(No Model.) 4 Sheets—Sheet 1.

P. SCHMAHL.

FIRE LADDER.

No. 318,660. Patented May 26, 1885.

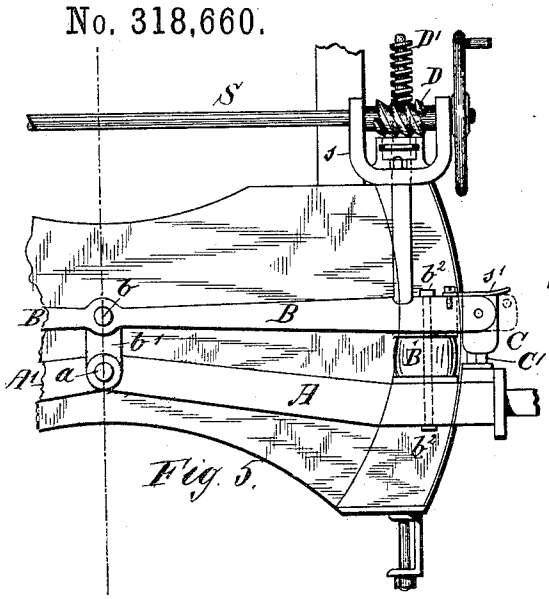

Fig. 5.

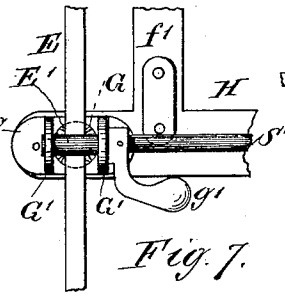

Fig. 7.

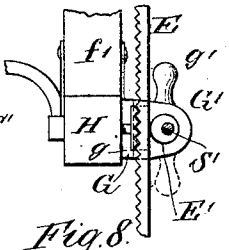

Fig. 8.

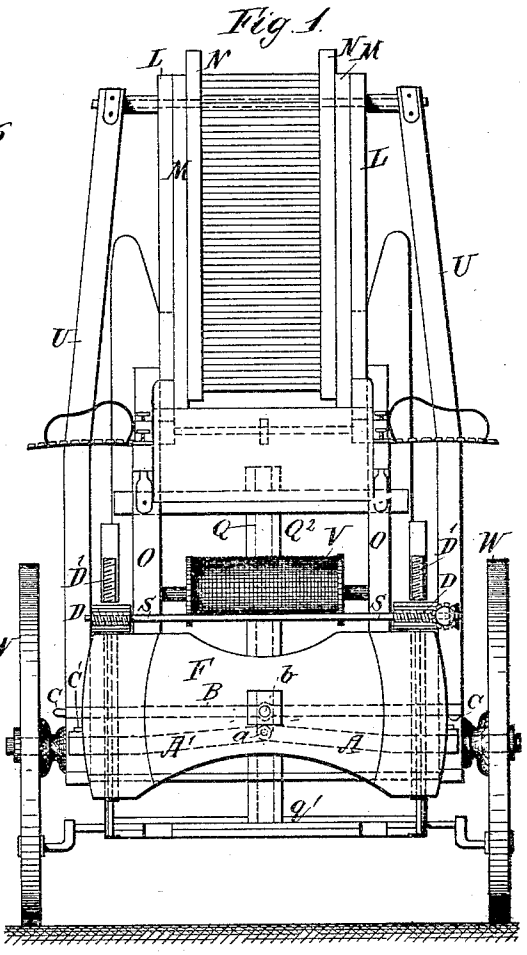

Fig. 1.

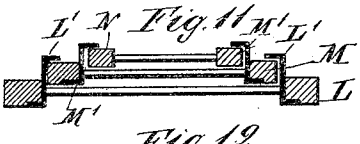

Fig. 11.

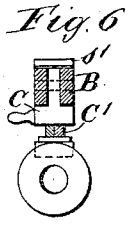

Fig. 6.

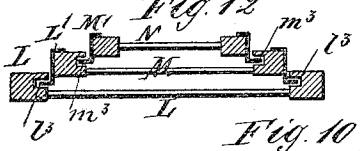

Fig. 12.

