A. AUDET.

FIRE APPARATUS.

APPLICATION FILED APR. 4, 1914.

1,114,718.

Patented Oct. 27, 1914.

4 SHEETS—SHEET 1.

FIG. 1.

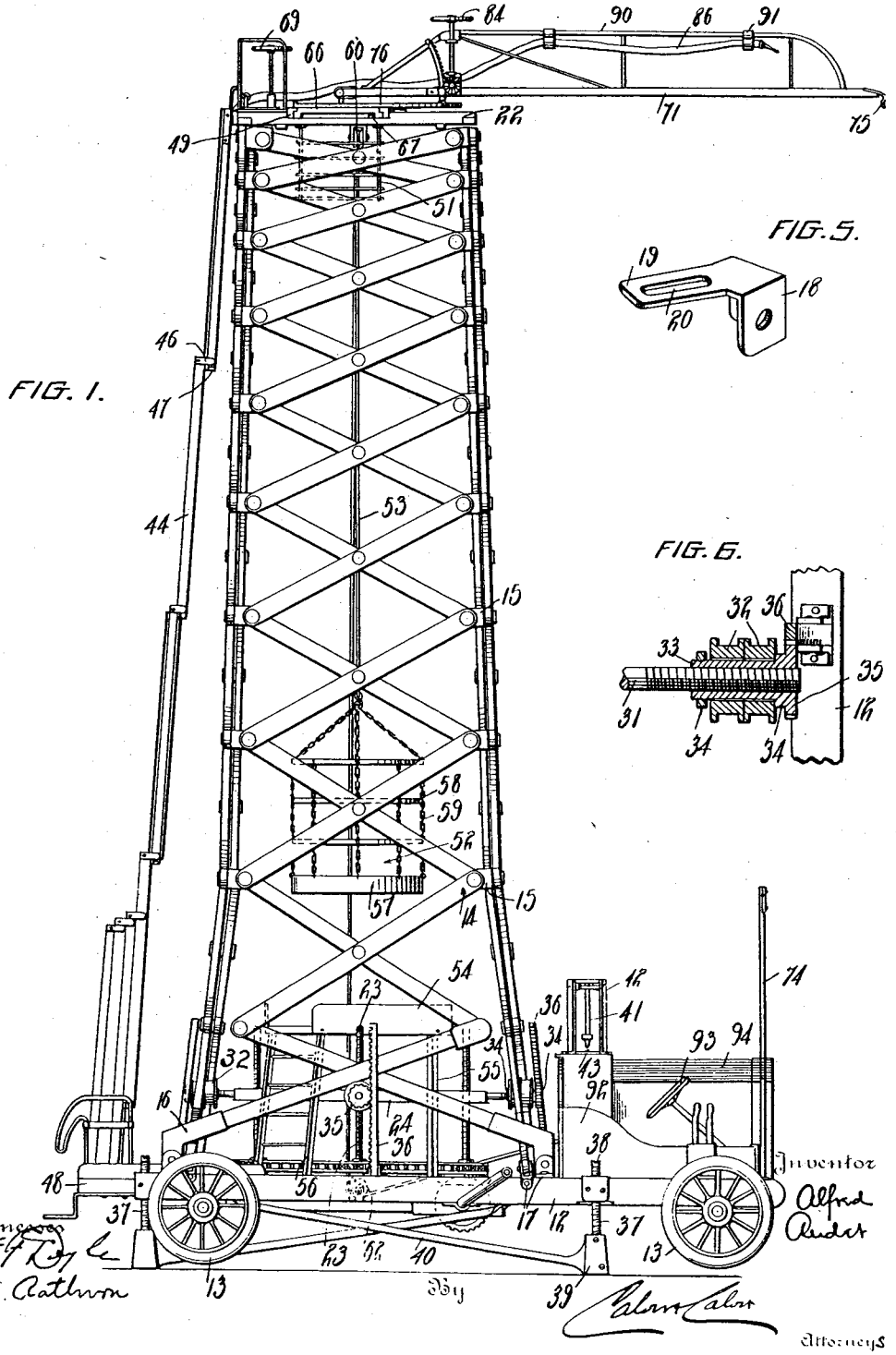


FIG. 5.

FIG. 6.

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4 SHEETS—SHEET 2.

