No. 855,771. PATENTED JUNE 4, 1907.

T. HAINES.

TRUCK LADDER.

APPLICATION FILED APR. 5, 1906.

4 SHEETS—SHEET 1.

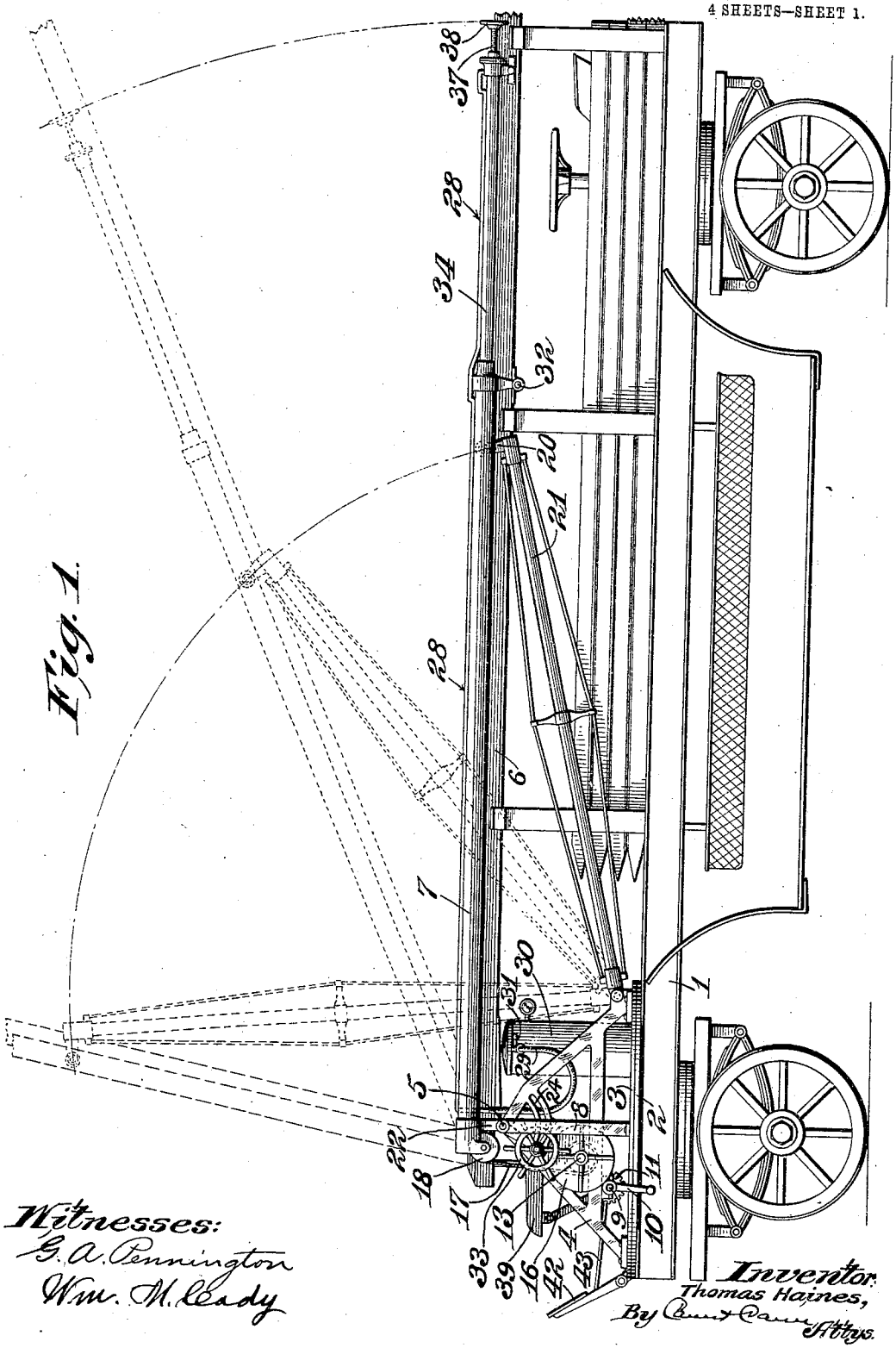


Fig. 1.