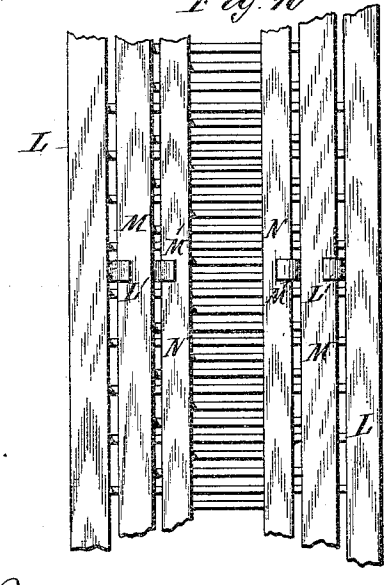

Fig. 10.

Witnesses:
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W. E. Boulter

Inventor:
Paul Schmahl
per Henry Orth
Kiratt & Co

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P. SCHMAHL.

FIRE LADDER.

No. 318,660. Patented May 26, 1885.

Fig. 2.

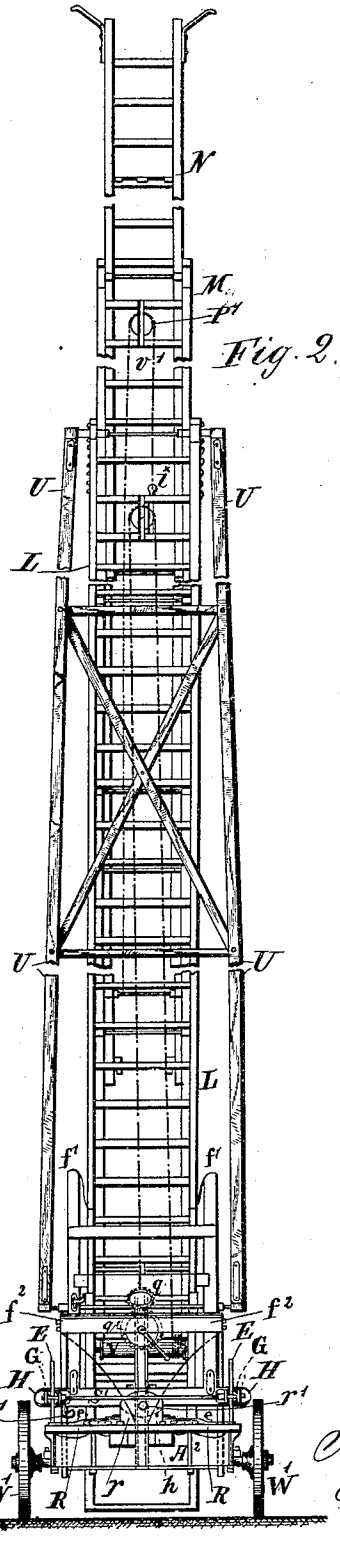
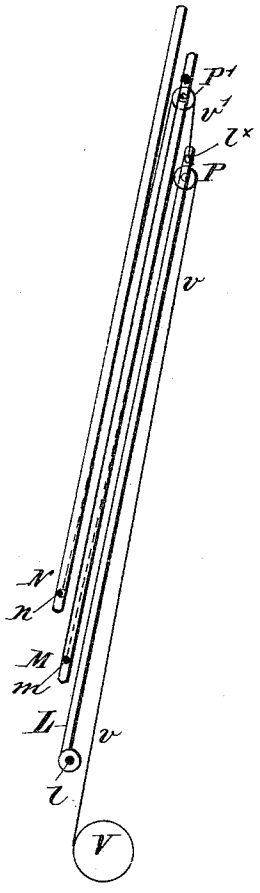


Fig 13.



Witnesses
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Paul M. Trobloch

Inventor
Paul Schmahl
per Henry Orth
his att'y

(No Model.)

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P. SCHMAHL.

FIRE LADDER.

No. 318,660.

Patented May 26, 1885.

Fig. 4.

