

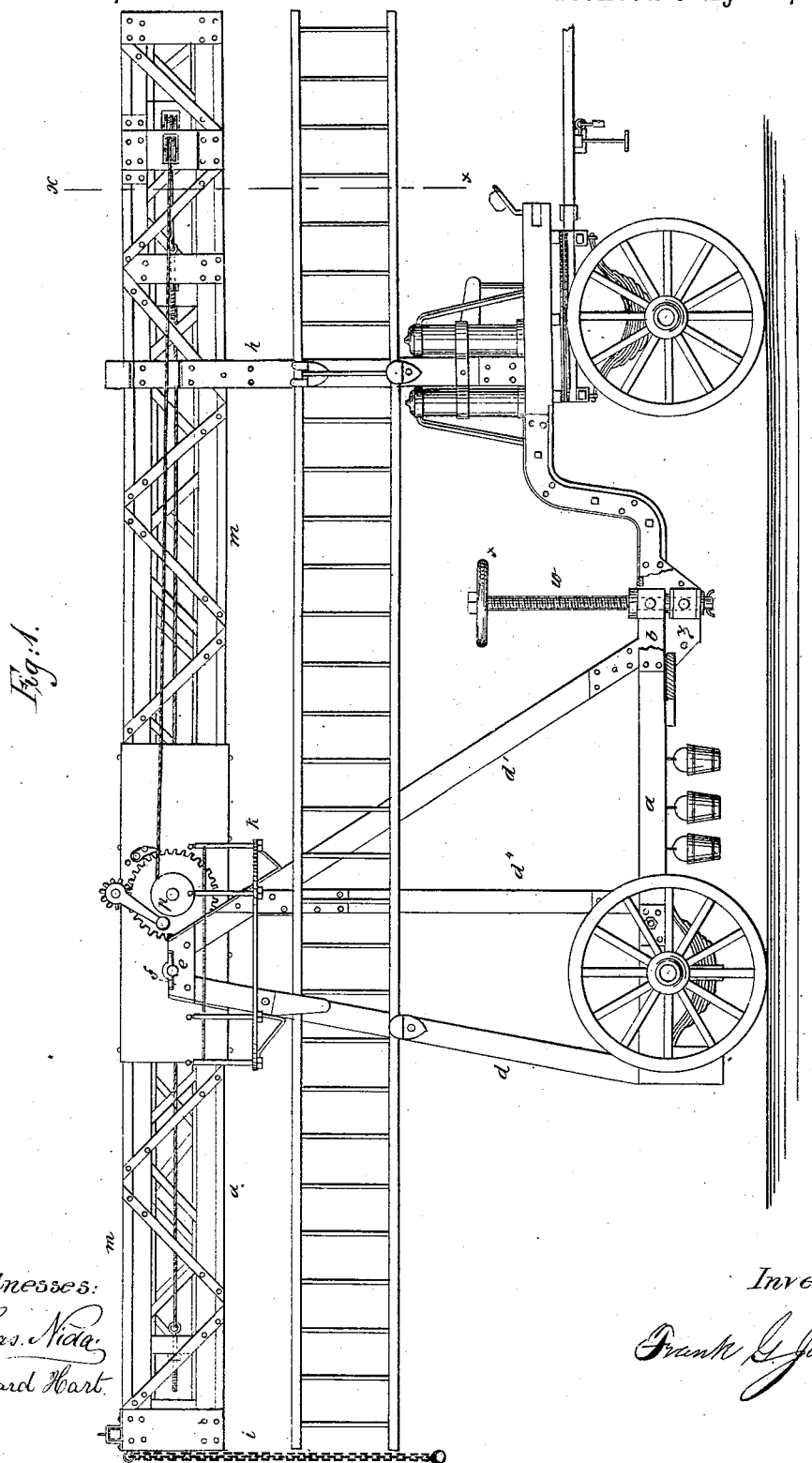
(No Model.)

3 Sheets—Sheet 1.

F. G. JOHNSON.
FIRE ESCAPE LADDER.

No. 261,158.

Patented July 18, 1882.



Witnesses:
Chas. Nida
Edward Hart

Inventor:
Frank G. Johnson

(No Model.)