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4 SHEETS—SHEET 2.

Fig. 2.

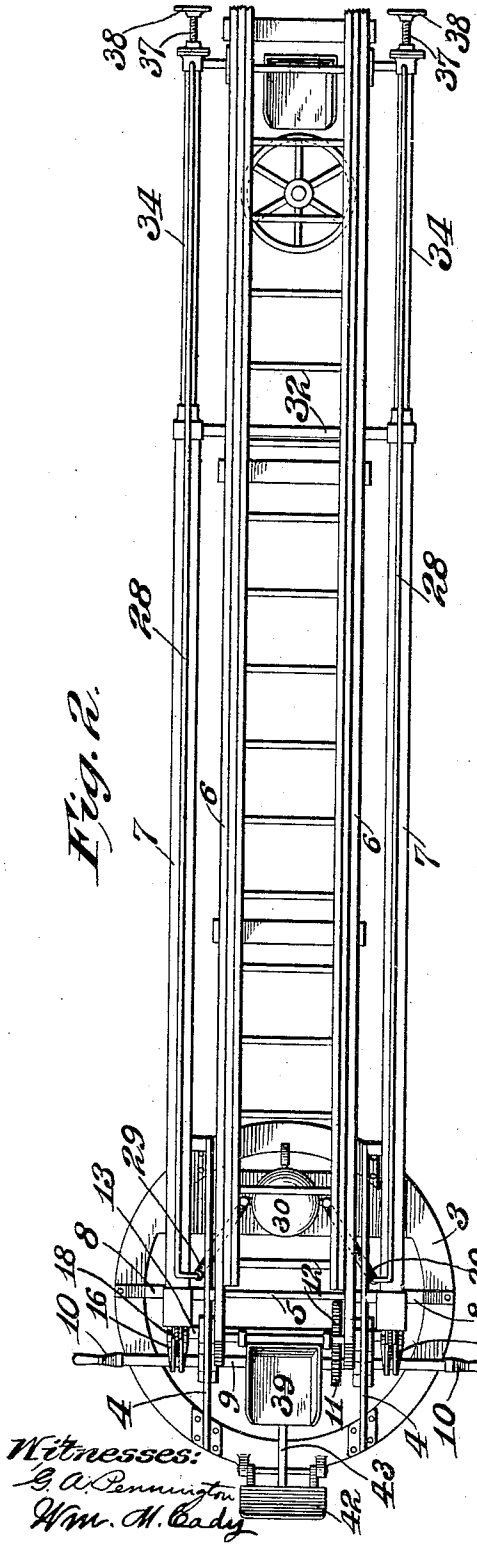


Fig. 3.