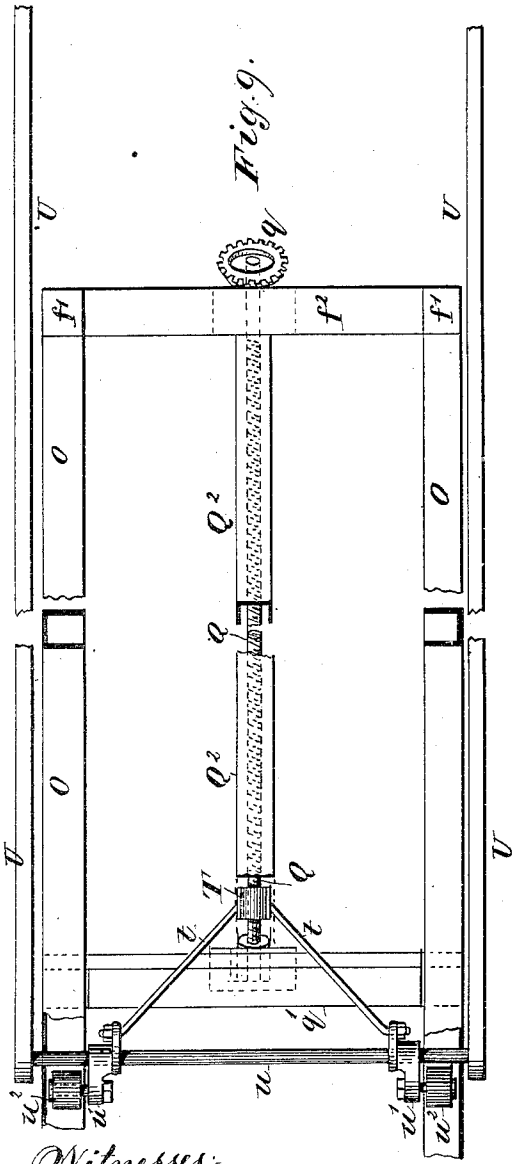
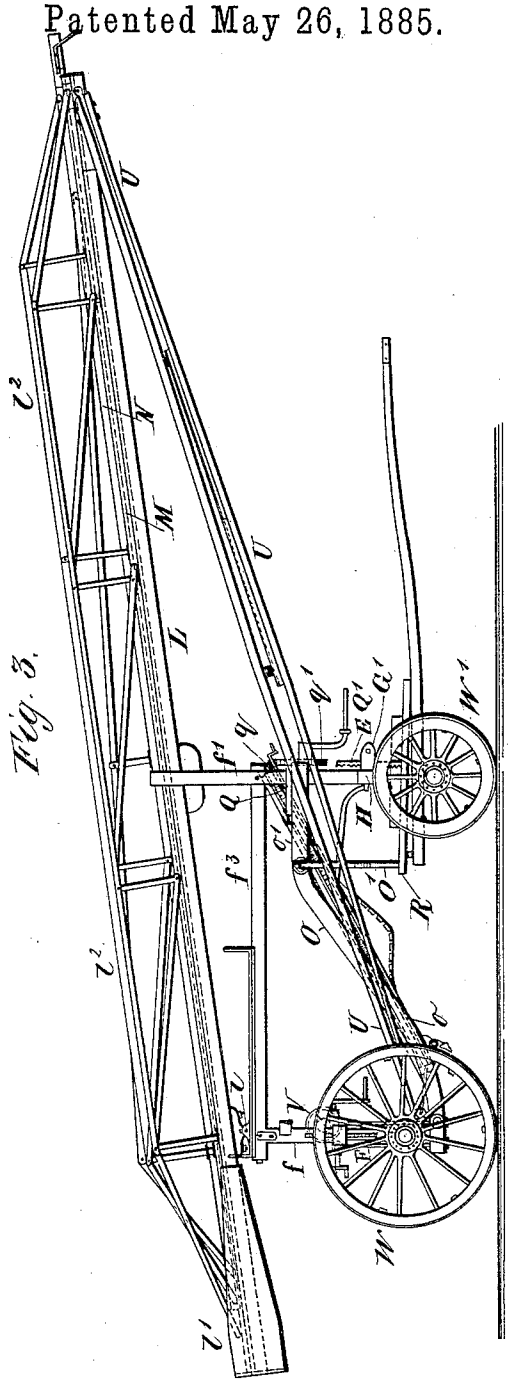


Fig. 3.



Witnesses:
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Samuel Quincy Edmonds

Inventor:
Paul Schmahl
by Henry Orth
his Atty.

(No Model.) 4 Sheets—Sheet 4.

P. SCHMAHL.

FIRE LADDER.

