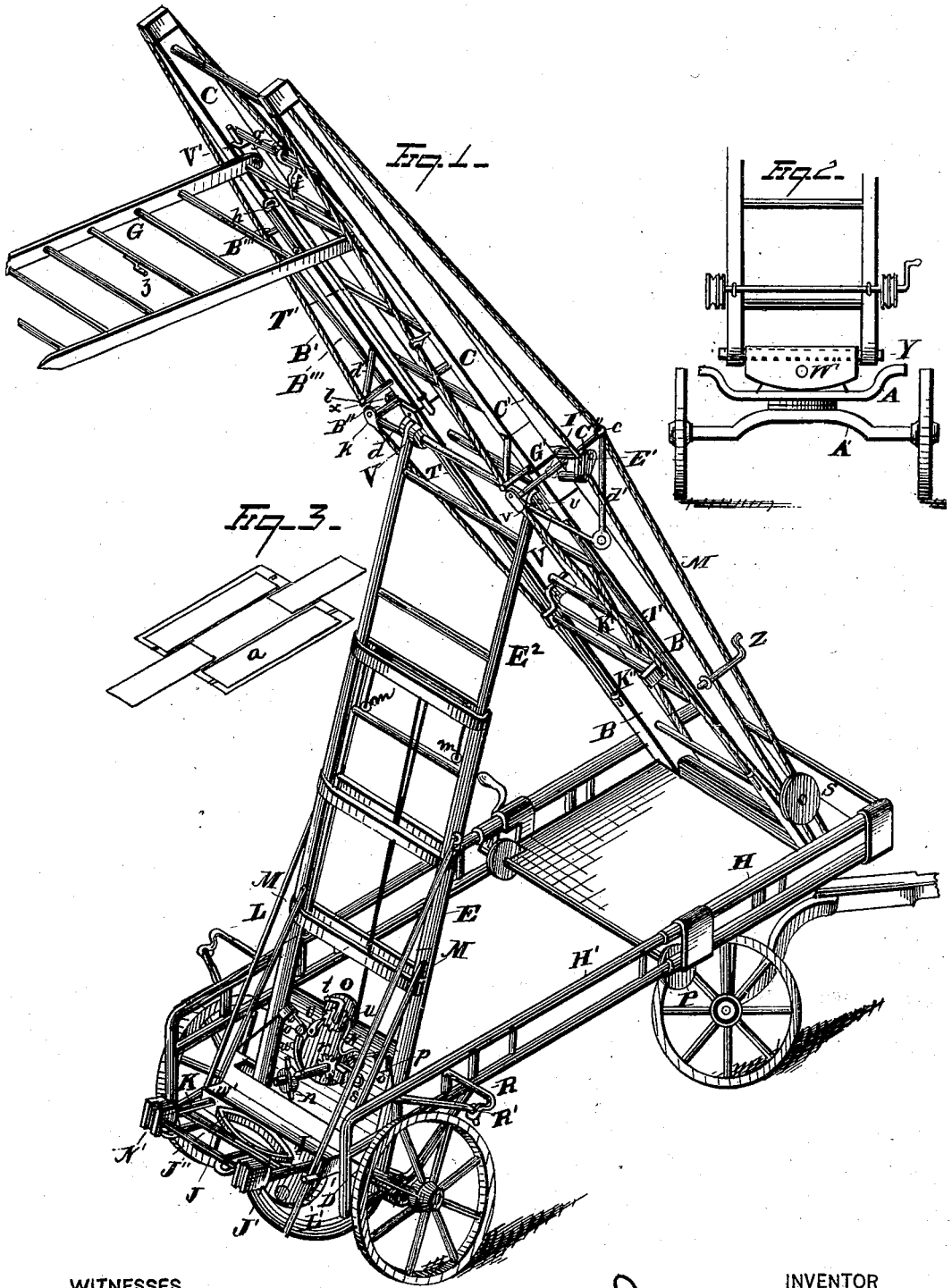
J. H. SPENCER.

FIRE-ESCAPE.

No. 188,312. Patented March 13, 1877.



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IMPROVEMENT IN FIRE-ESCAPES.

Specification forming part of Letters Patent No. **188,312**, dated March 13, 1877; application filed February 6, 1877.

To all whom it may concern:

Be it known that I, JOSEPH H. SPENCER, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Extension Fire-Ladders; and I do hereby 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 pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to extension fire-ladders; and consists in the parts and combinations, as hereinafter specified and claimed.

