No. 626,277. Patented June 6, 1899.

O. E. HEGSTAD.

EXTENSION LADDER AND TRUCK.

(Application filed Dec. 28, 1897.)

(No Model.) 7 Sheets—Sheet 1.



Fig. 1.

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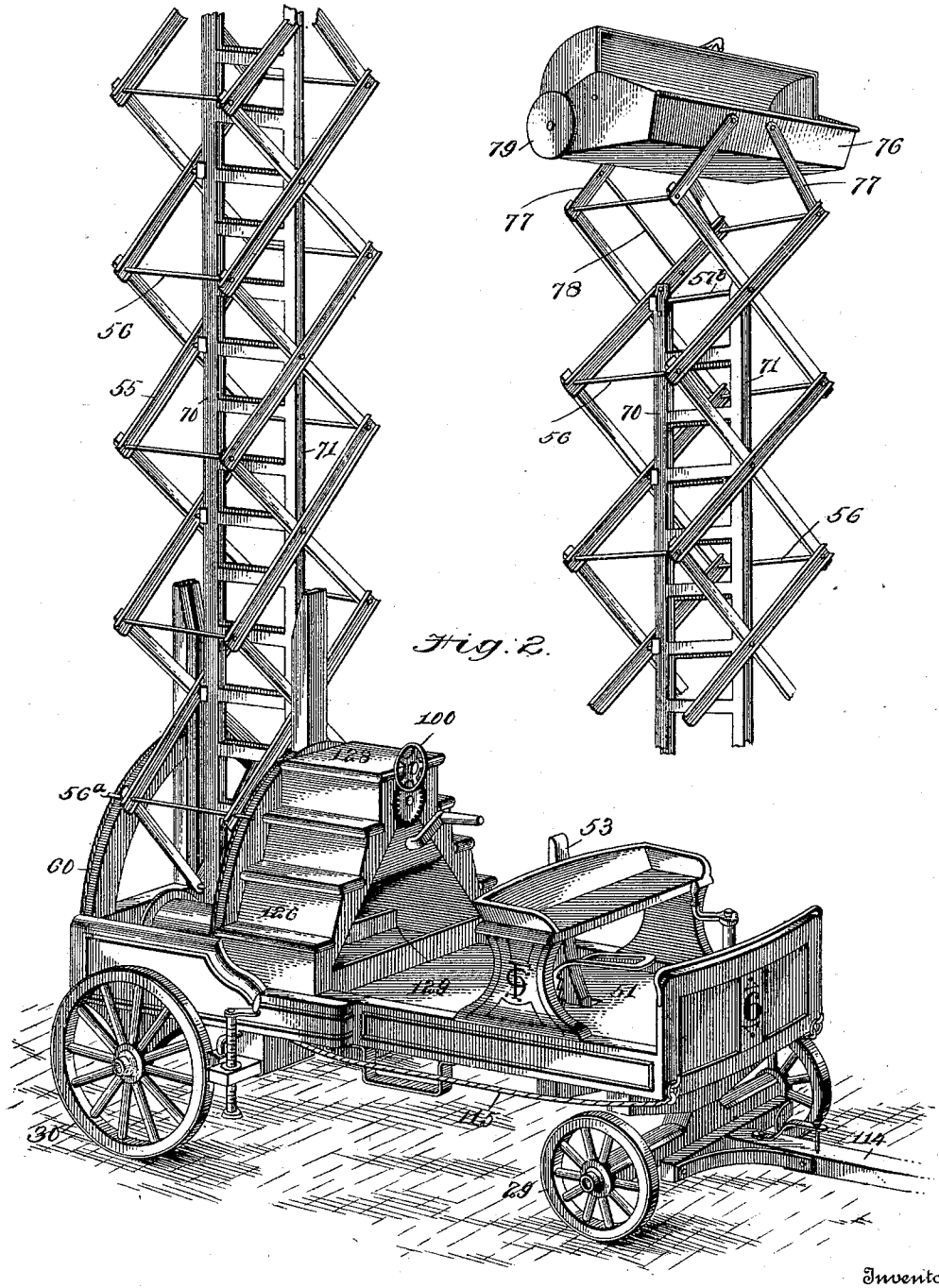
No. 626,277. Patented June 6, 1899.

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(No Model.) 7 Sheets—Sheet 2.



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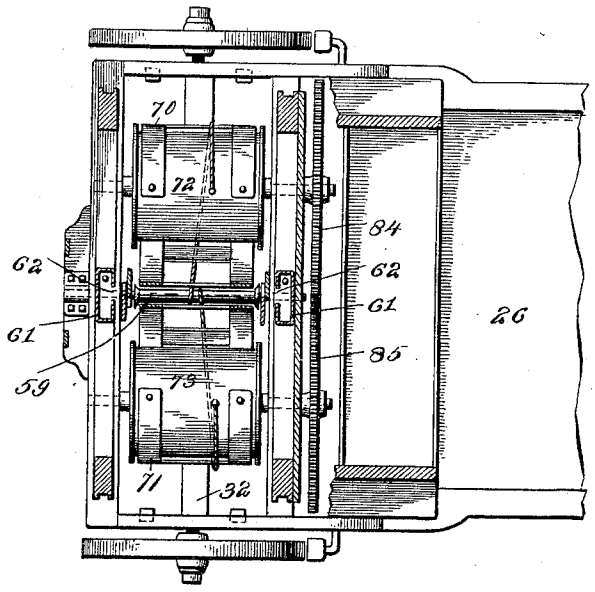
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EXTENSION LADDER AND TRUCK.

(Application filed Dec. 28, 1897.)

(No Model.) 7 Sheets—Sheet 3.

Fig. 4.