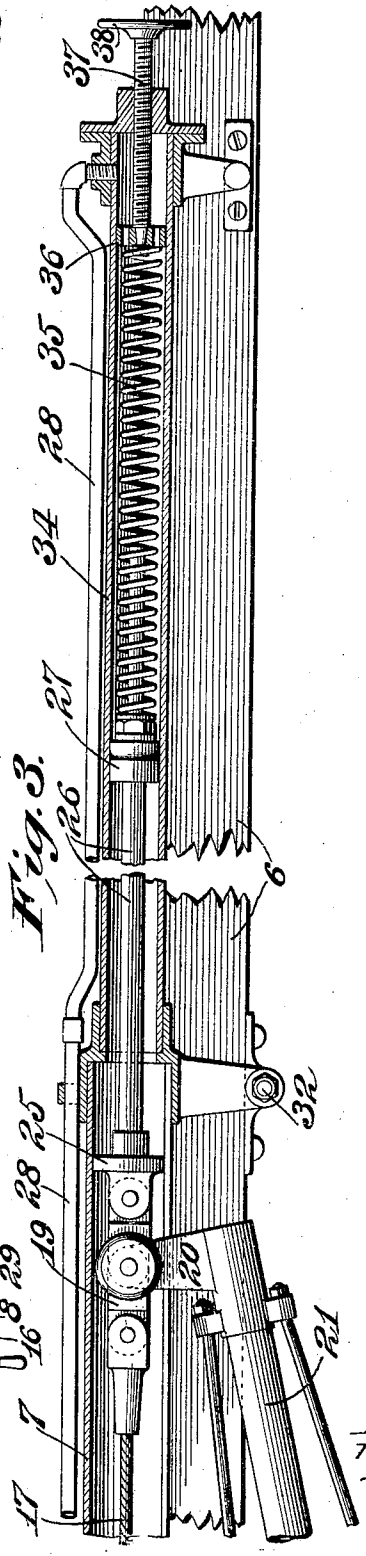
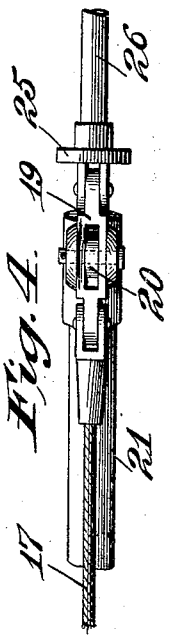


Fig. 4.



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4 SHEETS—SHEET 3.

Fig. 5.

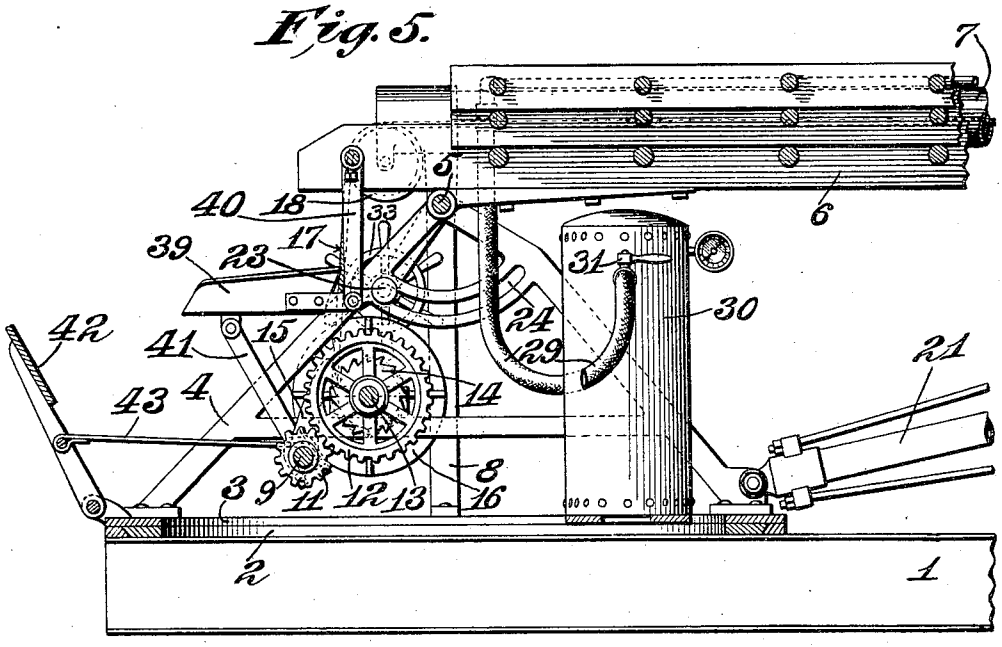
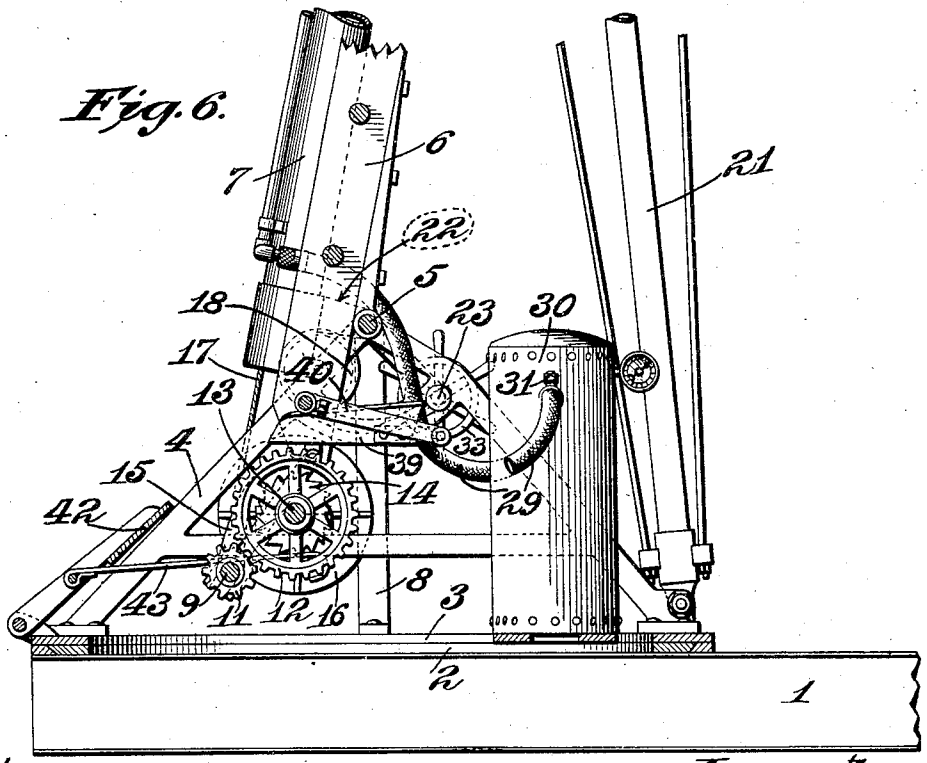


