheels and screw for inclining the ladder. Fig. 6 is a side elevation, partly in section, of the same. Fig. 7 is a detail rear elevation of the ladder extended. Fig. 8 is a horizontal transverse section taken in the plane indicated by the line xx of Fig. 7 looking downwardly; and Fig. 9 is a detail vertical section taken in the plane indicated by the line yy of Fig. 7. Fig. 10 is a detail perspective view illustrating the dentated arms at the upper end of the ladder. Fig. 11 is a detail inverted plan view of a portion of the bed-frame of the truck.

In the said drawings similar letters designate corresponding parts throughout the several views, referring to which—

A indicates the bed-frame of the truck, which may be of a general rectangular form, and B indicates the axle of the rear traveling wheels C, while B' indicates the axle of the forward traveling wheels C'. This forward axle B' supports a fifth-wheel section D, which is mounted upon a series of springs E and is designed and adapted to serve, in connection with the fifth-wheel section D' of the frame A, to permit of a turning of the forward wheels C', the springs E serving to cushion the forward end of the frame and at the same time allow said frame to be tilted laterally, for a purpose presently to be described.

The frame A is provided adjacent to its rear end with a transverse bar a , which is pivotally connected at a point midway its length to standards b , rising from the axle B, by reason of which it will be seen that the frame may be tilted laterally to incline the ladder in a corresponding direction.

Taking through a vertically-disposed bore d , formed in the axle B, is a screw e , upon

the upper end of which a gear-wheel f is fixed, as shown. Connected to the screw e in such a manner as to move vertically therewith and yet not interfere with the rotation of the same is a bar g' , which is fixedly connected at its upper end to the bar a of the frame A, whereby it will be seen that when the screw is moved vertically the said frame A will also be moved vertically. The gear-wheel f on the screw e meshes with a beveled gear-wheel g on a shaft h , which is journaled in suitable bearings carried by the frame A, and is provided at its forward end with a crank i , through the medium of which it may be rotated to tilt the frame A and the ladder carried thereby in a lateral direction. Thus it will be seen that the ladder may be quickly moved from one window of a building to another in a direction at right angles to the length of the truck without moving the truck, which is an important desideratum, and it will also be seen that when the truck is on a hillside the ladder may be readily adjusted so as to rest in a perpendicular position.

F indicates the lower outer section of the extensible ladder, which is provided in the inside of its side bars j with ways or grooves k , in which are designed to travel the gudgeons l of the lower extensible section G, which is designed to be nested in the section F, and is also provided in the inside of its side bars with ways or grooves to receive the gudgeons of the next upper extensible section G'.

By the provision of the gudgeons on the extensible or moving sections of the ladder frictional wear of the said sections is reduced and the liability of the same binding when the ladder is shot or extended is reduced to a minimum.

The side bars j of the lower outer ladder-section F are connected in a suitable manner to the plates or castings H, which are provided at their lower ends with segments I and are mounted upon the transverse pivot-shaft m , as illustrated. This shaft m is journaled and may be secured in the standards n of the frame A, so that the ladder may be inclined at various angles of inclination in the direction of the length of the truck.

When the ladder is not in use, the sections are nested, as shown in Fig. 1, and are swung on their bearings into an approximately horizontal position, so as to rest upon the support J, and by reason of the ladders being nested compactly, as shown, it will be seen that the truck may be made comparatively short in length, and the necessity of pivoting the rear axle so that the same may be turned to enable the truck to turn a corner is thereby obviated.

Connected in a suitable manner to the segments I of the castings H, which may be and preferably are grooved, as shown, are cables K, which are connected at their rear ends to the forward frame-bar p of the coiled springs

L, which springs are preferably arranged in two transverse series separated by an intermediate frame-bar q and have their rear frame-bar r connected to the rear transverse bar of the frame A by threaded screws s , upon which are mounted nuts t , through the medium of which the springs may be tightened, if necessary. These springs L serve in practice as a counterbalance to the weight of the ladder, and they assist in raising the ladder to a perpendicular position and make it easier to adjust the ladder to any angle of inclination in the direction of the length of the truck.