In the drawing, Figure 1 represents a perspective view of my ladder when in its operative condition. Fig. 2 shows a detached view, representing the manner in which the lower section of the ladder is secured to the truck. Fig. 3 shows a view of a wheel-carrying roller-truck.

The ladder proper embraces a lower and an upper section, pivoted or hinged together at G′ in a strong, substantial manner. The lower section is so attached to the truck, near the front axle, as shown in Fig. 2, as to allow the ladder to swing laterally as well as upward and downward. The purpose served by pivoting the ladder at W′, whereby the ladder may swing laterally, is to secure a proper adjustment of the ladder in cases where the truck stands on an uneven surface. This lateral swing of the ladder is regulated by the steering apparatus, and when the ladder has been brought to the desired position laterally, it can be secured to retain that position by means of the locking-pin *s*, inserted between the cogs of the pinion *r*.

When the truck is not in motion or the ladder is being elevated, the axle-locking pin *w*′ is inserted, which transfers the action of the steering apparatus from the axle to the extension-support E, and thus motion is communicated to the ladder. When the truck is in motion and the ladder in its folded position, the pin *s* is withdrawn, which permits the steering device to act on the axle to steer the truck.

The steering apparatus, as shown in the drawing, embraces a tiller, *n*, corrugated sheaves *o o o*, (one of which is placed on the tiller-rod,) chain or cord *p*, pinion *r*, and locking device *s*. The sheave on the tiller-rod may be the only corrugated one employed, the others being smooth. The ends of the chain or cord *p* are secured to the axle, as shown, the cord passing around the central sheave and over the others. The truck is steered or the ladder moved according to the direction in which the cord is wound on the central sheave by the turning of the tiller.

Any other steering device to accomplish the purpose may, however, be substituted in lieu of the one described.

The upper and lower sections of the ladder are re-enforced by rods and braces on the upper and lower as well as outer side, thus giving the sides a truss form, and thus greatly strengthening the ladder.

The strengthening-braces on the under side consist of the wire-ropes or rods B′ B′, which are secured at one end to the side rails and at the other to the rods B″ B″. An additional brace and rod may be provided, as shown B‴ B‴, if desired. The brace on the upper side consists of a wire-rope fastened at its ends to the upper and lower part of the ladder, which passes, at about the place where the two sections of the ladder are hinged together, under and in the groove of a sheave of the pulley *c*, which is secured to the rod C″. Said wire-rope brace is passed through said pulley in order to permit the ladder-sections to be folded together. Said rod C″ may be of one piece with rod B″, or said rods may be of separate pieces. In either case they are strengthened by the rods *d d*′.

The ladder is also further provided with side braces, by which it is still further strengthened. The side braces are also preferably constructed of wire, and are fastened, like the other braces, to the ends of the ladder. They also pass through pulleys E′, fixed to proper supports to the upper part and side of the lower section, for the like purpose of permitting the ladder to be folded. Attached to the under brace-rods B″ B″ is a locking device, which consists of a pin, stud, or projection, *l*, and an aperture or socket, *k*, the former combined with the upper section, and the latter formed in a plate or inclined projection of

the lower section. When the ladder is unfolded and straightened, the pin or projection *l* rides up on the incline of the said plate, and drops into the aperture or socket *k*. The said plate, being elastic, returns to its first position when the pin has dropped into the socket, and in this manner the two sections of the ladder are firmly locked to each other, end to end. Any other suitable locking device may, however, be substituted for the one described.

To support and brace the ladder when in its elevated position, I provide the telescopic extension-support E, which is secured and pivoted to the rear axle, and may be so arranged as to pass through or under the same. Said extension-support is braced or strengthened by the rods M, which are secured to support E, and the cross-piece I, which latter is placed on the upper side of the bolster of said rear axle. This extension-support is so constructed that its extension part E^2 slides in grooves formed in the sides of the main part. The upper part of said part E^2 is secured to carriages V, which move on rails T, secured to the under side of the side rails of the lower section of the ladder proper. The extension-support is pivoted to the carriages at *v*, as shown. The upper or sliding part E^2 of the telescopic extension-support is elevated by means of ropes or chains, which are attached to the lower part or round of E^2, and pass over sheaves or pulleys *m*, secured to the upper part of the stationary section, and then pass around a grooved wheel or corrugated sheave, O, which is turned by the crank *p*, so that as the rope or chain is wound on said wheel the sliding upper part E is elevated. Said grooved wheel O has, in connection therewith, the ratchet-wheel *u*, pawl *v*, and spring *w*, to prevent any return movement of the wheel when not desired. To raise the support E to its operative position is accomplished by means of ropes or chains, which are attached to the two carriages V, and pass over pulleys I′, and around corrugated sheaves S. A preferable manner of construction is to secure both ends of this rope or chain to the carriage, and pass it around the pulleys I′ and S; the latter only, or both of which, may be corrugated. In this case an endless chain is formed, and by turning the crank in the proper direction the support E is raised or lowered.