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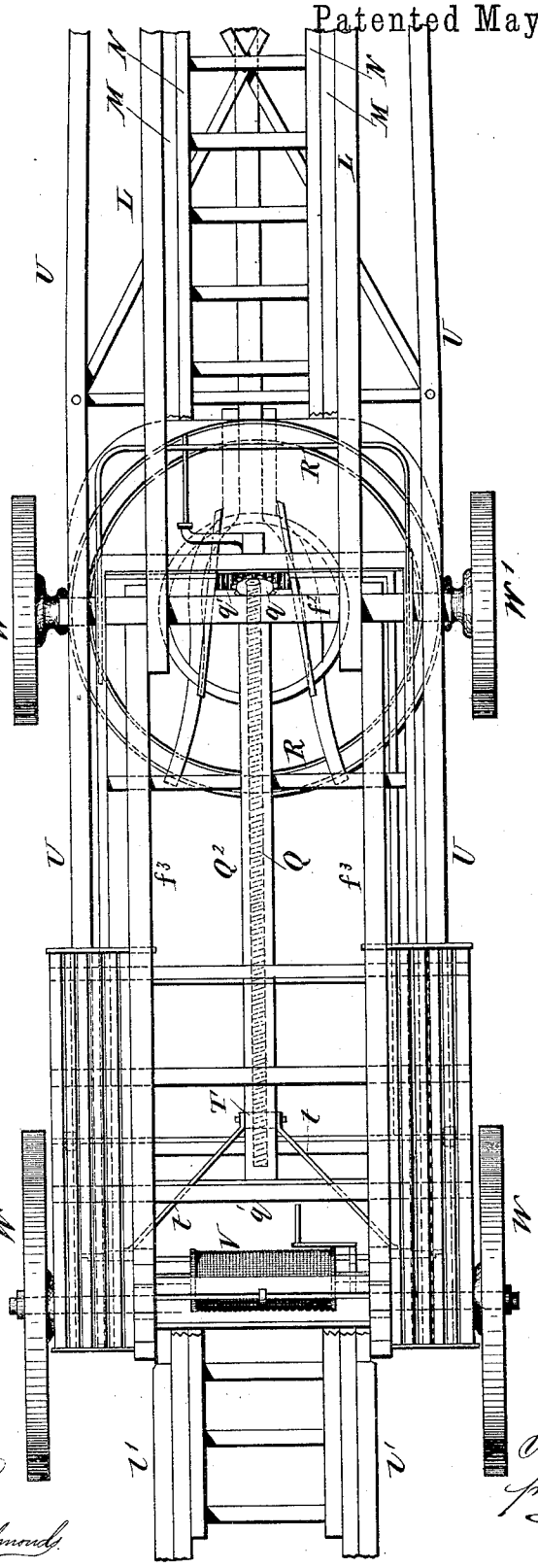

Fig. 4.

Witnesses:-
W. S. Butler
Samuel Owen Edmonds

Inventor:-
Paul Schmahl
per Henry Orth
his att'y.

UNITED STATES PATENT OFFICE.

PAUL SCHMAHL, OF BIBERACH-ON-THE-RISS, WÜRTEMBERG, GERMANY.

FIRE-LADDER.

SPECIFICATION forming part of Letters Patent No. 318,660, dated May 26, 1885.

Application filed December 16, 1884. (No model.)

To all whom it may concern:

Be it known that I, PAUL SCHMAHL, a citizen of Würtemberg, residing at Biberach-on-the-Riss, have invented certain new and useful Improvements in 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 appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in extensible fire-ladders; and it consists in the means employed for leveling the frame-work that supports the ladder when the truck is standing on uneven ground, substantially as hereinafter fully described.

The invention further consists in the means for raising the lower ladder-section from which the other ladder-sections are supported, substantially as hereinafter more fully described.

The invention further consists in means for securing the ladder-sections together, and for extending or raising and lowering said sections from and on their support, substantially as hereinafter more fully described; and, lastly, the invention consists in certain details of construction and combination of parts, substantially as hereinafter fully described.

Referring to the accompanying drawings, Figure 1 is a rear elevation of my improved fire-ladder. Fig. 2 is a front elevation thereof, showing the ladder extended for use. Fig. 3 is a side elevation of the ladder. Fig. 4 is a top plan view thereof. Fig. 5 is a detail view of part of the rear wheel-axle and the bolster that supports the rear portion of the truck-frame. Fig. 6 is a detail view of the devices for locking the rear part of the truck-frame against lateral oscillation. Fig. 7 is a face view, and Fig. 8 a side view, of a portion of the mechanism for adjusting or leveling the fore part of the truck-frame and locking the same in position when adjusted. Fig. 9 is a detached detail plan view, showing the relative arrangement of part of the mechanism for elevating the ladder. Fig. 10 is a top plan view of a portion of the extensible ladder. Figs. 11 and 12 are transverse sections thereof, showing the mode of securing the ladder-sections and allowing them to slide one on the other. Fig. 13 is a diagrammatic view illustrating the mode of extending the ladder-sections.