Journaled in suitable bearings in the castings H are the ends of the cross-bar N, which is provided with a threaded bore or sleeve m' for the reception of the ladder-adjusting screw P, which is preferably threaded, as shown, so that a quick adjustment of the ladder may be effected. This screw P or the shaft thereof, which is journaled in a suitable pivoted bearing below the seat, preferably extends through the seat of the truck and is provided at its upper end with a hand-wheel u and a gear-wheel v , which may be formed integral with each other, if desired, when a set of two screws connected by a chain could be used.

By rotating the hand-wheel u the screw P may be quickly turned and the ladder quickly raised and lowered when its sections are nested. When the ladder is extended and it is desired to incline it, I employ a slow and powerful gearing. This slow and powerful gearing consists of a worm-screw Q, which is journaled in suitable bearings in a plate or casting R and is provided with a crank at one end, whereby it may be readily rotated when desired.

The plate or casting R, as better shown in Fig. 5, is pivotally connected to a hanger-plate R', carried by the sleeve or bearing of the screw P, and it is provided with a spring-pressed stud S, designed to take into an aperture w in the hanger-plate R' to lock the worm-gear Q in engagement with the wheel v when it is desired to rotate the screw P and raise or lower the ladder slowly.

When it is not desirable to use the slow gearing, the stud S is disengaged from the aperture w , and the plate or casting R is swung so as to disengage the worm-screw from the wheel v , when the screw P may be rotated and the ladder raised and lowered through the medium of the wheel u , which may be then turned as fast as desired.

Journaled in suitable bearings upon the bed-frame A, preferably in rear of the bearing-point of the ladder, is the shaft x of the spool or reel V, upon which the hose W is wound. This hose W, which is designed to be suitably connected to the upper or other desired section of the ladder, is held to the ladder by the friction-sheaves a' , which are connected to the sections at or adjacent to the upper ends thereof and serve the addi-

tional function of preventing frictional wear of the hose when the ladder is shot or extended.

Loosely mounted upon the shaft m between the castings H is a sleeve X , to which are connected the ends of the coiled springs Y for extending or shooting or aiding in the extension or shooting of the ladder. These springs Y , which are coiled upon and are adapted to turn the sleeve X for the purpose stated, have their outer ends connected to a bail Z , which is pivotally connected to or journaled in the castings H , so as to move and adapt itself to the size of the springs when the same are coiled or expanded. I do not desire to be understood as limiting myself to coiled springs for such purpose, as springs of any suitable description may be employed.

Formed integral with or fixedly mounted upon the sleeve X is a sprocket-wheel N' , around which takes a sprocket-belt N^2 , which also takes around and serves to transmit motion to the ladder-hoisting windlass M , which is provided at its middle with sprocket-teeth m^3 , as better shown in Fig. 3 of the drawings. This windlass M , which is fixed upon a transverse winding-shaft M^3 , is coned from its middle toward its opposite ends, as shown, or in any other suitable manner, and the coned portions M^5 are respectively provided with a spiral groove m^4 , which grooves extend from points adjacent to the large portion of the windlass, where the hoisting-cables are connected, to the small or reduced ends of the same and serve to seat the hoisting-cables when the same are wound upon the windlass to extend the ladder.

By reason of the windlass being coned, as described, and the cables connected to the large portion of the same it will be seen that the power of the springs will be equalized and the said springs prevented from expending all their power on the initial movement of the ladder.

It will further be observed that by reason of the windlass being coned and the cable or cables connected to the large portion of the same the primary force of the springs will be exerted to wind the cables on the large portion of the windlass, as it requires more power to raise or elevate the ladder when the windlass is large, and as the springs unwind they get weaker, which makes it necessary to make the windlass small, so as to elevate the ladder its full length.

The hoisting-cables P' of the lower extensible sections G , which are the ones connected to and adapted to be moved upon the windlass M , take around pulleys p' upon the non-extensible section F and are connected to the lower end of the lower extensible section G , so that when the cables are wound upon the windlass the said section will be extended, as shown in Fig. 7 of the drawings.

The hoisting-cables of the extensible section G' are connected at one end to the upper

end of the non-extensible section F and take around pulleys p^2 at the upper end of the section G , and have their ends connected to the lower end of the section G' , so that when the section G is raised the section G' will be raised above it.