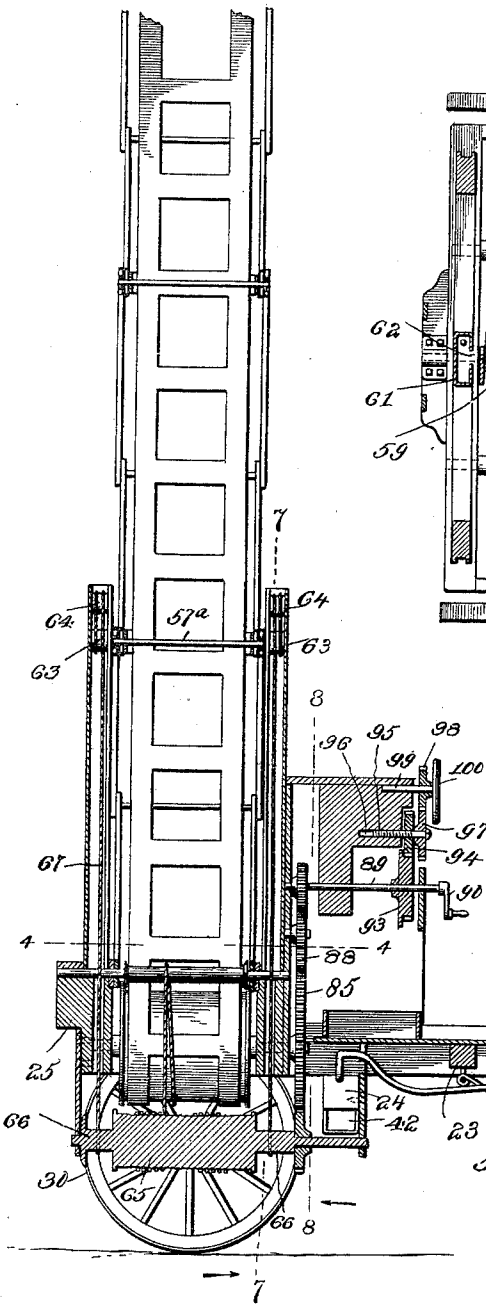
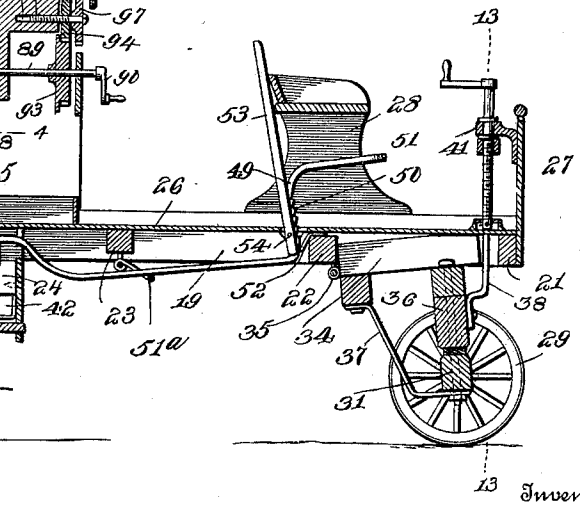


Fig. 3.



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EXTENSION LADDER AND TRUCK.

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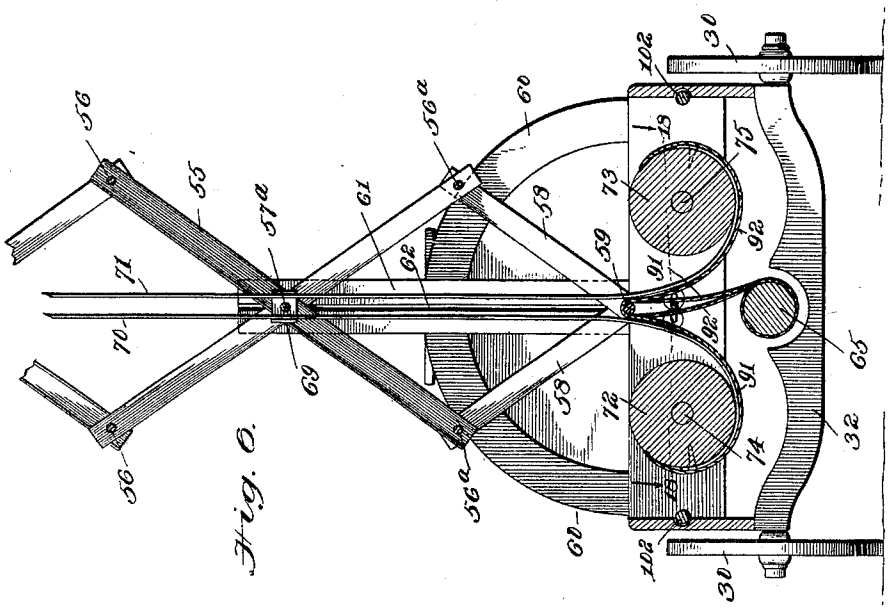


Fig. 6.

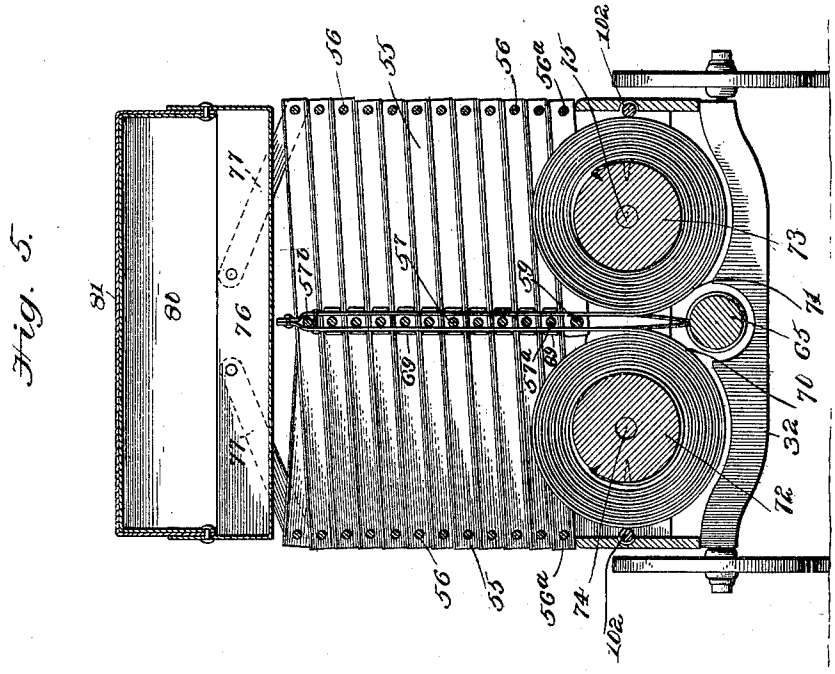


Fig. 5.