Fig. 6.



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4 SHEETS—SHEET 4.

Fig. 7.

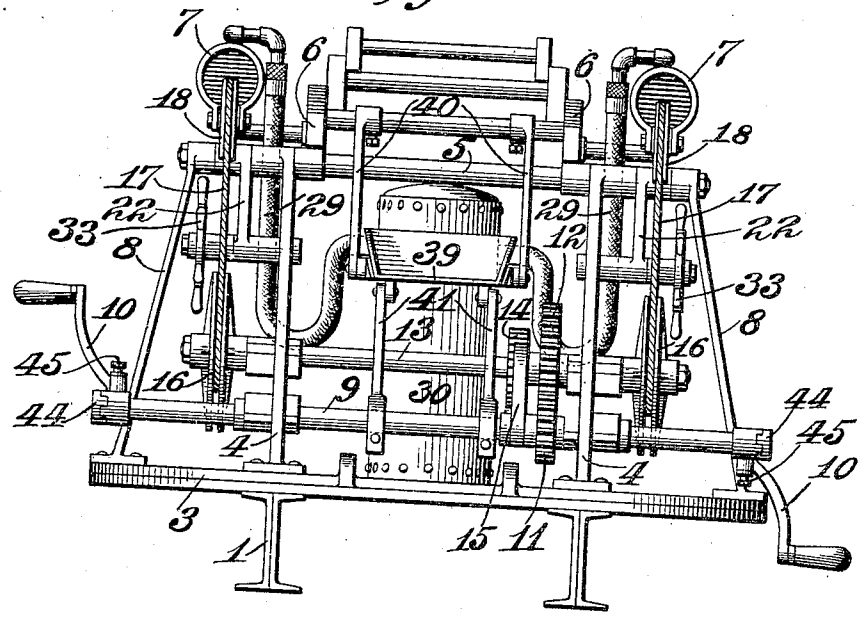


Fig. 8.