G is an escape or extension section, which can be raised upward to lengthen the ladder, or lowered into a window, thus furnishing an additional means of escape. It is pivoted at its lower end to carriages V′, which move on rails T′, fixed to the inner surface of the side rails, which latter are placed back of the rounds of the upper section. This escape-section is elevated, therefore, from the back of the upper section, and not from the front, as is usually the case.

The rails on which this escape-section, and also the support E, move, are constructed hollow, so as to permit of the introduction of steam through the open lower end, to thaw off any covering of ice that may have formed on the same, and which would interfere with the operation of the various parts of the ladder.

The truck-frame consists of parts H and H′, the former of which slides over the latter, for the purpose of securing a more nearly perpendicular position of the ladder, when that is desirable. The construction may be like that shown, where the rear frame slides in grooves of the forward frame; or the rods of the rear part may be made to slide in tubes of the front part. The ends of the truck may be made to approach each other by means of a chain or rope, the ends of which are attached to the rear frame at opposite points, and which rope or chain passes once around a grooved wheel or sheave placed at a proper point intermediate the places of attachment of the cord, so that the revolution of the said grooved wheel, secured to the forward frame, will shorten or lengthen the truck, according to the direction in which the wheel is turned.

The extension-support E has attached to it on its sides the lateral braces L, whose ends rest on the ground on either side of the truck, and serve to steady the ladder. Instead of attaching said braces permanently to support E, they may be provided with hooks on their upper ends to fit into eyes attached to support E. When not in use they rest inside of pins L′ on the cross-bar of the rear truck. When in use they rest in guides or rests R R′, attached to the side of the truck-frame, their outer ends in contact, or nearly so, with the ground.

The escape-section G is provided with a hook, *f*, attached to its lower round, which hook, when made to grasp any round of the upper section of the ladder proper, serves to retain the escape-section G in any desired position. To the side rail of the upper section is also attached a spring or catch, *h*, which holds the escape-section to the ladder proper when the former is not in use. Said escape-section is also provided with hooks *z z*, into which a cord or rope is slipped when the ladder is to be elevated, which rope passes through the eye *g*, and is secured to one of the rounds of the upper section of the ladder proper. At the upper part and under side of the lower section is provided a stop, *x*, which prevents the carriage from running off the track. Z are rests, upon which the side rails of the upper section of the ladder rest when the device is not in operation.

J is an extra ladder-rest, provided with two cross-pieces, which, in connection with two cross-pieces, K′ K″, fixed to the lower section, serve to carry two extra ladders, to be used in the ordinary manner. These are brought into requisition when it is not necessary to use the extension-ladder, and may of course be used at the same time. This is an advantage not provided for in any of the present

extension-ladders. These cross-pieces J J′ rest on a spring, J″, so as to provide the requisite elasticity. The side rails of the lower section rest on the cross-heads N′, which are grooved to admit the same, and are attached to the upper part of rods to which the cross-pieces J J′ are fixed.

When the device is in operation and stands, for instance, on a sidewalk, and it is desired to move the same in a lateral direction, it is accomplished by means of the small trucks represented in Fig. 3. These trucks consist of a frame carrying two rollers, as shown, and an open space between the same, approached by two inclined planes or shoes; or one only may be used, if desired, though I prefer to use two. The wheels of the rear truck are run up on the incline and settle in the opening between the rollers. The device can then be moved laterally by means of these rollers. These inclined shoes are hinged to the frame of the small truck on either side, so that they turn up when the wheel is in position on the same.