In the drawings, W indicates the rear train-carrying wheels, and W′ the like fore train-wheels of the truck on which the ladder is mounted and from which it is supported.

The rear portion of the truck-frame consists of two uprights, *f f*, braced at their upper and lower ends by cross ties or braces, said uprights being secured to a bolster-plate or axle-tree, F, to which is also secured the bolster B, said parts being adapted to oscillate upon a pivot pin or bolt, *b*, that passes transversely through said bolster and plate.

The parts described are supported from the rear wheel-axle in the following manner: The axle is formed in two parts, A and A′, pivoted together at their inner ends at *a*, Fig. 5, and connected to the bolster B by means of a link, *b′*. A spring buffer or buffers of rubber or other suitable material, B′, are interposed between the outer ends of the bolster B and the axle A A′, so that the whole rear frame is adapted to oscillate laterally, the amplitude of this lateral oscillation being adjusted by more or less compressing the buffers by means of adjusting-bolts b^2.

To the outer ends of the beam B are pivoted rectangular lugs or dogs C, held in position by means of a spring, *s′*, said lugs serving, when turned down and caused to abut against the heads of the bolt C′, to lock the bolster B and parts connected therewith against oscillation, said screw-bolt closing the orifice of the lubricating-boxes that contain the lubricant for the axle A A′. In Fig. 5 I have shown said dogs when turned down and locking the said parts against oscillation on the axle A A′, and in dotted lines I have shown them turned up to permit said parts to oscillate.

The object of arranging the rear truck-frame to oscillate on its supporting-axle is to permit its being leveled when the truck-wheels stand on inclined or uneven ground to give the ladder, when extended, greater stability and prevent all danger of its toppling over before its outer end has been brought to bear on the wall of a building.

The leveling of the frame is effected by means of the following mechanism: On each end of the bolster-plate F is secured a forked bearing, *s*, in which is mounted a transverse shaft, S, that extends from one standard to the other, which shaft carries on that portion which lies within the fork of the bearings a worm, D, that meshes with a screw-spindle, D′, secured to the bolster B. This worm-gearing is so arranged that when the shaft S is rotated in the proper direction the rear truck-frame will swing or rotate on its pivot so that one side will move upward and the other downward, or vice versa. Instead of a worm-gear, bevel-gearing may be employed, as will be readily understood. The uprights *f f* are connected by means of longitudinal girts f^3 to like uprights *f′ f′* of the front portion of the truck-frame; and in order to adapt said front portion of the truck-frame to oscillate laterally with the rear portion thereof the hound H has a depending perforated lug, *h*, through which and a corresponding lug, *r*, projecting from a cross-bar, of the upper half of the fifth-wheel, projects a bolt, *r′*, on which said forward part of the truck-frame is free to oscillate. This latter portion of the truck-frame is leveled automatically and simultaneously with the rear portion of said frame by the mechanism described, as said front portion of the frame will necessarily follow or partake of the lateral oscillations of the rear portion, and is guided in its oscillatory movement and locked in position as follows: To the hounds of the lower half of the fifth-wheel of the fore train of the truck is secured a ring or sixth-wheel, R, which ring is grooved or U-shaped in cross-section, forming a track in which rest the ends of two rack-bars, E, said ends being guided by two arms, *e*, Fig. 2, secured to the usual transverse brace or cross bar of the upper half of the fifth-wheel, the two halves of the fifth-wheel being, as usual, connected with the axle-tree A^2 by means of a king-bolt, which axle-tree is provided with guide-lugs projecting vertically therefrom over the periphery of the wheel R that rotates with the axle-tree on the king-bolt. The upper ends of the rack-bars mesh with toothed wheels G in such manner that the teeth or cogs thereof lie always in the same plane as the teeth or cogs of the rack-bars. The wheels G have their bearings or studs (on which said wheels are loosely mounted) secured to bearing-plates *g*, bolted to the outer ends of the bolster H of the fore train truck-frame.

From the plates *g* project bearing-lugs G′, in which is loosely mounted a transverse shaft, S′, that carries cams or eccentrics E′, arranged to bear on the rack-bars and force the same against the toothed wheels to lock said parts against movement when the shaft S′ is rotated in the proper direction by means of the handle *g′*, said bearing-lugs G′ serving as guides to properly guide the upper end of the rack-bars. In this manner the entire truck-frame is rigidly locked when leveled or adjusted.