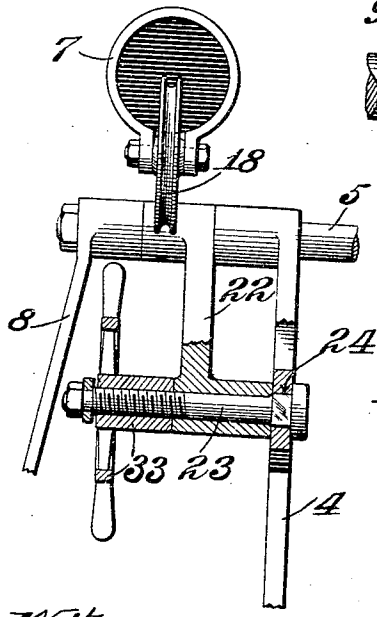


Fig. 10.

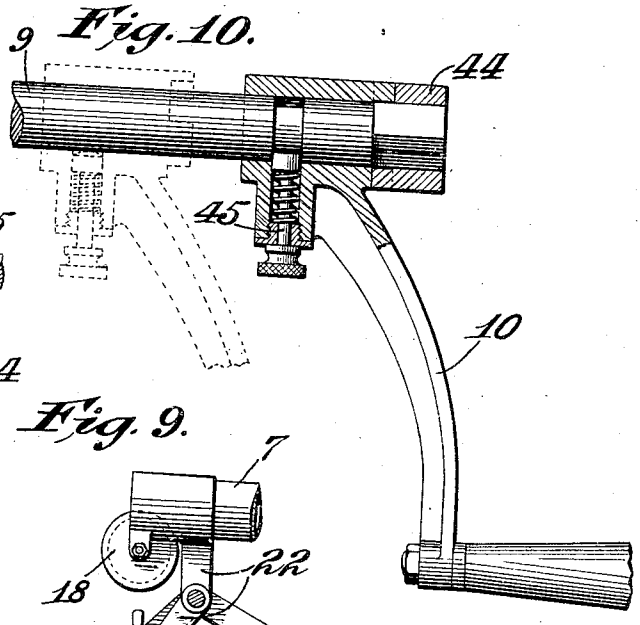


Fig. 9.

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UNITED STATES PATENT OFFICE.

THOMAS HAINES, OF ST. LOUIS, MISSOURI.

TRUCK-LADDER.

No. 855,771. Specification of Letters Patent. Patented June 4, 1907.

Application filed April 5, 1906. Serial No. 309,979.

To all whom it may concern:

Be it known that I, THOMAS HAINES, a citizen of the United States, and a resident of the city of St. Louis and State of Missouri, have invented a new and useful Improvement in Truck-Ladders, of which the following is a specification.

My invention relates to truck ladders, and especially to truck ladders for fire department service; and it has for its principal objects to facilitate the raising and lowering of the ladder; to hold said ladder in its elevated position; and other objects hereinafter more fully appearing.

My invention consists in the parts and in the arrangements and combinations of parts hereinafter described and claimed.

In the accompanying drawings, which form part of this specification, and wherein like symbols refer to like parts wherever they occur, Figure 1 is a side elevation of the truck ladder; Fig. 2 is a plan view thereof; Fig. 3 is an enlarged sectional view of a portion of the elevating mechanism; Fig. 4 is a plan detail view of the hoisting cable and piston connection; Fig. 5 is a vertical section of the forward part of the truck on line 5—5 of Fig. 2 with the ladder in its normally lowered position; Fig. 6 is a vertical section of the forward part of the truck on line 5—5 of Fig. 2 with the ladder in its elevated position; Fig. 7 is a front end elevation of the truck ladder; Fig. 8 is an enlarged detail view showing the ladder holding mechanism in elevation; Fig. 9 is a detail view showing a portion of the ladder holding mechanism in side elevation; Fig. 10 is a detail view of one of the operating cranks.