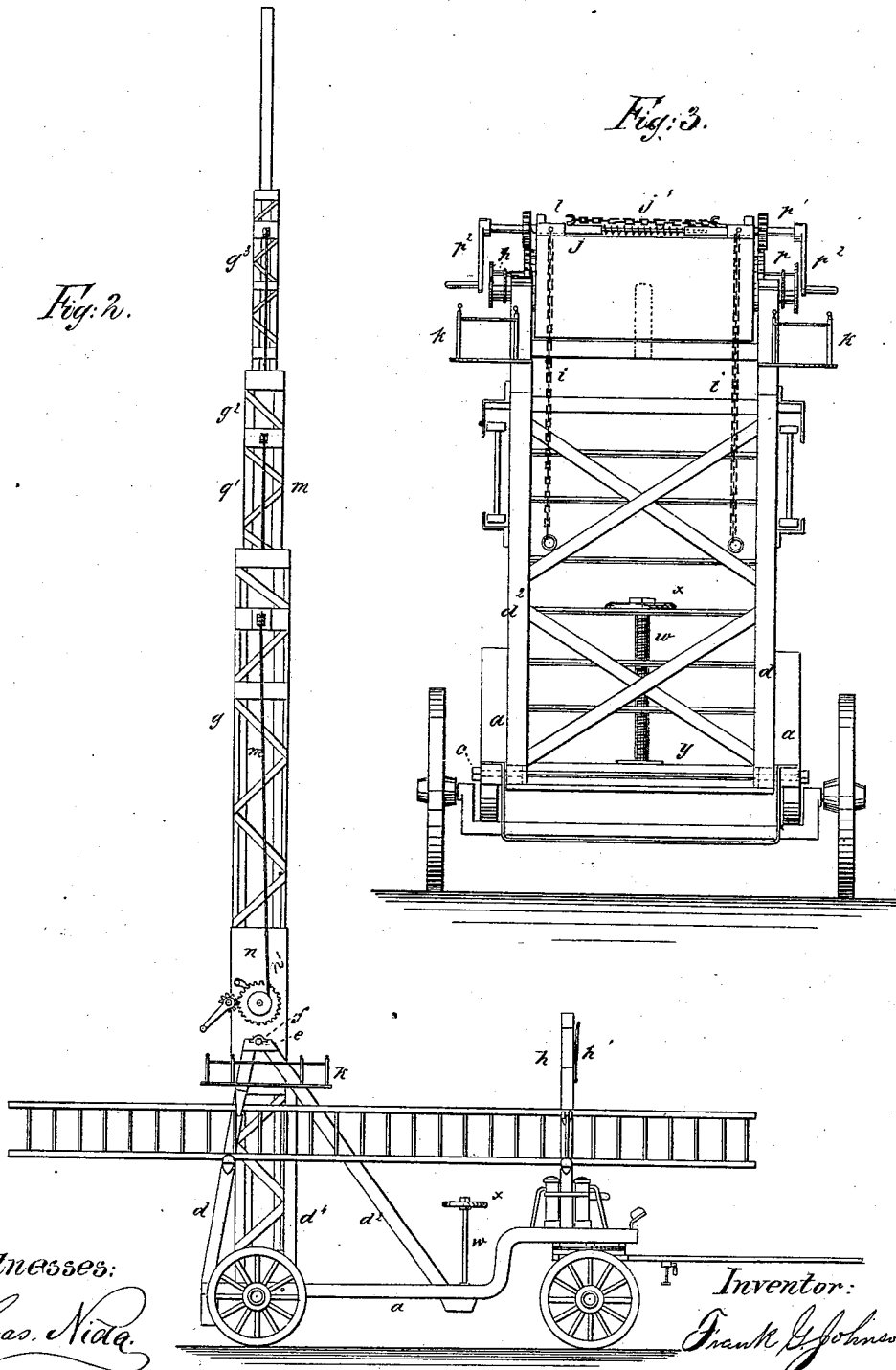
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Fig. 2.