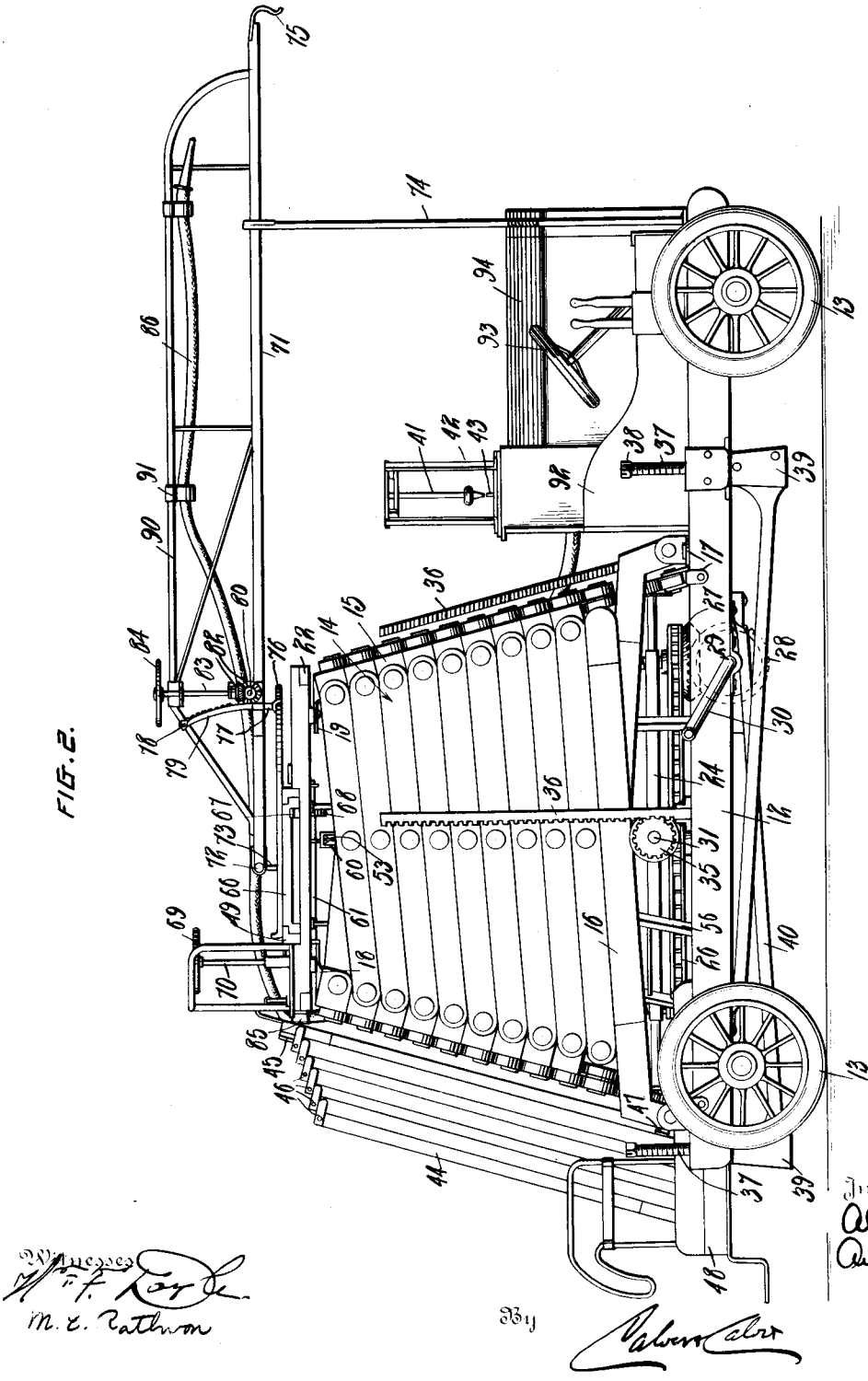


FIG. 2.

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4 SHEETS—SHEET 3.