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EXTENSION LADDER AND TRUCK.

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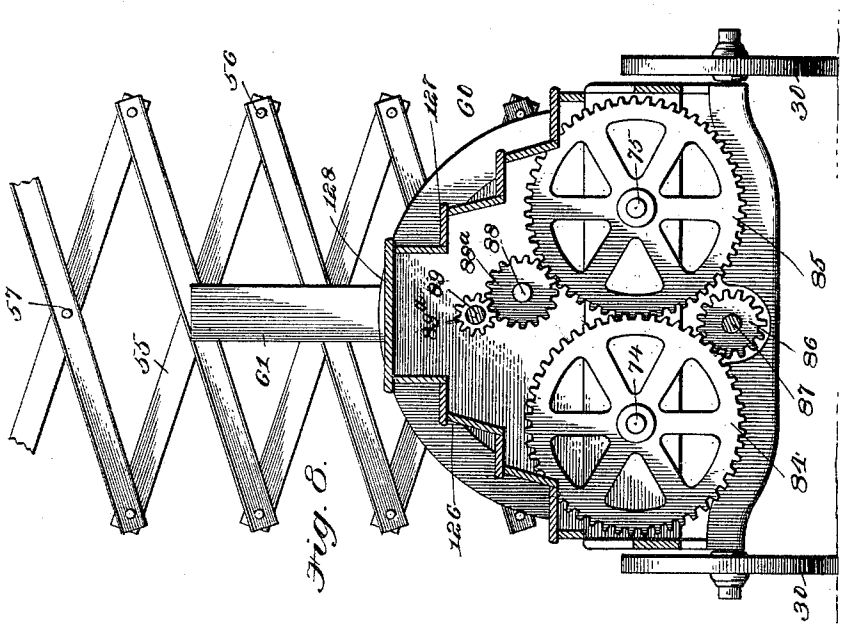


Fig. 6.

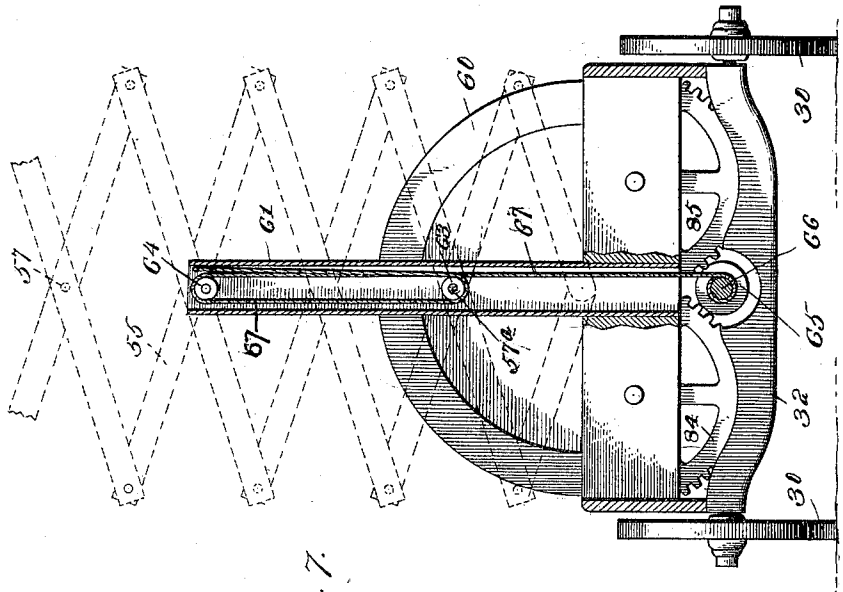


Fig. 7.

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EXTENSION LADDER AND TRUCK.

(Application filed Dec. 28, 1897.)

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Fig. 9

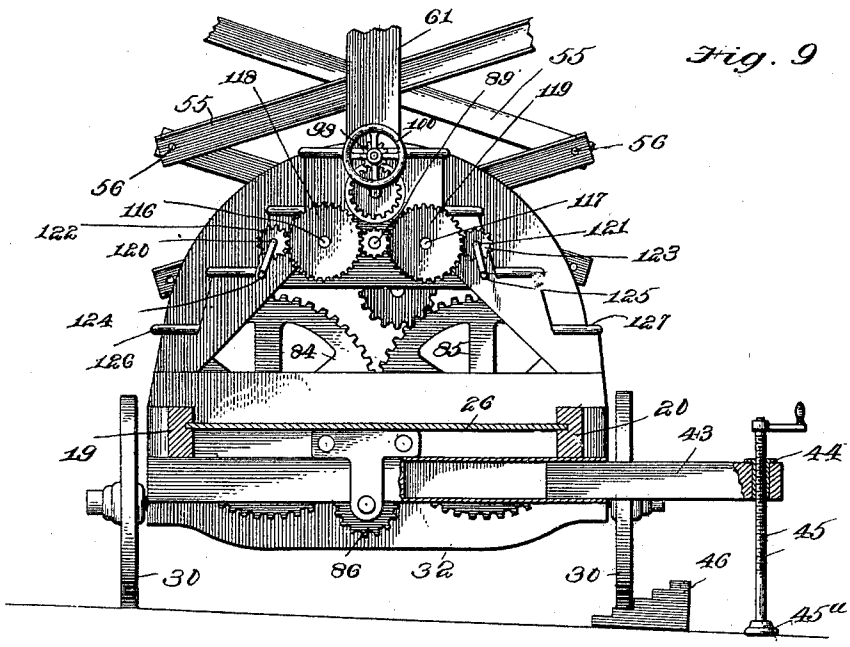


Fig. 10.