Upon the forward part of a wheeled truck 1 is mounted a base plate 2 on which is pivotally mounted a turntable 3. Two upright frames 4 are secured on the turntable and constitute supports for a horizontal axle 5 upon which are pivotally mounted a main section 6 of the ladder and the two main lifting booms 7 therefor. Said axle is further supported at its ends by means of braces 8.

Mounted in suitable journal bearings provided therefor on the upright frames is a main winding shaft 9, which is equipped at its ends with hand levers or cranks 10 for actuating. Upon the main shaft, is a pinion 11 which meshes with a gear 12 upon a shaft 13 which is journaled in bearings provided therefor on the upright frames 4. The shaft 13 has a ratchet wheel 14 fixed thereon in position for a pawl 15 loosely mounted on the main shaft to engage with. Said shaft 13 is also provided at each end with winding drums or sheaves 16. These winding drums have cables 17 fastened to their hubs, and the groove or space between the end shoulders of each drum is approximately equal to the diameter of the cable. In consequence of this arrangement, the effective diameter of the drum increases with each turn thereof for the purpose hereinafter stated. The cables respectively pass over pulleys 18 that are journaled in downwardly extending arms mounted on the main lifting booms forward of their axle; and thence said cables extend, respectively, through said lifting booms 7, which are tubular, and are secured at their other ends to links 19 mounted in said booms, respectively. In order to provide for the mounting of said links 19 each of the main lifting booms is slotted lengthwise, and through each slot extends the arm 20 upon which the link is pivotally mounted.

The arms are respectively mounted on the ends of secondary lifting booms 21 whose forward ends are pivotally connected to the upright frames, respectively, on the turntable. In order to secure the greatest leverage action, the point of connection of the secondary lifting booms to the turn table should be distant as far as practicable from the point at which the main lifting booms are pivoted thereon. For this reason, the main lifting booms are pivoted at the upper portion of the upright frame and the secondary booms are pivoted at the bottom of said frame.

In order to give stability to the ladder when in its elevated position, the axle upon which it is mounted is preferably arranged above the center of the turntable, the booms being connected to the rearmost portion of the upright frames.

In order to gain leverage, the main lifting booms have downwardly projecting arms 22 which constitute their connection to the main axle: And the front ends of said booms extend forwardly of the main axle. The winding drums are so located that in the initial lowered position of the ladder, the line of pull will make a high angle to the line extending through the main axle and the axis of the pulley 18, and so that such angle will increase to a right angle in the early stage of lifting said ladder.

In order to secure the ladder at such eleva-

tion as may be desired, the downturned arms by which the booms are mounted on the axle are extended downwardly past the axle and are provided with perforated hubs. Through each of these hubs extends a bolt 23 headed at one end and screw-threaded at the other end. The portion near the head of the bolt is flattened and fits in a slot 24 provided therefor in the upright frame, said slot being a circular arc having the axle for a center. Upon the projecting screw-threaded end of the bolt is a large handwheel 33 screw-threaded to engage therewith. When it is desired to fasten the ladder at any position, the hand wheel is screwed home to firmly clamp the downturned arm to the frame. When it is desired to change the adjustment of the ladder, the hand wheel is unscrewed.

Each of the links 19 is secured to a sliding member 25 arranged inside of the tubular boom and mounted on the end of a piston rod 26. The piston head 27 works in an elongated cylinder 34 mounted on and in alinement with the tubular boom. This elongated cylinder has an air-admission port near its rearmost or outermost end, and into this port leads a pressure pipe 28 which is arranged alongside of the boom and at its forward end communicates by means of a flexible hose 29 with an air storage tank 30 located on the turntable. Communication from the air tank to the cylinder is controlled by means of a turncock 31, or other suitable valve.

One or more cross-pieces 32 are mounted on and connect together the rear ends of the main lifting booms and brackets are mounted on and secure the ends of the cylindrical extensions of said main booms to the main section of the ladder. The cross-pieces constitute a cradle upon which rests the main section of the ladder.