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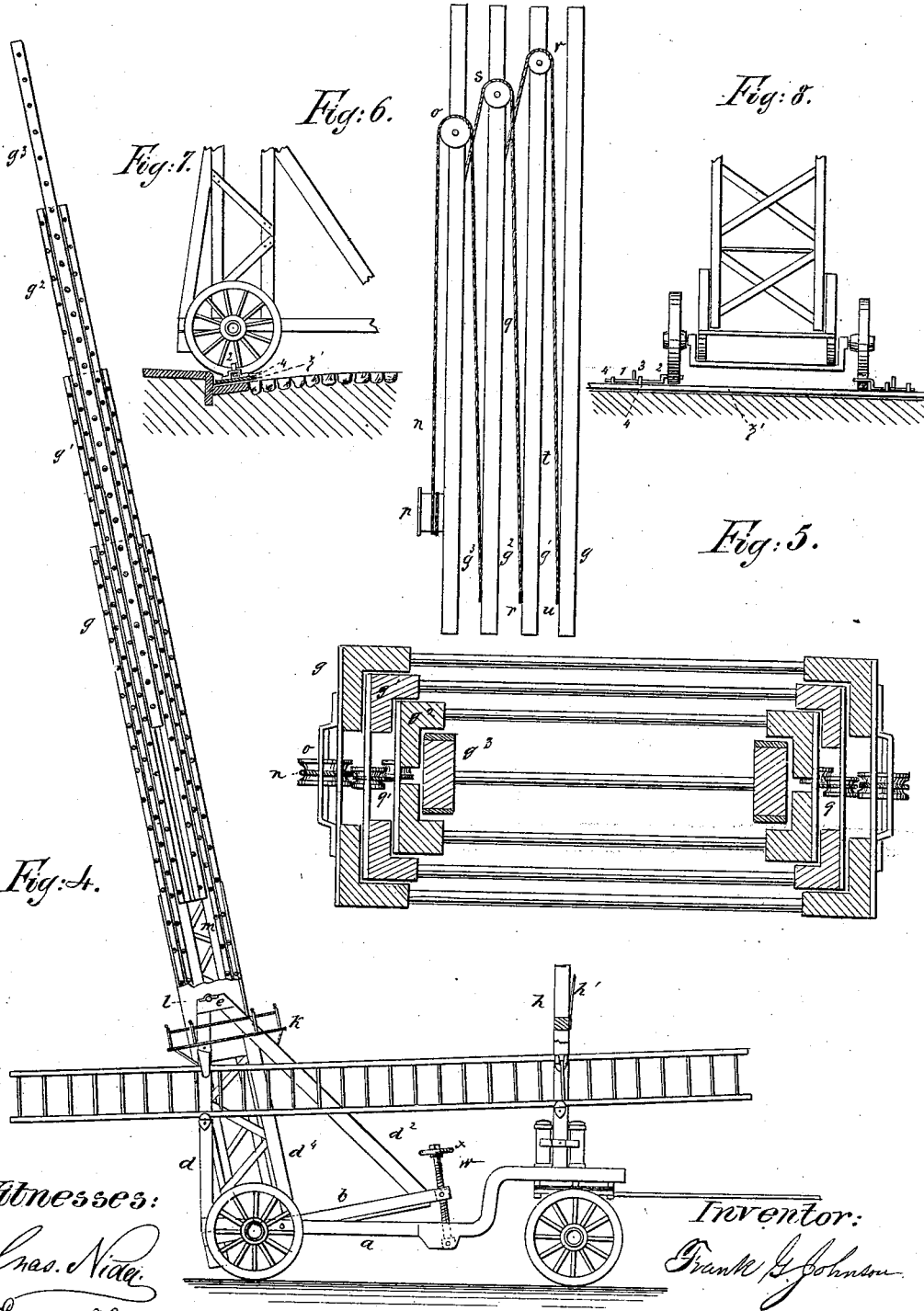
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UNITED STATES PATENT OFFICE.

FRANK G. JOHNSON, OF BROOKLYN, NEW YORK.

FIRE-ESCAPE LADDER.

SPECIFICATION forming part of Letters Patent No. 261,158, dated July 18, 1882.

Application filed April 26, 1880. (No model.)

To all whom it may concern:

Be it known that I, FRANK G. JOHNSON, of the city of Brooklyn, in the State of New York, have invented certain new and useful Improvements in Extension-Ladders; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings and the figures and letters marked thereon.

My improvements relate to extension-ladders for ascending to the sides and roofs of high buildings, and in apparatus for elevating, directing, and transporting the same, being particularly designed for extinguishing fires.