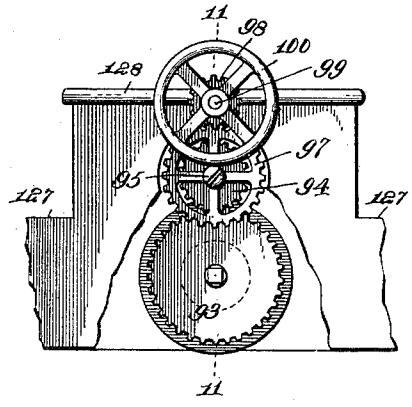


Fig. 11.

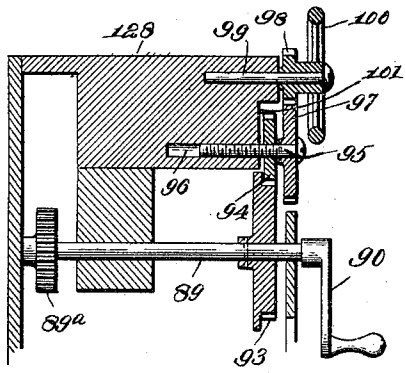
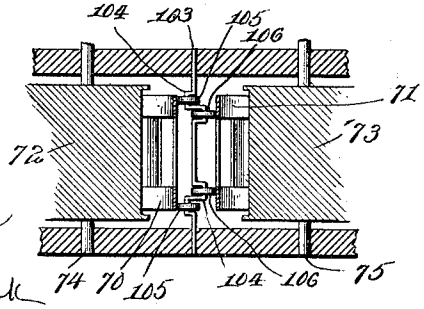


Fig. 12.



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No. 626,277. Patented June 6, 1899.

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EXTENSION LADDER AND TRUCK.

(Application filed Dec. 28, 1897.)

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Fig. 12.

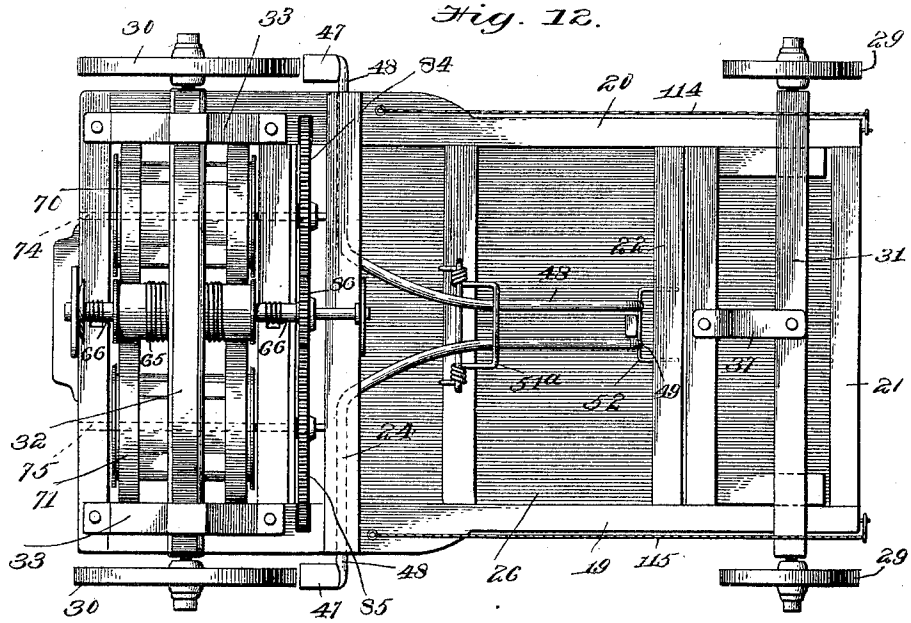


Fig. 13.

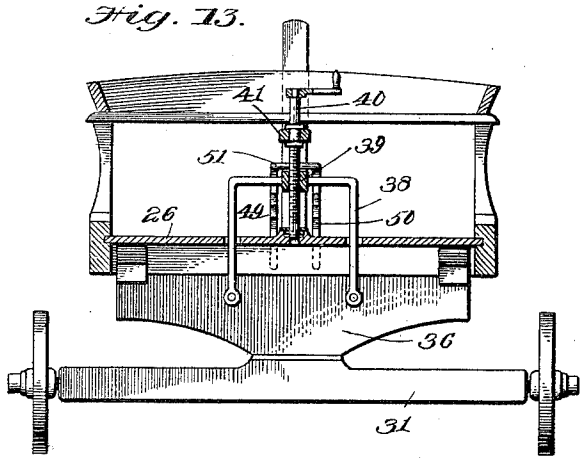


Fig. 14.

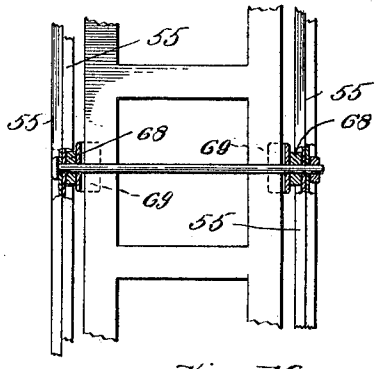


Fig. 16.

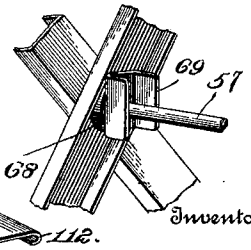


Fig. 15.