The operation of the construction thus far described is as follows: Normally the parts are in the lowered position, as shown in full lines in Fig. 1. In order to raise the ladder by air pressure the turncock 31 is opened, whereupon air from the pressure tank passes through the pipe 28 and enters the outer or rear end of the cylinders. The pressure of the air thus admitted into the cylinders is transmitted through their respective pistons and piston rods to the links which are pivotally secured to the secondary booms, and the pressure thus exerted swings said secondary booms upwardly and with them the ladder which is thus raised to the desired position. In order to raise the ladder by manual power, the operator exerts his force upon the hand-crank, and this force is transmitted through the pinion on the crank shaft and through the gear which meshes therewith to the shaft of the winding drums, and thence through the cables thereon to the said links 19. In the initial position of the parts, the effective radius of the winding drum is small in comparison with the gear wheel on the drum shaft, in consequence of which the maximum power is applied at the beginning of the operation. As the lifting movement progresses, the effective radius of the drum is increased by the thickness of the cable, so that the velocity of the lifting movement progressively increases with a corresponding decrease, however, of the force applied to the link 19. In the initial position of the parts, the cables exert a leverage action tending to lift the main boom. This leverage action is due to the arrangement of the pulleys forward of the main axle; and by reason of the fact that such pulleys are located above the main axle, the leverage continues through a considerable angular movement of the lifting operation. During the elevation of the main booms, the clamping bolt travels along in the circular arc provided therefor on the upright frames; and when the booms have arrived at the desired postion, the hand wheels 33 are turned to firmly clamp the depending arms of said booms to their respective side frames. The pawl 15 on the main shaft cooperates with the ratchet to prevent unintentional lowering of the ladder. In order to prevent the sudden lowering of the ladder, the rear or outermost portion of each of the cylinders is provided with a strong helical spring 35 which abuts at one end against the piston and at its other end against a bearing plate 36 provided therefor at the rear end of the cylinder. The position of this bearing plate or backstop is made adjustable by means of a screw-bolt 37 which works in a threaded hole provided therefor in the head of the cylinder and which is manipulated by means of a hand wheel 38 on its outer end.

In order that the driver's seat 39 may be out of the way when the ladder is in a raised position, two downwardly projecting arms 40 are rigidly secured to the forward end of the main section and pivotally connected to the rear of the seat. To the front portion of the seat are pivotally secured links 41 which are pivotally mounted on the main shaft 9. These links are of such length as to maintain the seat in a substantially horizontal position when the ladder is in its normal lowered position. When the ladder is raised, the arms move downwardly and inwardly about the axle 5, carrying the seat inwardly with them.

The foot rest 42 is also arranged to be placed out of the way. Said foot rest is pivotally mounted on the turn-table and is held in normal position by a link 43. This link is pivotally attached to the foot rest at one end and has a hook or loop at its other end. The link rests upon the shaft 9, whereby it is free to slide thereon rearwardly but has its forward movement limited by the engage-

ment of the hook with said shaft; and in this forward position, the link serves as a tie to hold said foot rest in proper position.

The hub of the hand crank, which is arranged to slide on the shaft 9, has its outer end portion formed into a toothed clutch member adapted to engage a counterpart consisting of a toothed sleeve 44 fixed on the end of the shaft. The hub is provided with a spring-pressed pin 45 adapted to fit into a circumferential groove provided therefor in the shaft 9 at the point occupied by the pin when the clutch members are interlocked; in consequence of which arrangement the hub is locked against accidental disengagement. The locking pin has a projecting portion arranged for manipulation. By pulling out the spring pin, the hand crank is free to be shifted inwardly on the shaft and be moved out of the way when the ladder-actuating mechanism is not in use.

The ladder is composed of a main section and one or more extension sections mounted thereon; and in other respects the truck ladder is provided with the usual equipment.

Obviously, my device admits of divers modifications without departing from my invention, and I do not wish to be restricted to the specific construction hereinbefore described.