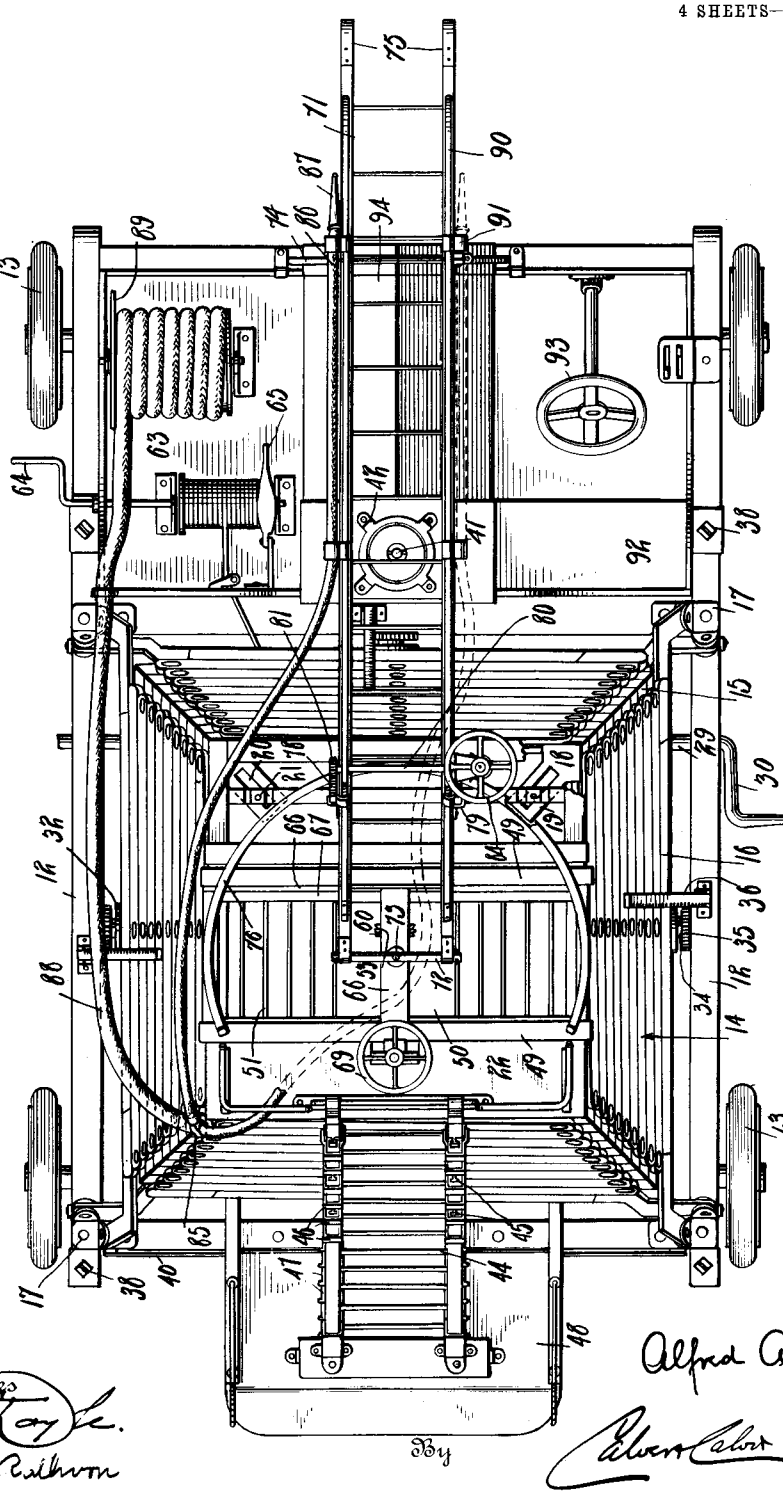


FIG. 3.