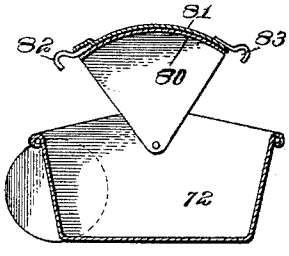
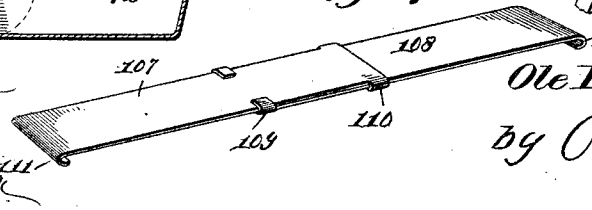


Fig. 17.



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UNITED STATES PATENT OFFICE.

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EXTENSION-LADDER AND TRUCK.

SPECIFICATION forming part of Letters Patent No. 626,277, dated June 6, 1899.

Application filed December 28, 1897. Serial No. 664,047. (No model.)

To all whom it may concern:

Be it known that I, OLE E. HEGSTAD, residing at Hegbert, in the county of Swift and State of Minnesota, have invented a new and useful Extension-Ladder and Truck, of which the following is a specification.

My invention is in the nature of an extension-ladder and fire-escape mounted upon a truck or wagon for transportation from place to place, in which I employ the well-known mechanical structure designated "lazy-tongs."

The general object of my invention is to provide an improved apparatus of this class for the use of fire-departments of towns and cities, such apparatus being capable of use as a ladder by means of which the firemen may reach the upper portion of a burning building, as an elevator, to be raised and lowered in rescuing persons from a burning building, or as a water-tower for supporting hose, thereby facilitating the operations of the firemen upon high buildings.

My invention consists in the improved construction, arrangement, and combination of parts hereinafter fully described and afterward specifically pointed out in the appended claims.

In order to enable others skilled in the art to which my invention most nearly appertains to make and use the same, I will now proceed to describe its construction and operation, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a perspective view illustrating my invention with the ladder lowered and all the parts in position for transportation from place to place. Fig. 2 is a perspective view of the same with the ladder raised, the upper portion being broken off and shown at the side. Fig. 3 is a central vertical longitudinal section of the parts as shown in Fig. 2, omitting the upper portion of the ladder and the bed or cradle. Fig. 4 is a horizontal sectional view on the broken line 4 4 of Fig. 3, looking downward and omitting the front portion of the wagon. Fig. 5 is a transverse vertical section, the parts being in the adjustment shown in Fig. 1. Fig. 6 is a sectional view on the same line, the parts being in the adjustment illustrated in Figs. 2 and 3. Fig. 7 is a transverse vertical sectional view on the broken line 7 7 of Fig. 3, looking toward the front of the wagon. Fig. 8 is a transverse vertical sectional view on the broken line 8 8 of Fig. 3, looking toward the rear of the wagon. Fig. 9 is a transverse vertical sectional view taken on a plane cutting through the wagon-body in front of the stairway, illustrating the manner of leveling up the wagon on laterally-sloping ground and showing a modification in the winding mechanism. Fig. 10 is a detail view illustrating the brake for the ladder-winding mechanism in front elevation. Fig. 11 is a vertical section through the parts illustrated in Fig. 10 on the line 11 11 of said figure. Fig. 12 is a bottom plan view of the complete machine. Fig. 13 is a transverse vertical section on the line 13 13 of Fig. 3. Fig. 14 is a fragmentary detail view illustrating a section of the ladder and one of the crossing joints of the lazy-tongs, parts being broken away. Fig. 15 is a detail sectional view transversely through the bed or cradle carried at the top of the ladder. Fig. 16 is a detail perspective view of one of the crossing joints of the lazy-tongs. Fig. 17 is a detail perspective view of the footboard to be used in connection with the cross-bars of the lazy-tongs. Fig. 18 is a detail sectional view on the broken line 18 18 of Fig. 6, looking downward.

Like numerals of reference mark the same parts wherever they occur in the various figures of the drawings.

As a preface to the description of the construction and operation of my invention I will state that although some of the parts appear upon the drawings to have been made of wood I will preferably make all the parts composing my invention of metal, so that they may be strong and fireproof.

The truck-body is provided with longitudinal beams 19 and 20 and transverse beams 21, 22, 23, 24, and 25. The forward part of this frame supports a floor 26, a dashboard 27, and a seat 28.

My improved extension-ladder and lazy-tongs device is erected at the rear end of the wagon, the arms of the lazy-tongs device extending crosswise, this location being selected to permit the ladder to be placed in close proximity to a building by simply backing

the truck up against it in order to avoid the necessity existing in most structures of this class for tilting the ladder laterally of the wagon in order to reach the building, which practice involves great danger of upsetting or throwing down the ladder.

I have mounted my truck upon front wheels 29 and rear wheels 30, the former being journaled on an axle 31 and the latter on an axle 32. The rear axle 32 is supported from the frame on brackets 33 (see Fig. 12) and the front axle is secured to a frame 34, pivoted at 35 to the cross-beam 22. A bolster 36 is interposed between the front axle 31 and the frame 34, the axle and frame being connected by a brace 37. The bolster 36 supports an angular bail or loop 38, which passes through the floor 26 and extends up parallel with and a short distance behind the dashboard, a nut 39 being secured to it, through which a screw 40 passes, said screw being swiveled in a bracket 41, secured to the dashboard 27. By rotating the screw the frame 34 may be moved on its pivot 35 away from or toward the floor 26 of the truck, this movement resulting in raising or lowering the front of the truck and tilting the ladder.

As before stated, my ladder is to be under no circumstances tilted sidewise, such movement being entirely unnecessary and dangerous. As a consequence it is desirable and necessary that when my ladder is in use my truck should stand level when considered laterally. Very often the ground in front of a house slopes laterally and when my truck is backed up to a building on such laterally-sloping ground it becomes necessary to level it up at or near the rear end. This I accomplish by the following means: Boxes or guideways 42 are secured under the transverse beam 24, in each of which is arranged to be adjusted laterally a beam 43, which projects in its normal or inactive position a slight distance beyond the end of the cross-beam, the projecting end being provided with a screw-threaded sleeve 44, through which is passed a jack-screw 45, provided with a swivel-base 45^a. In order to level up the wagon, the beam 43 on the low side is thrown outward as far as deemed necessary, when the jack-screw can be operated to raise that side of the wagon to a level with the other side, a block 46 being placed under the wheel when it has reached its proper height. This adjustment is clearly illustrated in Fig. 9.