The extensible ladder I have shown in the drawings as composed of three sections, though it will be understood that more or less ladder-sections may be employed.

L indicates the lower section, which is pivoted at *l* to the truck-frame, and extends rearward of the pivot sufficiently to rest on the ground when in its greatest elevation. The rear end of this ladder-section is provided with a framing or housing, *l′*, to prevent the other sections sliding out when lowered on the truck-frame, as shown in Figs. 1 and 3, and it is also provided with a hand-rail, l^2. The ladder-sections M and N slide the former in section L and the latter in section M, and are arranged as more plainly shown in Figs. 10, 11, and 12, the sections L M being each provided with iron clamps L′ M′, those L′ guiding the ladder-sections M, and those M′ the ladder-section N.

Instead of arranging the guide-clamps on the sections L and M, as shown in Figs. 10 and 11, they may be arranged, as shown in Fig. 12, on sections M N, and the former as well as section L provided with guide-grooves l^3 m^3, in which the lower outwardly-projecting angle or foot plate of the clamp-slides.

The ladder is adapted to describe an arc of a circle of eighty degrees on its pivot, so that any inclination within this radius from a nearly horizontal line when lowered on the truck may be given to the ladder, which is erected and extended as follows: O O are two parallel guide-beams of substantially U shape, with their open portion facing each other, the forward end of these beams being supported from the uprights *f′* of the fore train-frame of the truck and the rear end from the lower portion of the rear train-frame of said truck. As shown, the beams O have a curved portion, *o*, said curved portion being on an arc of a circle the center of which is that of the pivot of the ladder-section L on the truck-frame, or approximately so, said curvilinear portion terminating in a straight outer portion, *o′*. To a cross-tie, *q′*, forming a portion of the lower part of the rear truck, or to the axle-tree, is secured a bearing in which rotates freely the unthreaded foot of a screw-spindle, Q, the upper unthreaded end of which rotates freely in a like bearing secured to the upper cross-tie or brace, f^2, of the fore train truck-frame. The spindle carries at that end a gear-wheel, *q*, adapted to mesh with a gear-wheel the shaft of which has its bearings in said cross-tie f^2, and said shaft carries a crank, Q′. Upon the screw-spindle Q is mounted an interiorly-threaded nut, T, to which is secured one end of two connecting-rods, *t*, the other end of which is secured to the lower end of two fish-belly struts or supporting-girts, U, whose outer end is pivoted to the outer end of the side pieces of the ladder-section L. At their lower end the struts are connected by a transverse crank-axle or shaft, *u*, on the cranks of which are mounted rollers u^2, that are arranged to travel in the grooves of the guide-beams O O. The screw-

spindle Q is enclosed in a U-shaped beam, Q^2, to shield it from dust and dirt, as plainly shown in Fig. 9, a portion of the beam being broken away. On rotating the gear-wheel q by means of the crank Q′, the nut T is caused to travel along said spindle, carrying with it the lower end of the struts or supporting-girts U, thus elevating the end of ladder-section L, as will be readily understood. It will also be understood that no stop mechanism is required to hold the ladder-section at any given inclination, as the nut T cannot move downward except by rotating the screw-spindle in the proper direction. When the ladder-section L is at its greatest elevation, the rollers u^2, (shown in dotted lines in Fig. 3,) stand in the horizontal portion o' of the guide-beams O, which support the ladder firmly. The guide-beams are braced by means of a forked brace, O′, the arms of which are connected to said beams, and the foot thereof, being provided with a roller, is stepped in the groove or way of the sixth-wheel R, thus giving said beams a firm support at the point of greatest strain under the weight of the ladder when fully erected.

The extension of the ladder-sections is effected as follows: V is a winding-drum mounted in the upper portion of the rear train truck-frame, to which one end of a rope, v, is secured. The rope v passes over a pulley, P, attached to the upper end of ladder-section L, and its other end is attached to the lower end of ladder-section M, as at m. A second rope, v', attached to the upper end of ladder-section L, as at $l^{\times}$, passes over a pulley, P′, secured to the upper end of ladder M, the other end of said rope v' being attached to the lower end of ladder-section N, as at n, as more plainly shown in Fig. 13.