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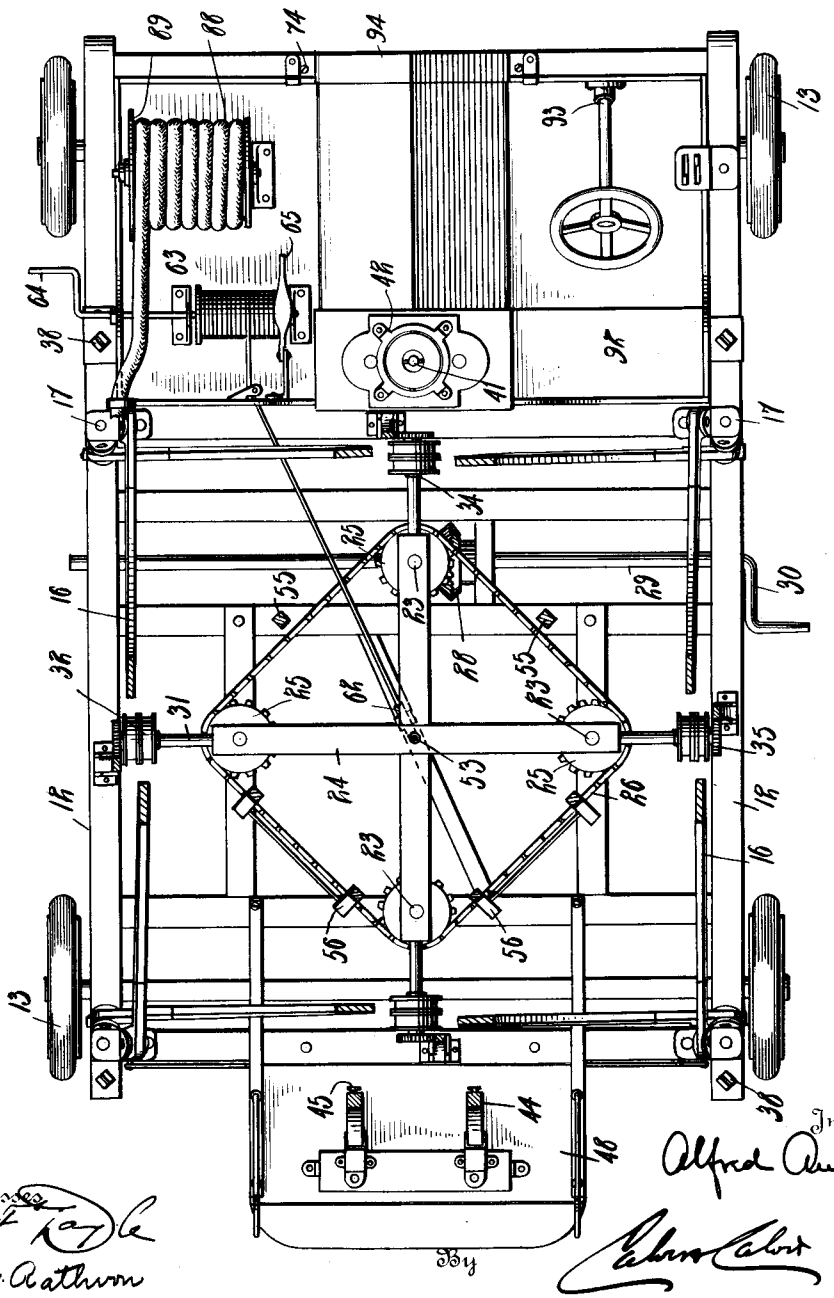
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4 SHEETS—SHEET 4.

FIG. 4.



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FIRE APPARATUS.

1,114,718. Specification of Letters Patent. Patented Oct. 27, 1914.

Application filed April 4, 1914. Serial No. 829,496.

To all whom it may concern:

Be it known that I, ALFRED AUDET, a citizen of the United States, residing at Salem, in the county of Essex and State of Massachusetts, have invented or discovered certain new and useful Improvements in Fire Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to fire apparatus of the type comprising a wheeled vehicle carrying a vertically extensible tower for use as a fire escape and also as a means whereby the firemen may obtain ready access to the fire in the upper stories of buildings for the purpose of extinguishing the same, and has for its general object to provide practical, efficient, and convenient apparatus of this character.

The more particular objects of the invention, together with means whereby the same may be carried into effect, will best be understood from the following description of one form or embodiment thereof illustrated in the accompanying drawings. It will be understood, however, that the particular construction described and shown has been chosen for illustrative purposes merely, and that the invention may be otherwise practised without departing from the spirit and scope thereof. It will also be seen that certain features of the invention, as defined by the claims hereunto appended, are not limited to apparatus of the particular type above referred to, but are of more general utility.

In said drawings: Figure 1 is a side elevation of the apparatus, showing the jacking and leveling devices in operative position and the tower partly raised or extended; Fig. 2 is a similar view showing the tower collapsed and the parts in position for transportation: Fig. 3 is a plan view; Fig. 4 is a horizontal section taken on a plane adjacent the base of the tower; Fig. 5 is a detail perspective view of one of the brackets connecting the lazy-tongs and upper platform; Fig. 6 is a detail sectional view of a portion of the elevating mechanism.

12 denotes the supporting or vehicle frame which is mounted on wheels 13 and is of a suitable form and size to furnish the necessary support or base for the tower as well as to accommodate the other essential and accessory parts hereinafter described. The vehicle upon which the apparatus is carried may be of any suitable character but as herein shown the frame 12 constitutes a part of the chassis of a motor vehicle which, except as hereinafter pointed out, may be of any usual or well known type, and the various parts of which will not require detailed description.

The vertically extensible tower comprises four sets of lazy-tongs, designated as a whole by the numeral 14, arranged in the form of a square, at the corners of which said lazy-tongs are connected by means of brackets or angle irons 15 to which the corresponding members of adjacent lazy-tongs are suitably pivoted.