The ladder having been adjusted as to inclination toward or from the house by means of the mechanism just described it becomes necessary to chock or brake the rear wheels. For this purpose I have provided the following mechanism:

47 are brake-shoes adapted to bear against the front of the rear wheels 30. These brake-shoes are connected to arms 48 of a metal rod or bar pivotally secured on the top of the beam 24 and bent forward near the center and upward at 49, the upward bends being formed into toothed racks 50 and passing through the floor 26 are again bent forward and joined at the front, forming a treadle 51, located below and just in advance of the seat in a position to be pressed upon by the foot of the driver when seated against the action of the spring 51^a. A spring-pawl 52 normally engages the teeth of the racks 50, and a lever 53, which extends upward immediately in the rear of the seat-back, is pivoted at 54 in a position to have its lower end beyond the pivot bear against the spring-pawl 52, whereby rearward pressure upon the upper end of the lever 53 will press the pawl 52 out of contact with the teeth of the racks 50, leaving the driver free to operate the brake without automatically locking it. When the driver presses his foot upon the treadle 51, the brake-shoes will be forced tightly against the rear wheels 30, and the spring-pawl will automatically engage the racks 50 and hold the brake-shoes locked in position. Pressure backward on the lever 53 will release the lock and allow the treadle 51 to rise, releasing the pressure of the brake-shoes on the wheels. On account of the location of the upper end of the brake at the back of the seat, the driver, sitting in his seat, may press his back against the lever to hold the pawl 52 out of contact with the teeth of the racks 50, leaving the brake mechanism free to be operated without locking and without the necessity of using his hands in any way.

When the rear wheels 30 are locked by the brake, as before described, they will form a firm base immediately under the extension-ladder, and all danger of the ladder slipping away from the house will be obviated.

My lazy-tongs are constructed in substantially the same manner as such devices usually are, the bars 55 being connected at their ends by cross-bars 56 and at their center crossings by cross-bars 57 in the well-known manner. At the bottom are provided two bars 58 of only half the length of the balance of the bars of the series, such bars 58 being mounted on the lower cross-bar 59, which is secured in the frame of the machine. The first pair of end cross-rods, which I have marked 56^a, connect these short bars 58 on each side of the device with the corresponding bars on the opposite side. These cross-rods 56^a are projected laterally to rest upon curved frames 60, such curved frames extending from the base of the machine upward and inward to the extent of about one-fourth of a circle each, their outer edges on the line of a true circle, with the cross-rod 59 as a center, whereby when the lazy-tongs are extended or folded the cross-rods 56^a will be supported by and ride upon the peripheries of said curved frames 60, thereby greatly strengthening and stiffening the whole structure. The curved frames 60 at their upper inner ends abut against a hollow metal post 61 on each side of the framework, said post having a longitudinal slot 62 in its inner face, through which the project-

ing end of the next junction cross-bar 57ª passes into the interior of the post, where it is provided with a roller 63. A similar roller 64 is journaled in each hollow post above the roller 63. Below the bed of the truck, between the rear wheels and transverse to the rear axle, is journaled a drum 65, the purpose of which will be explained later. Its two ends are reduced, forming smaller drums 66. A cable 67 is secured to each of these reduced drums and passed upward over the roller 64, down under the roller 63, up again over the roller 64, then down again under the roller 63, up again and secured inside of the hollow post. By the rotation of the drum 65 and smaller drum 66, which is effected by mechanism to be hereinafter described, the lower end of the cable 67 is wound about the smaller drum 66, which will cause the roller 63 to be raised nearer to the roller 64, thus carrying up the cross-bar 57ª with it and acting to extend the lazy-tongs upward.

The bars of my lazy-tongs are preferably made of metal with the edges turned, as shown, to stiffen them, and in crossing the bars the flat sides are brought together, by reason of which the turned edges of the inner cross-bars are projected inward, as clearly shown in the drawings and particularly shown in detail in Fig. 16. A washer 68 around each junction cross-rod 57, at the point of crossing of the bars 55 on each side, fills the space between the turned edges of the bars 55. Upon each cross-rod 57, at each end, is a guideway 69, consisting of a plate of metal bent U-shaped or having its edges turned in parallel to the cross-rod 57, a space being left between each turned edge and the cross-rod 57 to receive one of the two sections 70 and 71 of my improved spring-steel extensible ladder and serve as a guide therefor in raising and lowering it, one of said sections or ladders lying on one side of the series of cross-rods 57 and between them and the turned edges of the guideways 69, and the other on the opposite side of said series of cross-rods and between them and the opposite turned edges of the guideways 69.

The upper ends of the ladder-sections 70 and 71 are secured to the upper junction cross-bar 57ᵇ of the lazy-tongs, while their lower ends are secured, respectively, to two drums 72 and 73, mounted on shafts 74 and 75, journaled in the frame.

76 is a cradle or bed secured to the upper end of the lazy-tongs by means of links 77, pivotally connected to the cradle and to the outer ends of the top bars of the lazy-tongs. A brace 78 connects one of these links 77 with the bar of the lazy-tongs to which the opposite link 77, on the same side of the cradle, is attached, thereby preventing the tipping endwise of the cradle. At the rear corners of the cradle are provided rollers 79, which project in the rear of the cradle and bear against the walls of the building to hold the cradle clear of projections, such as window sills and frames. The cradle is provided with a pivoted cover in two sections 80 and 81, both curved and mounted on the same pivot and one adapted to slide within the other, the inner one being provided with a hook 82 to catch over the rear edge of the cradle and the outer one with a hook 83 to catch over the front edge of the same.