Contrivances to accomplish one and all the above-named purposes are well known.

The great need of an elevating-ladder with extreme extending scope for use upon the high structures of recent years, and which shall possess requisite stiffness and strength, with facility for easy and quick application and transportation, to be reliable under all conditions in practical use, with entire freedom from all the "shortcomings" of its predecessors, has led to my invention.

In the drawings, Figure 1 represents a side elevation of the ladder as closed and in its seat on the carriage, as ready for transportation. Beneath it a fireman's ordinary ladder is secured, of which several others, as well as all the usual implements of a well-appointed hook-and-ladder truck, are secured to the carriage for use as needed. Fig. 2, in a reduced scale, shows Fig. 1 with the elevator on its platform-seat and partly erected. Fig. 3 represents an end elevation of the carriage. Fig. 4 shows a similar view partly in vertical section. Fig. 5 is a horizontal section of the ladders when retracted. Fig. 6 is a group of ladders, showing the ropes and pulleys for actuating them.

First, I construct my ladders, in sections, each of double ladders of any required but of equal length, in doing which I first provide for each double ladder L-shaped rails of strong light wood or other proper material, as shown at *g*, Fig. 5. Of these four distinct L-shaped frames I construct two separate ladders by securing the ends of rungs or cross-bars let into opposite edges of the frames, (see Fig. 5, *g*⁴, *g*⁵, &c.) and when thus completed I secure

the two ladders firmly together, but at proper distance apart, by means of strong and flat metal braces, serving also as binding-straps *m*, Figs. 5, 2, and 1, bolted upon and across diagonally from frame to frame, thus producing an open-work or latticed rectangular tube, forming a pair of complete independent ladders. I next take other L-shaped rails of same length, but of slightly-less measurement, or not, in cross-section, and construct a second pair of ladders precisely like the former, except that the outside measurement must so correspond with the inside of the first as to slip easily within the angles of the larger one, or the base-ladder, and this done I repeat it in a third ladder, observing always the same requisite conditions, so that when thus put together I have a nest of three ladders in one, and all of equal length, that will slide on each other freely. The inner or fourth ladder I prefer to make single, similar to ordinary ladders, except that its frame may be stayed with metal plates and is made to fit inside No. 3. Thus my elevator consists in a series of complete double ladders, each side capable of separate use independent of the other side—a great advantage in case of fires. The construction of open quadrangular double ladders insures the greatest possible strength with the greatest possible lightness. The corner L-shaped rails, united by the rungs *g g* and proper fastenings sidewise of the ladder, and two such ladders secured apart by diagonal plates *m* on the edges, as described, form a double ladder, combining strength and stiffness, which insures a sustaining power of the highest possible degree in any like capacity of cross-section area, and at least four times as great as if the ladders were single, at whatever angle of elevation they may be used. I give stiffness and bracing strength to my outside or base ladder by a metal plate secured over the entire base end, as seen at *J*, Fig. 3, and extend it up the two edges, as seen in Fig. 1. I also secure a metal plate to the ladder several feet above its lower end, as seen at *n'*, Figs. 1, 2, 4, and extending around it or upon its opposite edges to facilitate attaching the several parts for carrying and operating the ladders.

Second. My appliances for extending and contracting the ladders consist of a crank

with a pinion, taking a toothed and pawled wheel, p , rotating on a spur-shaft secured in the plate, properly strengthened, and carrying also a winding-drum, p , for the operating-rope.

5 The duplicate of all the above-described parts is found on the opposite plate of the ladder. Strong cords or wire ropes n , Fig. 6, connect with the ladders. The first rope has its outer end secured to the hoisting-drum, thence it

10 passes along outside the frame of the base-ladder to and over a grooved pulley secured to the frame, thence downward between the two ladders, nearly to their opposite ends, where the rope is secured to a tightening-staple near

15 the bottom of the second ladder. A second rope is made fast at its outer end to the inside of the frame of the base-ladder, below its grooved pulley, thence it passes up and over a grooved pulley on the second ladder, and

20 down to near the bottom end of the third ladder, where it is made fast, like the first one. A third rope is secured in like manner to ladder No. 2, thence up and over a pulley, and down, and made fast to No. 4 ladder. All these ropes