It will be seen that on winding the rope v on drum V said rope will draw on the lower end of the ladder-section M and slide the same out of section L. This outward motion of ladder-section M will cause the rope v' to draw on the lower end of ladder-section N and slide the same out on section M. When fully extended, the ladder-sections are held in that position by the usual ratchet-and-pawl mechanism on the drum-shaft and truck-frame, respectively, or other suitable stop mechanism to hold the drum V against rotation.

To guard against accident in case either of the ropes v or v' should give way, any usual well-known or preferred stop or safety mechanism may be employed.

Having now described my invention, what I claim is—

1. In a fire-ladder, the combination, substantially as described, with the truck-frame and the bolster of the aft train of the truck, of a two-part aft train-axle hinged together and to said bolster, for the purpose specified.

2. In a fire-ladder, a wheeled truck from which the ladder is supported, composed of a carriage having its rear train-axle formed in two parts, hinged together, and a truck-frame having its bolsters pivoted to the carriage-axles, and in combination therewith, a leveling mechanism for leveling the frame on the carriage, substantially as and for the purpose specified.

3. In a fire-ladder, a wheeled truck from which the ladder is supported, composed of a carriage having its rear train-axle formed in two parts, hinged together, and a truck-frame having its bolsters pivoted to the axles of the carriage, and buffers interposed between the rear bolster and its axle, and in combination therewith, leveling mechanism for leveling the truck-frame on the carriage, substantially as and for the purpose specified.

4. In a fire-ladder, a wheeled truck from which the ladder is supported, composed of a carriage having its rear train-axle formed in two parts hinged together, a sixth-wheel having an annular groove formed in its upper face and connected with the fore train, a truck-frame having its bolsters pivoted to the carriage-axles to allow said frame to oscillate laterally, a leveling mechanism consisting of rack-bars and worm-gear operated by crank and applied to the aft truck-frame, and the rack-bars E, and toothed wheels G, said rack-bars being stepped in the groove of the sixth-wheel, said parts being arranged for co-operation, substantially as and for the purpose specified.

5. In a fire-ladder, a wheeled truck from which the ladder is supported, composed of a carriage having its rear train-axle formed in two parts hinged together, a sixth-wheel connected with the fore train, having an annular groove formed in its upper face, a truck-frame supported from the carriage and free to oscillate laterally, and in combination therewith, a leveling mechanism for the fore train portion of the frame composed of rack-bars E, stepped in the groove of the sixth-wheel and the toothed wheels G, and a locking device to lock the rack-bars and wheels against operation, substantially as and for the purpose specified.

6. In a fire-ladder, a wheeled truck from which the ladder is supported, composed of a carriage having its rear train-axle formed in two parts hinged together, a truck-frame supported from the carriage-axles and free to oscillate laterally thereon, and in combination therewith, buffers interposed between the rear train-axle and bolster, a leveling mechanism for leveling said frame applied to the fore and aft portions of the frame, and operated from the latter portion, and locking devices connected with said leveling mechanism and operating to lock the same out of operation, substantially as and for the purpose specified.

7. In an extensible fire-ladder, the combination, substantially as described, with the carrying-truck, the truck-frame and a ladder pivoted at its lower end to said truck-frame, of an elevating mechanism consisting of a screw-spindle, a nut operating on said spindle, and connecting-braces connecting the nut with the upper end of the ladder.

8. In a fire-ladder, the combination, sub-

stantially as described, with the rear wheel-axle formed in two parts pivoted together, and the rear truck-frame bolster connected with the pivot of said axle by link and adapted to oscillate laterally, of buffers interposed between the axle and bolster for the purpose specified.

9. In a fire-ladder, the combination, substantially as described, of the rear wheel-axle, the aft train truck-frame bolster adapted to oscillate laterally on the rear wheel-axle, and a locking-dog to lock said bolster against lateral oscillation, for the purpose specified.

10. In a fire-ladder, the combination, substantially as described, with a wheeled truck and a ladder-section pivoted thereto at one end, of an elevating mechanism, consisting of a screw-spindle rotating in fixed bearings, a nut operating on said spindle, struts connected with said nut and the upper end of the ladder, and grooved guides to guide the lower end of the struts for the purpose specified.

11. The combination, substantially as herein described, with the guide-beams O, the brace O′, the truck-frame and bolster H, of the fore axle-tree, the sixth-wheel R, and the fifth-wheel, for the purpose specified.

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

PAUL SCHMAHL.

Witnesses:
FR. STAYZ,
T. P. MARBEY.