16 denotes combined supporting and operating levers or arms pivoted at their upper ends to the lower ends of the lowermost members of the lazy-tongs and at their lower ends to brackets 17 bolted or otherwise secured to the frame 12. The levers 16 are arranged in intersecting pairs, one pair for each set of lazy-tongs, the levers of each pair being, however, disconnected from each other. The uppermost angle irons 18 to which the lazy-tongs members are pivoted, and one of which is shown in detail in Fig. 5, are formed with inwardly extending arms 19 arranged diagonally of the tower, as shown in Fig. 3. Said arms are formed with elongated slots 20 in which slide pins or bolts 21 projecting from the under side of an upper platform 22 adjacent the corners thereof. The arrangement of the slotted arms 19 and sliding pins 21 provides for the necessary inward and outward movement of the upper ends of the upper-most members of the lazy-tongs with respect to the platform in raising and lowering the tower.

For raising and lowering the tower the following mechanism is provided: 23 denotes vertically arranged threaded shafts or elevating screws, four in number, suitably journaled at their lower ends in the frame 12 and having threaded engagement with the arms of a cruciform elevating frame 24 (see Fig. 4). Fast upon the shafts 23 are sprocket wheels 25 connected by a sprocket chain 26, whereby rotation of any of the shafts 23 will be communicated to all of the others and said shafts rotated simultaneously and in the same direction. Fast upon one of the shafts 23 is a bevel gear 27 meshing with a bevel gear 28 fast upon a horizontal shaft 29 journaled in the frame 12. Ro-

tation of the shaft 29 is communicated, through the bevel gears 28 and 27, to the corresponding shaft or elevating screw 23, and through the chain 26 and sprockets 25 to the other elevating screws, which are all thus simultaneously rotated, thereby raising or lowering the frame 24. The shaft 29 may be operated in any suitable manner, as by providing driving connections of well known character between the same and the engine of the vehicle, but as herein shown is provided with a manually operated crank 30. The arms of the frame 24 are formed at their ends with cylindrical or shaft portions 31 upon which are journaled rollers 32 which engage the lower sides of the levers 16 of the several pairs intermediate their ends and adjacent their intersection, whereby, as the frame 24 is raised said levers will be swung upon their lower pivots, the upper ends thereof will move upwardly and inwardly, the lazy-tongs will be extended, and the tower will be elevated.

The several members of each set of lazy-tongs are of progressively decreasing length from the bottom to the top of the tower, thereby providing an upwardly tapering tower of great stability. As is usual in such structures the members of said lazy-tongs are pivoted to one another at or near their centers, so that as said tower is extended the outer ends of said members are drawn inwardly, thereby contracting said tower laterally in all directions, without, however, decreasing the area of the base thereof, which is determined by the fixed brackets 17 to which the lower ends of the levers 16 are pivoted to turn on axes slightly inclined to the horizontal, whereby the upper ends of said levers are permitted to move inwardly diagonally of the tower as the latter contracts. As the lazy-tongs are extended the points of engagement of the rollers 32 with the members 16 move gradually inwardly. To provide for this said rollers may be formed with guide flanges engaging the inner and outer faces of the members 16 and may be mounted for longitudinal sliding movement on the portions 31 of the arms of the elevating frame 24, whereby said rollers will be caused and permitted to follow the inward and outward movement of the portions of the levers 16 which they engage. Preferably, however, and as shown (see particularly Fig. 6), means are provided for positively moving said rollers on the shaft portions 31 the requisite amount, said means being as follows.

The rollers 32 are rotatably mounted on sleeves 33 and are held against longitudinal movement thereon by means of suitable flanges or collars 34. Any suitable form of antifriction bearings may, if desired, be interposed between the rollers 32 and sleeves 33. The sleeves 33 are formed with the interior screw threads coöperating with threaded ends of the shaft portions 31 and are provided at their ends with pinions 35 which mesh with upright and suitably inclined racks 36 secured to the frame 12. As the frame 24 is moved upwardly and downwardly engagement of the pinions 35 with the racks 36 causes rotation of the sleeves 33 on the shafts portion 31, thereby moving said sleeves inwardly and outwardly upon said shaft portions and carrying with them the rollers 32.