When it is desired to remove a person from the upper windows of a burning building, the ladder having been raised to the proper height the rear cover is opened and the person deposited in the cradle. The rear cover is then closed to protect the person from fire and the front cover closed for the same purpose, as well as to prevent the person from falling or otherwise getting out of the cradle while it is being lowered to the ground.

The shafts 74 and 75 of the drums 72 and 73 are extended frontward, and gear-wheels 84 and 85 are secured thereon, which mesh with each other, the gear-wheel 84 meshing with the pinion 86 on the inner end of the shaft 87, upon which the drums 65 and 66, hereinbefore described, are mounted. Another shaft 88 is mounted above the shafts 74 and 75 and carries a pinion 88ª, meshing with the gear-wheel 85, and a shaft 89, carrying a pinion 89ª, meshing with the pinion 88ª, has a crank-handle 90 attached at its front end, whereby it may be rotated and its motion communicated, through the gearing described, to the drums 65, 72, and 73. Wire cables 91 and 92 are secured to the drums 72 and 73 outside of the sections 70 and 71 of the ladder, and passing inward and upward are carried over the top of the bottom cross-bar 69 of the lazy-tongs and thence downward and secured to the drum 65.

When the wagon has been backed up to a building and leveled up and it is desired to raise the ladder in proximity to the building, the crank-handle 90 is turned, which rotates the shaft 89 and pinion 89ª, which being in mesh with the pinion 88ª and the pinion 88ª being in mesh with the wheel 85, in mesh with the wheel 84, and the wheel 84 in mesh with the pinion 86, its motion will be communicated to all these pinions and the drums 72, 73, and 65. The rotation of the drums 72 and 73 will cause the sections 70 and 71 of the ladder to be forced upward, their sides being confined or guided in the guideways 69, carrying with them the upper cross-bar 57ᵇ and causing the lazy-tongs to be extended. This extension of the lazy-tongs is facilitated by the raising mechanism connected to the junction cross-bar 57ª of the lazy-tongs, as hereinbefore described, the wire cables 67 being wound upon the smaller drums 66 at the same time the cables 91 and 92 are wound upon the larger drum 65. These cables, as before described, pass around the rollers 63 and 64 and serve to elevate the junction cross-rod 57ª at the same speed that the lazy-tongs are extended by the action of the cables 91 and 92.

From the foregoing description it will be seen that I have three coöperative means

working in unison to elevate the lazy-tongs, consisting of the sections 70 and 71 of the ladder, which are of sufficient stiffness to raise the lazy-tongs when the drums 72 and 73 are rotated, the cables 91 and 92, which while being wound upon the drum 65 will cause the rotation of the drums 72 and 73, and consequently assist or work in unison with the ladder-sections, and, finally, the means just described for elevating the junction cross-bar 57^a by means of the cables 67, wound upon the small drum 66, the result attained by these three coöperating mechanisms being to quickly and easily extend the lazy-tongs mechanism and with it to raise the double ladder, all strain in the raising operation being brought upon the junction cross-bar of the lazy-tongs, whereby the operation is rendered much easier and there is much less liability of straining or breaking the lower bars of the lazy-tongs, upon which the strain of raising the lazy-tongs has been put in all machines of this class of which I have any knowledge.

The lazy-tongs are guided and steadied in their upward movement by the contact of the projecting ends of the lower outer cross-bars 56^a with the curved frames 60, such curved frames forming a firm support for these cross-bars in whatever position they may be stopped in the raising operation, the projecting ends of the junction cross-bar 57^a working in the slots 62 in the inner sides of the side posts 61 also serving to steady and guide the structure in its vertical movement.

In order to hold the ladder extended in any position to which it has been raised, I have provided a brake mechanism, which comprises a gear-wheel 93, rigidly mounted on the shaft 89, and a gear-wheel 94, loosely mounted on a shaft 95, which is threaded into a socket 96 in the frame of the machine and carries a gear-wheel 97, rigidly secured to it, which meshes with a pinion 98 on the shaft 99, journaled in the frame and carrying at its outer end a hand-wheel 100. When the winding mechanism is being operated, as before described, the rotation of the gear-wheel 93 with the shaft 89 will cause the gear-wheel 94 to be rotated as an idler on the screw-shaft 95, said shaft 95 remaining stationary and the balance of the brake mechanism being idle. When the lazy-tongs and ladders have been raised to the desired position, the hand-wheel 100 is turned, which communicates motion to the shaft 99, pinion 98, gear-wheel 97, and screw-shaft 95, causing the latter to be turned into the socket 96 until the gear-wheel 94 is brought in contact with the face 101 of the framework and locked from further turning. This gear-wheel being locked becomes, in effect, a rigid portion of the machine and prevents the gear-wheel 93, with which it meshes, from turning, thus securely locking all the train of mechanism leading from the gear-wheel 93 to the lazy-tongs and ladders, as hereinbefore described, rigidly in the positions to which they have been moved. In order to lower the ladders, the brake must be released, which is done by simply turning the hand-wheel 100 in the opposite direction, and thus releasing the gear-wheel 94 from contact with the face 101 of the frame, which permits it to again become an idler to be turned by the rotation of the shaft 89 during the lowering operation. As the ladders are winding upon the drums 72 and 73 their tendency will be to spring outward, and for the purpose of preventing friction with the frame of the wagon friction-rollers 102 are journaled in position to bear against the portion of the ladder wound upon the drums 72 and 73 to prevent rubbing against the frame.

In Fig. 18 I have specially illustrated means whereby a rolling support will also be given to the inner sides of the ladder-sections while being wound upon and unwound from the drums 72 and 73. This mechanism consists of a shaft 103, mounted rigidly in the frame of the machine at about the mid-height of the drums and midway between them. The shaft is provided with a double-crank bend 104 near each end, and upon these double-crank bends are mounted loose rollers 105 to bear against the inside of the ladder-section 70 at each end, and 106 to bear against the inside of the ladder-section 71, the operation of which will be well understood without further description.