The mode of operating is as follows: The escape-section G is raised, by means of a cord attached to the upper round of the same, to a perpendicular or nearly perpendicular position, and then a rope or cord, which passes from a lower round of the upper section through the eye *g*, is hooked to the hook *z*, the other end of said cord being attached to the lower round of the escape-section. As power is applied to the rope which raised the escape-section to a perpendicular position, it brings the escape-section farther to the rear, and carries with it the upper section of the ladder proper by reason of the cord-connection. When the outer end of the escape-section abuts on the ground, power is applied to the upper end of the upper section, and as the escape-section in that position acts as a fulcrum, it causes the lower section to rise sufficiently to cause the pin *l* to drop into the socket *k*, whereby the upper and lower sections are locked together. Then the crank of the corrugated sheaves S S is brought into action, and as the carriages V are drawn up on the rails by the chains, the support E is elevated and forces up the ladder. When it is desired that the ladder shall assume a more nearly perpendicular position, the telescopic extension-support E is extended by means of the devices hereinbefore described. If the incline of the ladder is still greater than required, a more near approach to the perpendicular can be secured by causing the forward truck-frame to slide over the rear one, as hereinbefore fully set forth, thus diminishing the distance between the ladder and its rear support at the base. If the ladder does not reach to the desired height, the escape-section G may be elevated above the top of the upper section, either by hand or by chain and pulley; or, if it is desired to rescue a person in a story below the top of the ladder, said escape-section may be lowered into a window of said story.

When the ladder is elevated it is evident that the support E, by passing through the axle of the rear truck, is in the most favorable position as regards strength and absence of strain on the weakest parts. If the support E were secured below the axle it would tend to turn the same, and thus a strain would take place at the upper connection of the said support with the carriage V, which is the weakest part. If the support E were secured above the axle it would assume a more nearly horizontal position, and require very much greater power to raise the same in the first instance, and a strain on the weak parts, as in the former case, would not be avoided. By securing the support below the axle the first of these evils is avoided, but not the last. The lower part of the support E is placed at an angle with the part above the sheave O, so that said lower part will occupy a horizontal position when the device is not in operation, in order that the steering of the apparatus shall not be interfered with.

The wire-rope braces C′ M at the places of the pulleys E¹ *c* have a section of chain, for the reason that wire-rope, in bending around sheaves continually, would soon break, whereas by inserting a short section of chain at these points this liability is avoided.

The upper section has attached to its lower end a sleeve or equivalent device, into which the upper end of the lower section fits, and in this way the strength of the ladder to resist lateral strain is increased.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an extension-ladder, a rear support, the lower end of which passes through the axle of the truck, and is pivoted thereto to admit of lateral swing of said support, substantially as described.

2. In an extension-ladder, a rear extension-support which can be lengthened or shortened, the lower end of which is secured to and passes through the axle of the truck, substantially as and for the purpose described.

3. An extension fire-ladder, the sections of which are adapted to be folded on a four-wheel truck, the ladder pivoted to the truck in a manner to have lateral as well as vertical adjustment, substantially as and for the purpose set forth.

4. In combination with the lower section of a fire extension-ladder, a rear support connected to a carriage which slides on rails secured to the side pieces of the ladder, substantially as and for the purpose described.

5. In combination with the side rails of an extension-ladder, braces B′ (one for each rail) and brace-rods B″ on the under side of the side rails, and braces M and brace-rods C″ (rods C″ secured to the lower section only) on the front or upper side thereof, substantially as and for the purpose set forth.

6. An extension fire-ladder, consisting of hinged sections provided with braces on the

outer side of the side rails, the central post of said braces being secured to the lower section of the ladder, substantially as and for the purpose set forth.

7. An extension fire-ladder consisting of hinged sections which are provided with braces on the upper and outer sides of the side rails, said braces secured to posts attached to the lower section of the ladder, substantially as and for the purpose set forth.

8. An extension fire-ladder composed of hinged sections, and provided with braces on the three outer sides of the side rails, the lower braces being secured to independent posts, while the upper and side braces are secured to posts attached to the lower section, substantially as and for the purpose set forth.

9. An escape or extension section, G, arranged on the under side of the ladder proper, so that it can be extended upward or swung into a window, substantially as described.

10. The combination of tiller *n*, sheaves *o o o*, and chain or cord *p* with the rear axle, by which the ladder is swung laterally, substantially as and for the purpose described.

11. The combination of rear support, carriage V, pulleys I′, rails T, corrugated sheaves S, and chains or cords by means of which the ladder is elevated, substantially as described.

12. A hinged extension fire-ladder, provided with pin *l* and socket or aperture *k*, by means of which the sections of the ladder are secured to each other in a firm position when open, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH H. SPENCER.

Witnesses:

FRANCIS TOUMEY,

EDWARD WALSH.