It is desirable that when the tower is raised a firm and level support therefor be provided. To this end means are herein shown whereby the frame 12 may be jacked or lifted and supported directly from the ground, or independently of the wheels 13, in a horizontal position, said means being as follows: 37 denotes jack screws having threaded engagement with the frame 12 adjacent the corners thereof. Any suitable means may be provided for turning said jack screws 37 but as herein shown said screws are formed with square and slotted heads 38 for the reception of suitable cranks or hand wheels. At their lower ends the jack screws 37 are connected by swivel joints with base members or supporting feet 39 each of which is connected by means of elongated braces 40 with the two adjacent corners of the frame. As will be seen, by properly operating the screws 37 the base members 39 may be raised or lowered, thereby jacking the apparatus or raising the wheels 13 from the ground. Moreover by properly regulating the extent to which each of said jack screws is operated it will be seen that the frame 12 may be brought to a horizontal position irrespective of the nature of the ground upon which the apparatus stands, so that the tower when extended will occupy a vertical and stable position. In order to assist in the leveling operation there is provided a leveling device in the nature of a plummet 41 suspended by a gimbal or other universal joint in a frame 42 suitably supported on the vehicle and preferably upon the engine hood 94, said plummet coöperating with a suitably fixed index point or pin 43.

44 denotes a ladder composed of a suitable number of relatively sliding sections secured to and guided upon one another. As herein shown one face of each section is formed with undercut ribs 45 (see Fig. 4) which slide in undercut grooves in the adjacent face of the contiguous section. Also each section is provided at its upper end with arms 46 which engage the lateral faces of the section immediately above and are also adapted to engage stops or lugs 47 projecting laterally from the lower ends of said last named section, thereby limiting the extension of the parts and preventing complete separation of the ladder sections. The up-

permost section of the ladder is suitably secured to the upper platform 22, while the lowermost section thereof is secured to a rear platform 48 of the vehicle. With this construction as the tower is extended the upper ladder section will be carried upwardly with the platform 22, sliding upon the section immediately below the same until the lugs 47 of said upper section engage the arms 46 of the lower section, whereupon said lower section will also be lifted. As the vertical extension of the tower continues the ladder 44 will be gradually extended, each ladder section as it reaches the limit of its movement with respect to the section below lifting said last-named section also, whereby a continuous ladder connecting the upper platform 22 and rear platform 48 is always provided irrespective of the degree of extension of the tower. The upper platform 22 is provided with a pair of lateral guides 49, for a purpose presently to be explained, and between said guides with an opening 50 from which lead short downwardly inclined ladders or steps 51.

52 denotes an elevator or cage suspended within the hollow interior of the tower by means of a rope or cable 53. The cage or elevator 52 when in its uppermost position communicates through the ladders or steps 51 and opening 50 with the upper side of the platform 22, and when in its lowermost position rests upon a platform 54 supported by uprights 55 from the vehicle frame 12 within the base of the tower, and from which platform lead suitably disposed ladders or steps 56. The elevator 52 comprises a base or floor 57 and a suitable number of rings or hoops 58 connected with one another and with the floor or platform 57 by chains 59 which, at their upper ends, are connected to one another and to the end of the hoisting rope or cable 53. The rope or cable 53 passes upwardly from the elevator 52, thence about a sheave 60 suspended from a shaft 61 suitably journaled at the lower side of the platform 22, thence downwardly through a substantially central opening in the elevator platform 57 and a substantially central opening in the elevating frame 24 (see Fig. 4), thence about a sheave 62 secured to the vehicle frame 12, and thence to a winding drum 63 suitably supported and journaled on the vehicle frame. By operating the winding drum 63 the elevator 52 may be raised and lowered between the steps or ladders 51 and the platform 54, being guided in its vertical movements upon the descending portion of the rope or cable 53, or that portion intermediate the sheaves 60 and 62, which portion passes through the platform 57. The winding drum 63 may be operated and controlled by any suitable means, as by suitable connections with the vehicle motor, but as herein shown the shaft of said drum is provided with a manually operated crank 64 for raising the elevator, while a brake 65 cooperating with said drum is provided for controlling the descent of said elevator.

66 denotes a frame mounted in the guides 49 to slide transversely of the platform 22, said frame being of suitably open construction to permit access to the steps or ladders 51.

67 denotes a rack carried by the frame 66 and meshing with a pinion 68 on the shaft 61.

69 denotes a hand wheel mounted on a vertical shaft 70 journaled in the platform 22 and connected by suitable bevel or other gearing with the shaft 61. By turning the hand wheel 69 the frame 66 may be moved laterally on the platform 22.

71 denotes a bridge hinged at its inner end for movement in vertical planes upon a bar 72 pivoted at its center for movement in a horizontal plane upon a post 73 carried by a transverse member of the frame 66. The bridge 71 is preferably supported, when the tower is collapsed and the apparatus in position for transportation, in a crotch or support 74 carried by the vehicle, preferably at the forward end of the engine hood 94. The bridge 71 is preferably provided at its outer end with suitable hooks 75 adapted to engage a window frame or other portion of a burning building for the purpose of securely connecting the bridge 71 therewith.