The uppermost section G^2 is raised in the same manner by the raising of the section G' , but for this section G^2 , I deem it necessary to employ but one cable, as the said section is much smaller and lighter than the others. Indeed, when desired, but one cable need be employed to elevate all the sections, two cables being preferably employed, however, for the sake of safety in the event that one should break.

In order to reduce friction and facilitate the shooting or extension of the ladder, I provide the sections F G with friction-wheels r' at their upper ends, which engage the edges of the sections G G' , as shown, and, if desired, the section G' might also be provided with similar antifriction-wheels to engage the section G^2 , but on account of the small size and light weight of the said section G^2 , I do not deem this necessary.

Fixedly mounted upon one end of the windlass-shaft M^3 is a gear-wheel M^9 , which is designed to be engaged by the tooth m^3 of the locking-lever N^7 , and has a portion of its periphery plain for the engagement of a brake-band N^8 , which is connected at one end to a lug extending laterally from the casting H and is connected at its opposite end to the lever N^7 , whereby when the said lever is raised to release the shaft M^3 and the springs to extend or assist in extending the ladder the brake will be applied to lessen the speed of the shaft and the movement of the extensible ladder-sections up or down.

The shaft M^3 may be rotated to nest the sections of the ladder and coil the springs by a crank, as r^7 , or any other approved device, although I prefer to use a crank. When desired, the coiled springs need not be sufficiently strong to raise the ladder, but simply strong enough to balance it, so as to enable a person or persons by turning the crank r^7 to raise or elevate the ladder with ease.

Journaled in suitable bearings at the upper end of the non-extensible section F is a rock-shaft Y' , which is provided with the angular branches y' , as shown. These branches y' , as better shown in Fig. 9, are bent at their free ends to form the shoulders y^2 , which are designed to be adjusted into engagement with one of the rounds of the extensible section G to prevent the same and consequently the other sections from being lowered in the event that the cables break. When desired, a rock-shaft Y' and its appurtenances may be employed upon each ladder-section with the exception of the uppermost one.

The rock-shaft Y' may be provided, if desired, with a crank at one end, to which a rod may be connected, whereby the operator may

rock the said shaft and disengage the branches y' from the section G without climbing the ladder.

To put my improved ladder into operation, the same is raised into a perpendicular or approximately perpendicular position through the medium of the hand-wheel u , when it may be shot or extended by simply raising the lever N^7 , so as to disengage the tooth m^3 from the wheel M^9 , and by turning the crank r^7 .

The ladder may then be inclined or pitched against the wall of a building by turning the wheel u or the worm-screw Q , as is most desirable, and may then be adjusted laterally, if necessary, by turning the crank i .

In order to secure the upper section of the ladder and render the ladder more stable, I prefer to provide the upper section of the ladder at its upper end with one or more den-
tated arms X^7 , which when the ladder is raised are designed to be placed in engagement with a window-sill, as shown in Fig. 10. These arms X^7 are connected with the upper ladder-section in a hinged manner, as shown, so as to permit of them being swung into a position against the inside of the side bars of said section when not in use.

It will be seen from the foregoing description that I have provided a portable extension-ladder of a very compact and light construction and one which may be very quickly operated and which is not liable to get out of order.

In the foregoing description I have specifically described the construction and relative arrangement of the several elements of my improved ladder in order to impart a thorough understanding of the same, but I do not desire to be confined to such construction and arrangement of parts, as in practice such changes or modifications may be made as fairly fall within the scope of my invention.

In order to strengthen the frame A of the truck, I provide it at an intermediate point of its length with the cross-bar A^7 , which is connected at its ends to the side bars of the frame, and the braces A^8 , which are connected to said cross-bar adjacent to its middle and are also connected to the four corners of the frame. For the same purpose I provide the hounds A^9 , which are fixedly connected to the axle and connected together at their forward ends and pivotally connected to the cross-bridge or cross-bar A^7 , as shown in Fig. 11, so as to permit of the frame being rocked laterally, as before described.

Having described my invention, what I claim is—

1. In a portable ladder, the combination with a frame, of the pivotally-mounted castings having the segments at their lower ends, the ladder carried by said castings, one or more coiled springs having one of their ends connected with the frame, and cables connecting the opposite ends of the springs and the segments of the castings, substantially as specified.