25 and pulleys have their duplicates on the opposite sides of the double ladders. The crank-shaft p' , Fig. 3, extends across the ladders, as shown, with duplicate cranks, &c., on its opposite end, so as to operate by two cranks and

30 drums simultaneously. It follows that when the winches are turned ladder No. 2 will be forced out of No. 1, which will repeat itself upon all the ladders by the strain on their respective ropes, and they will simultaneously move

35 inward in the same direction, and consequently move inward by their own weight when the pawls are unlocked and the crank held to avert sudden action. The pawls hold the ladders in a

40 fixed position when connected with the ratchet-wheel. At f' , Figs. 1, 2, 3, a strong and short stud secured to the plate n' is shown, having its exact fellow on the opposite side, and serving as trunnions on which the group

45 of ladders rest at all times, oscillate on, when directing them from a vertical position, and support them in transportation from place to place when closely grouped, as seen in Fig. 1.

Third. The combined ladders thus constructed I mount upon an oscillating frame, d d' ,

50 supported upon a wheeled truck. (Shown in Figs. 1, 2, 3, 4.) This frame consists of a base-beam, b , into either end of which is secured the lower ends of upright side timbers, d d' ,

55 inclined inward, as shown, one at an angle of about sixty degrees and the other at about eighty degrees, (more or less,) so that their upper ends approach near to each other to receive a cross-piece, as shown at f , and carrying journal-boxes and caps to take the trunnions for carrying the ladders, thus forming one side of what I will term a "gallows-

60 frame," having its precise counterpart opposite, the two being secured together into one common frame-work by cross-timbers at the bottom ends, and toward the rear end at the

65 base of a vertical timber, d^4 , which at its top

takes and is secured to the diagonal d' . This vertical timber d^4 is placed below the bearings for the trunnions to support the weight and give steadiness to the ladders. Diagonal cross- 70 ties and braces are shown in Fig. 3 to stiffen the gallows-frame laterally. This entire frame is made to oscillate on the truck by means of pintles or a shaft of metal across the frame a of the truck, and also traversing the base-timbers b of the gallows-frame, near to the vertical support d^4 , as shown at c , Fig. 1, and about one-third the distance (more or less) from the rear end of b , upon which bearings the combined frame may be rocked backward within 80 the side frame, a , of the truck. At the forward end of timber b a strong iron shaft is secured across between the timbers, upon which shaft a strong oscillating screw-nut is placed at y , underneath which, and secured within 85 the side frame, a , of the truck, is a second shaft carrying an oscillating socket-step, z , taking the lower end of a strong elevating-screw, w , with hand-wheel on its upper end, the turning of which will raise the lower forward end 90 of the frame, as shown in Fig. 4, for the purpose of inclining the ladder.

Fourth. The operating-truck consists of a four-wheeled carriage provided with a fixed axle for the hind wheels, and a swiveling axle 95 with king-bolt for the forward wheels, being all a common device and well known; but with the oscillating and adjustable gallows-frame last described, when properly attached, it constitutes a carriage to secure and transport the 100 ladders from place to place, has a platform on which to stand and fasten them vertically, from which to elevate them, and from their oscillating base to direct and sustain them when erected, and in either case vertically, or at any 105 desired angle; also, a turn-table platform to change direction of the ladders horizontally by using the hind wheels as a center of motion, any one or more of which operations may be performed alone or simultaneously. To the 110 upper part of the frame-work d a horizontal and railed gallery or stage, k , extending around the group of ladders, is secured, and designed for use by the erecting-men of the working team for the apparatus. On the forward end 115 of the truck-carriage, and nearly over the wheel-axles, a vertical strut, h , is secured on each side of the truck-frame a , and to a height slightly above the top of the gallows-frame. A cross-beam below the top secures the two struts into 120 a frame to support the forward end of the grouped ladders, and to this cross-beam is a plate of iron, h' , Figs. 2, 4, secured vertically from its bottom edge, and slightly bent from a right line, serving as a spring to catch and 125 bear against the ladder-rungs, steady the ladders in transit, and secure the group firmly. At the base end of the group two short chains are shown at Figs. 1, 3, also a short chain, J' , attached at either end to two hooks, jj , secured 130 to two spring catch-bolts which work through the frame. When this chain J' is drawn by

the hand the bolts will be drawn inward, and when released the spiral spring (seen in Fig. 3) will force them outward.