76 denotes a horizontally arranged segmental guide carried by the frame 66 and constructed on the arc of a circle concentric with the post 73. Slidably mounted on the guide 76 is a carriage comprising a base 77 and a pair of upright segmental guides 78 arranged on the arcs of circles having their centers in the axis of the hinge bar 72.

79 denotes segmental slides secured to the bridge 71 and engaging the guides 78, downward movement of said slides on said guides being limited by engagement of the lower ends of said slides with the base 77 of the carriage.

80 denotes a shaft suitably journaled in the bridge 71 and extending transversely thereof, said shaft being provided with pinions 81 which mesh with rack teeth formed on the guides 78. The shaft 80 is connected by bevel gears 82 with an upright shaft 83 suitably journaled in the bridge 71 and provided with a hand wheel 84 by which the same may be turned. By turning the hand wheel 84 the shaft 80 is rotated, thereby, through engagement of the pinions 81 with the racks on the guides 78, swinging the bridge 71 upwardly or downwardly about the axis of the hinge bar 72.

85 denotes a preferably forked coupling or union carried by the platform 22 from which lead one or more service hose lines 86 provided with suitable nozzles 87. Lead-

ing to the coupling or union 85 is a supply hose 88 adapted to be connected with a fire engine or other source of water supply. The hose 88, when not in use, is stored upon a suitable reel 89 carried by the vehicle frame. The bridge 71 is preferably provided with hand rails 90 upon which are mounted hose clamps 91 by which the service hose lines 86 may be clamped to said rails when desired. Preferably and as herein shown the driver's seat 92, steering wheel 93, and other controlling devices are arranged at one side of the engine hood 94 at the opposite side of which is arranged a platform upon which the winding drum 63 and hose reel 89 are located.

The operations of the various parts have been explained in connection with the foregoing description of their construction, but the use of the complete apparatus may be briefly reviewed as follows: The normal condition of the parts as is shown in Figs. 2 and 3 and when so disposed the vehicle may be driven to the point at which the fire occurs as an ordinary automobile. Having reached a suitable point adjacent the burning building or other structure the jack screws 37 are operated to lift the wheels 13 from the ground and cause the frame 12 to be firmly supported upon the feet or bases 39. The operation of the several jack screws should be such as to cause the frame 12 to be brought to a level position as indicated by the plummet 41 with respect to the index point 43. The shaft 29 is then rotated, thereby, through the gears 27 and 28, sprockets 25 and chains 26, rotating all of the elevating screws 23 and raising the frame 24. As the frame 24 is raised engagement of the rollers 32 with the levers 16 causes the lazy-tongs to be extended and the tower formed thereby to be raised until the platform 22 is brought to the desired level. As the tower is raised the ladder 44 is extended and the supply hose 88 drawn from the reel 89. After the tower has been elevated access to the platform 22 and descent therefrom may be had by means of either the ladder 44 or elevator 52. When the platform 22 has been brought to the level of the window or other portion of the burning structure at which the fire is to be attacked, or from which occupants of the building are to be taken, the bridge 71 is swung by hand about the pivot 73 and on the guide 76 into a position transverse to the apparatus, so as to extend toward the structure beside which said apparatus is located. Thereafter by manipulating the hand wheels 69 and 84 the end of said bridge may be moved toward said structure and raised or lowered to cause the hook 75 to engage some suitable portion thereof, thereby providing a secure and ready means of access to or escape from said structure. Meantime the hose 88 will have been connected with the fire engine or other source of water supply under pressure, thereby enabling the firemen on the platform 22 or bridge 71 to direct a stream or streams of water from the nozzle or nozzles 87 at close range upon the fire. By reason of the clamps 91 the service lines 86 may be clamped to the hand rails 90 either when the apparatus is not in use or for the purpose of causing said lines to deliver continuous streams of water upon the fire without attention on the part of the firemen.

Having thus described my invention what I claim is:

1. In an apparatus of the character described, in combination, a frame, a hollow extensible tower composed of a plurality of sets of lazy-tongs, the corresponding members of the lazy-tongs of adjacent sets being pivotally connected at the corners of said tower, and means for supporting said tower from said frame connected to the corners of said tower and to said frame at fixed points.

2. In an apparatus of the character described, in combination, a vertically extensible tower laterally contracting in all directions, and supporting means for said tower having a base of fixed area and connected at its upper end to said tower for contraction therewith.

3. In an apparatus of the character described, in combination, a frame, a hollow vertically extensible and laterally contracting tower composed of a plurality of sets of lazy-tongs, the corresponding members of the lazy-tongs of adjacent sets being pivotally connected at the corners of said tower, and combined supporting and operating members for said lazy-tongs connected with the corners of said tower and with said frame at fixed points to provide a base of fixed area for said tower.