2. In a portable ladder, the combination with a frame and a ladder pivoted at an intermediate point of its length; of one or more counterbalance-springs resting within the frame and arranged in series, a bar connected to and separating a series of springs, a bar connected with the ends of one series of springs and the frame, a bar connected with the ends of the other series of springs, and a cable connecting the latter bar and the lower end of the ladder, substantially as specified.

3. In a portable ladder, the combination with the frame, a shaft mounted in standards rising from the frame, castings pivotally mounted upon said shaft and having the segments at their lower ends, and a ladder carried by the castings; of the counterbalance-springs arranged in series and having their inner and outer ends connected to transverse frame-bars, cables connecting the forward frame-bar of the springs and the segments of the castings, and a suitable means for connecting the rear frame-bar of the springs to the frame, substantially as specified.

4. In a portable ladder, the combination with the truck-frame, the transverse shaft m , mounted in bearings rising from the said frame, the castings H , pivotally mounted upon the said shaft and having segments at their lower ends, a ladder carried by the castings, a spring for counterbalancing the ladder connected with the segments of the castings, and a cross-bar connecting the castings and having a threaded bore or sleeve; of a rotary screw journaled in suitable bearings and taking through the bore of the cross-bar, and a suitable means for rotating the screw, substantially as specified.

5. In a portable ladder, the combination with a ladder comprising two or more sections, all of which except the base-section are extensible, a shaft, a windlass mounted on said shaft, a cable connecting the windlass and the extensible ladder section or sections, a spring, and mechanism intermediate the spring and the windlass; of a gear-wheel fixed on the windlass-shaft and having a portion of its periphery plain, a locking-lever having a tooth for engaging the teeth of the gear-wheel, and a brake-strap having one of its ends stationary and its opposite end connected to the locking-lever at an intermediate point in the length thereof, substantially as and for the purpose set forth.

6. In a portable ladder, the combination with an axle, and standards rising from opposite sides of the same; of the truck-frame having a cross-bar pivotally connected midway its length to the standards, a vertically-disposed screw connected with the truck-frame and taking through a threaded bore in the axle, a gear-wheel fixed on the screw, a rotary shaft, and a gear-wheel carried by said shaft and meshing with the gear-wheel of the screw, substantially as specified.

7. A truck for the purpose described comprising front and rear axles, a frame mounted

on the axles so as to rock in the direction of its width and having a cross-bar, and hounds fixedly connected to the rear axle and pivotally connected to the cross-bar, substantially as and for the purpose set forth.

8. In a portable ladder, the combination of a frame, castings pivotally mounted on the frame and having the segments at their lower ends, the cross-bar connected with the castings and having the threaded bore or sleeve, a rotary screw mounted in suitable bearings and taking through the bore or sleeve of the said cross-bar, one or more coiled springs having one of their ends connected with the frame, and cables connecting the opposite ends of the springs and the segments of the castings, substantially as specified.

9. In a portable ladder, the combination of an axle, a truck-frame pivotally connected to the axle so as to rock laterally, a suitable means for rocking the truck and holding it in its adjacent positions, castings pivotally mounted on the frame and having the segments at their lower ends, the cross-bar connected with the castings and having the threaded bore or sleeve, a rotary screw mounted in suitable bearings and taking through the bore or sleeve of the said cross-bar, one or more coiled springs having one of their ends connected with the frame, and cables connecting the opposite ends of the springs and the segments of the castings, substantially as specified.

10. In a portable ladder, the combination of a frame, a ladder comprising a base-section having a pulley at its upper end, an extensible section arranged within the base-section and having a pulley at its upper end, a cable P', connected at one end to the lower end of the extensible section and taking over the pulley of the base-section, another extensible section arranged within the aforesaid extensible section, a cable connected at one end of the upper end of the base-section and having its opposite end connected to the lower end of the last-named extensible section, castings connected to the base-section of the ladder and pivotally mounted in the frame, means for moving the pivoted castings and the ladder and holding them in their adjusted positions, a windlass of varying diameter mounted between the castings and connected to the cable P', a bail pivoted in the castings, a shaft journaled in the castings and connected by intermediate gearing with the windlass, coiled springs surrounding said shaft and connected at one end thereto and connected at their opposite ends to the bail, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

LORENS SWENSON.

Witnesses:

C. P. LENT,
JACOB WELSH.