Fifth. The apparatus being thus nearly complete requires to be united, to do which the group of closed ladders is lifted into its seat by the trunnions taking into their bearings on the gallows-frame and the cap secured, the forward end falling between the uprights *h* with a proper fit, and rungs taking against the holding spring-plate *h'* and the ladders rest on the cross-timber *h²*. When in position, as thus described, the weight of the forward part of the ladders at the extreme end should preponderate about fifty pounds or more over the base end. The truck and its load should be suspended upon strong springs to insure ease in riding. Cross rods or rungs are shown in Fig. 3, secured between the uprights *d*, serving to stiffen the frame, as also for ladder-steps for the firemen in mounting to the platform *k*. All is now complete for use, as shown at Fig. 1.

Operation: The truck is drawn to its position for use and locked there by turning the forward axle at right angles. At same time two firemen mount to the platform *k* by the ladder-steps described, and two others seize each one of the chains *i* and pull downward, and the ladders will swing on the trunnions, and when nearly down the men drop the chains and push the base between the frames *d* until the spring-bolts take into their locking-recesses in the frame-work. As the distance from the platform to the trunnions corresponds with that length of the ladder to its bottom plate, it fits exactly by its metal end *J* to the frame-platform. Simultaneously with both operations the two men on the gallery are working the crank and extending the ladders, while one or two men at the pole are swinging the truck into vertical range with the objective point, and another man is at the hand-wheel *x*, gaging by the gallows-frame the proper angle of elevation for working the ladders to the best advantage.

The ladders are suited for use in any degree of prolongation, so that they can be adjusted to any length within their maximum scope. When fully extended and depressed to the limit of their lowest angle of elevation that will support two men on the outer end, and the truck be then turned around on the rear wheels as a center, the end of the ladder will perform a circle of more than eighty feet diameter.

When the truck is fixed ready for work the ladders may be run out to an altitude of one hundred and twelve feet and slanted to any window of a building in forty seconds of time.

I do not claim generally an extension-lad-

der composed of several lengths of individual ladders susceptible of being extended by ropes or condensed into the length of one; nor do I claim generally a wheeled truck or carriage for the transportation of such a group of ladders; nor the use of a supporting-frame for erecting such ladders from such truck; nor broadly the employment of such truck as a base of rest and platform to support and to direct the ladders when extended; nor do I claim broadly a series of extension-ladders capable of being condensed by one ladder passing into another, and so on alternately until all are within and occupy the length of one; nor the use broadly of an elevating-frame on said truck for supporting the grouped ladders in transportation; nor do I claim generally the elevating and directing of combined ladders through the agency of an elevating framework and a hinged base-ladder combined with an elevating-screw and turn-table, as specific devices, for all those uses are well known; but

What I do claim, and desire to secure by Letters Patent, is—

1. In combination with a series of sectional double ladders, forming an extension-ladder, as described, the base-plate *J*, chains *e j*, and bolts and spring *t*, when constructed and operated substantially as set forth.

2. In combination with an extension-ladder, the oscillating carrying base and frame *d d'*, the ladder-plate *n'*, platform and gallery *k*, winch, drum, and pawl *p p' p² p³*, in combination with the actuating-ropes *n* and pulleys *s*, as described.

3. In combination with the oscillating supporting-frame of an extension-ladder, the sustaining-shaft *c*, rock-nut *y*, rocking pivot-step *z*, and operating-screw *w*, combined with the supporting-trunnions *f'*, all constructed, arranged, and actuated substantially in the manner and for the purpose set forth.

4. With an extension-ladder, the following elements in combination: the adjusting oscillating frame *d d'*, the ladder-trunnions *f'* and plate *n'*, and the extending ropes and pulleys *n s*, with the wheeled truck turn-table, when constructed and operated in the manner and for the purpose described.

5. In combination with the supporting and directing frame of an extension-ladder, the vertical supporting-post *d'* and trunnions *f'*, the vertical post or strut *h*, and cross-timber and spring lock-plate *h'*, when arranged in the manner and for the purpose substantially as set forth.

FRANK G. JOHNSON.

Witnesses:

JAMES H. HUNTER,

EDWARD O. HART.