4. In an apparatus of the character described, in combination, a frame, a hollow extensible tower composed of a plurality of sets of lazy-tongs, the corresponding members of the lazy-tongs of adjacent sets being pivotally connected at the corners of said tower, and combined supporting and operating members connected at their upper ends to said lazy-tongs and pivoted at their lower ends to fixed points on said frame, the axes of the pivots being inclined to the horizontal.

5. In an apparatus of the character described, in combination, a frame, a set of vertically arranged lazy-tongs, and a pair of intersecting operating levers for said lazy-tongs, said levers being pivoted to the lowermost members of said lazy-tongs and at their lower ends at fixed points on said frame.

6. In an apparatus of the character described, in combination, a frame, a hollow extensible tower composed of a plurality of sets of lazy-tongs, the corresponding mem-

bers of the lazy-tongs of adjacent sets being pivotally connected at the corners of said tower, and a pair of operating levers for each of said sets of lazy-tongs, said levers being pivoted to the lowermost members of said lazy-tongs at the corners of said tower and at fixed points on said frame.

7. In an apparatus of the character described, in combination, a frame, a set of vertically arranged lazy-tongs, and a pair of intersecting operating levers for said lazy-tongs, said levers being pivoted to the lowermost members of said lazy-tongs and at fixed points on said frame and being disconnected from one another.

8. In an apparatus of the character described, in combination, a frame, a set of vertically arranged lazy-tongs, a pair of intersecting operating levers for said lazy-tongs, said levers being pivoted at their upper ends to the lowermost members of said lazy-tongs and at their lower ends at fixed points on said frame and being disconnected from one another, and means engaging said levers adjacent their intersection for swinging the same about their fixed pivots.

9. In an apparatus of the character described, in combination, a supporting frame, a set of vertically arranged lazy-tongs, a pair of operating levers for said lazy-tongs, said levers being pivoted at their upper ends to the lowermost members of said lazy-tongs and at their lower ends at fixed points on said frame, an elevating frame, rollers carried by said elevating frame and engaging intermediate portions of said levers, and an elevating screw journaled in said supporting frame and having threaded engagement with said elevating frame.

10. In an apparatus of the character described, in combination, a vertically extensible tower and elevating means for said tower including a plurality of operating members, a frame having a plurality of arms engaging said operating members respectively, and a plurality of elevating screws having threaded engagement with said arms respectively.

11. In an apparatus of the character described, in combination, a supporting frame, a hollow vertically extensible tower composed of a plurality of sets of lazy-tongs, the corresponding members of the lazy-tongs of adjacent sets being pivotally connected at the corners of said tower, a pair of operating levers for each of said sets of lazy-tongs, said levers being pivoted at their upper ends to the lowermost members of said lazy-tongs and at their lower ends at fixed points on said supporting frame, an elevating frame having a plurality of arms provided with means engaging intermediate portions of the levers of the several sets for swinging the same about their fixed pivots, and a plurality of elevating screws journaled in said supporting frame and having threaded engagement with the arms of said elevating frame respectively.

12. In an apparatus of the character described, in combination, a vertically extensible and laterally contracting tower, operating members for said tower, a frame having a plurality of arms, a plurality of elevating screws having threaded engagement with said arms respectively, rollers on said arms engaging said operating members, and means for automatically moving said rollers longitudinally on said arms as said frame is elevated.

13. In an apparatus of the character described, in combination, a supporting frame, a hollow extensible tower composed of a plurality of sets of lazy-tongs, the corresponding members of the lazy-tongs of adjacent sets being pivotally connected at the corners of said tower, a pair of combined supporting and operating levers for each of said sets of lazy-tongs, said levers being pivoted at their upper ends to the lowermost members of said lazy-tongs and at their lower ends at fixed points on said frame, an elevating frame having a plurality of arms, a plurality of elevating screws journaled in said supporting frame and having threaded engagement with the arms of said elevating frame respectively, rollers on said arms engaging intermediate portions of said levers, and means for automatically moving said rollers longitudinally on said arms as said elevating frame is raised.

14. In an apparatus of the character described, in combination, a vertically extensible tower and elevating means for said tower including a frame having a plurality of arms, a plurality of elevating screws having threaded engagement with said arms respectively, sleeves having threaded engagement with said arms, rollers on said sleeves, pinions carried by said sleeves, and stationary racks coöperating with said pinions.

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

ALFRED AUDET.

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