In Fig. 17 I have specially illustrated an extensible foot board or bridge, which may be placed on the cross-bars of the lazy-tongs at any desired height, said bridge consisting of two sections 107 and 108, telescoped together by bending their ends 109 and 110 over each other in opposite directions and having downwardly-turned outer ends 111 and 112 to engage over the cross-bars of the lazy-tongs to prevent displacement. 113 indicates a rope secured in any suitable manner to the tongue 114, and 115 indicates a similar rope secured to the body of the truck, said ropes being provided for use in case of the absence of horses to draw the truck or in situations where for any reason horses cannot be used.

In Fig. 9 I have illustrated a modification of the means for operating the winding mechanism. In this modification additional shafts 116 and 117 are mounted in the frame of the machine, carrying gear-wheels 118 and 119, located in horizontal alinement and in mesh with the pinion 89^a on the shaft 89. Outside of these shafts are two additional shafts 120 and 121, carrying pinions 122 and 123, meshing with the gear-wheels 118 and 119, the shafts 120 and 121 being provided on their outer ends with crank-handles 124 and 125, whereby they may be turned. By this arrangement both crank-handles may be operated by persons standing on the floor 26, the gearing being so arranged that both cranks will be turned in the same direction as the shaft 89.

The truck is constructed, as clearly shown, with steps 126 and 127, leading to a platform 128, the purpose of the steps and platform being to afford a convenient landing-place for persons brought down in the cradle, a tool-box 129 being provided under the steps and the steps and their framework serving as parts upon which to secure the bearings of the winding mechanism and its brake.

From the foregoing description of the construction and operation of my invention it will be obvious that I have provided an apparatus for the use of fire-departments which is simply and strongly constructed, readily and easily transported and operated, and which will not be liable to be easily broken or gotten out of order with ordinary usage. By reason of the position in which the lazy-tongs and ladders are mounted upon the truck these devices may be brought at once into close proximity to the building and the whole apparatus firmly fixed in position to retain the ladders upright, means being provided, as before described, for chocking the wheels and leveling up the wagon in a rapid and easy manner.

The whole machine will preferably be made of metal in order to make it fireproof and strong, and all adjustments may be made by persons standing upon the truck itself, whereby, besides adding weight to the truck as the base of the ladders, all tendency to sway the ladders by jolting the truck when operated from the ground will be obviated.

The front wheels are small and arranged to run under the wagon to allow of short turns in narrow spaces, so that the wagon can be readily backed up against the building in its own length.

It will be observed that the force used in extending the lazy-tongs is never applied to the lower bars thereof, as is the usual method. In this instance by winding the cables on drum 65 the ladders will uncoil from their drums and push upward on both sides of the junction cross-rods of the lazy-tongs and steadily lift the top of the lazy-tongs until fully extended, this lifting force being supplemented by the cables winding on the smaller drums and lifting the second junction cross-rod from the bottom. By this means of lifting the lazy-tongs the cross-bars can be made much lighter than when the push is from the bottom, as the strain in such cases is so great that it would require very heavy bars to withstand it. Throughout their upward motion the ladders are guided at their edges in guideways fixed upon the center cross-rods of the lazy-tongs, the edges of the ladders fitting snugly in these guides, so that the ladders cannot be bent edgewise and will tend to stiffen the lazy-tongs and hold it firmly erect at any height.

While I have illustrated and described what I consider to be efficient means for carrying out my invention, I do not wish to be understood as limiting myself to the exact construction and arrangement shown and described, but hold that such slight changes and variations as might suggest themselves to the ordinary mechanic would properly fall within the limit and scope of my invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with the truck, of a frame pivotally secured at its rear end to the under side thereof, the front axle carried by said frame near its forward end, and a screw connecting the body of the truck with the forward end of said frame, whereby the frame may be adjusted on its pivot to raise or lower the front end of the truck, substantially as described.

2. The combination with a lazy-tongs extension device, of two extension-ladders made of spring-steel, secured at their upper ends to the upper cross-bar of the lazy-tongs and extending downward on opposite sides of the central cross-bars, and a winding-drum for each ladder journaled in the frame below the lazy-tongs, substantially as described.

3. The combination of a lazy-tongs having its cross-arms of each side connected with those of the opposite side, at their crossings, by cross-bars, with U-shaped guides on each of said cross-bars, and flat winding ladders secured to the top of the lazy-tongs, passing down on opposite sides of the cross-bars and seated in said guides, substantially as described.

4. In an extension-ladder apparatus, a lazy-tongs device, a bed or cradle mounted upon the upper end thereof and provided with means for preserving a level position, and a cover consisting of two pivoted sections, to open at the back and front respectively, substantially as described.

5. In an extension-ladder apparatus, the combination with the frame of the truck, of the lazy-tongs mounted thereon, two hollow posts on the sides of the lazy-tongs, having vertical slots in their inner faces, the second junction cross-bar of the lazy-tongs extended into said slots, a pulley pivoted above the cross-bar in the hollow post, a pulley upon each extension of the cross-bar, a cable secured at the top of the post passed downward around the pulley on the cross-bar, upward around the pulley in the post, and then down again, and having its lower end secured to a winding-drum, substantially as described.

6. In an extension-ladder device, the combination with the lazy-tongs, of two drums below their support, and two spring-metal ladders, secured at their upper ends and adapted to be wound on drums at their lower ends, substantially as described.

7. In an extension-ladder device, the combination with the lazy-tongs, of two drums below the support of said tongs, and two spring-metal ladders, secured at their upper ends and adapted to be wound on said drums at their lower ends, a shaft journaled between the

drums and having two double-crank bends, and two rollers journaled on said bends at each end, to serve as friction-rollers to bear against the ladders in raising and lowering them, substantially as described.

8. The combination with a shaft of a gear-wheel thereon, a second shaft threaded into the frame of the apparatus adjacent to the shaft aforesaid, carrying a gear-wheel and an idler-pinion adjacent to the face of the frame, and a third shaft journaled in the frame, carrying a gear-wheel to engage the gear of the second shaft and a hand-wheel for turning it, substantially as described.

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