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

1. A truck ladder comprising a truck, a turntable mounted thereon, a ladder and main and secondary lifting booms pivotally mounted on said turntable, said booms having a sliding connection, and means for shifting said sliding connection, said means comprising cylinders mounted at the ends of the main booms and connected with a source of pressure and having pistons connected to said sliding connection.

2. A truck ladder comprising a truck, a ladder and main and secondary lifting booms pivotally mounted thereon, said booms having a sliding connection, means for shifting said sliding connection comprising a cable connected to said sliding connection, and an operating means for said cable, mounted on said truck, and additional means for shifting said connection comprising cylinders mounted on said main lifting boom and connected with a source of pressure and having pistons connected to said sliding connection.

3. A truck ladder comprising a truck, a ladder pivotally mounted thereon, means for raising and lowering said ladder and a shiftable seat pivotally mounted on said truck and secured to said ladder whereby when said ladder is raised, said seat is moved behind the ladder.

4. A truck ladder comprising a truck, a ladder and main and secondary lifting booms pivotally mounted thereon, said booms having a sliding connection, means for shifting said sliding connection, said means comprising cylinders mounted on said ladder and connected with a source of pressure, pistons connected to said sliding connection and springs arranged within said cylinders.

5. A truck ladder comprising a truck, side frames mounted on said truck, a structure including a ladder pivotally mounted on said side frames, means for raising and lowering said pivotal structure, arms fixedly secured to said pivotal structure, and clamps for releasably holding said arms to said side frames, whereby said pivotal structure can be secured in its elevated position.

6. A truck ladder comprising a truck, a ladder pivotally mounted on said truck, a main lifting boom secured to said ladder, a secondary lifting boom having a sliding connection with said main lifting boom, means for moving said sliding connection, a compression spring carried by said main boom and adapted to exert pressure upon said sliding connection, and an adjustable abutment for said spring.

7. A truck ladder comprising a truck, a ladder pivotally mounted on said truck, a main lifting boom secured to said ladder, a secondary lifting boom, a sliding member on said main lifting boom and having a pivotal connection with said secondary lifting boom, means for moving said sliding member, said means comprising a cylinder having communication with a source of pressure, a piston in said cylinder, said piston being connected to said sliding member, a compression spring between said piston and an adjustable abutment in said cylinder, and an adjusting screw for said abutment extending to the outside of said cylinder, whereby the tension of said spring may be varied.

8. A truck ladder comprising a truck, a frame mounted on said truck, a ladder pivotally mounted on said frame, a tubular main lifting boom secured to said ladder and having an arm near one end, said arm being pivotally secured to said frame with its pivot in axial alinement with the pivot of said ladder, a pulley mounted at the end of said main boom forward of its pivot, a secondary lifting boom pivotally mounted on said frame, a sliding member mounted in said tubular main frame, said sliding member having a pivotal connection with the outer end of said secondary boom, a cable having one end secured to said sliding member, and passing over said pulley at the forward end of said main boom, and having its opposite end secured to a winding drum beneath said pulley, and means for operating said drum.

9. A truck ladder comprising a truck, and a ladder, a tubular main lifting boom connected to said ladder, and a secondary lift-

ing boom, said ladder and said lifting booms being pivotally mounted on said truck, and said tubular main boom being longitudinally slotted and having a slidable member therein, and said secondary boom having a pivotal connection with said slidable member, and means to move said slidable member to raise and lower said ladder.

10. A truck ladder comprising a truck, a turntable mounted on said truck, a ladder, a tubular main lifting boom pivotally mounted on said turntable and connected to said ladder, a secondary lifting boom pivotally mounted on said turntable, said tubular main boom having a longitudinal slot formed therein, a slidable member in said tubular main boom, said slidable member having a pivotal connection with said secondary boom, and a cable having one end secured to said slidable member and its opposite end secured to and adapted to be wound about a winding drum.

11. A truck ladder comprising a truck, a turntable mounted on said truck, side frames mounted on said turntable, a pair of tubular main lifting booms pivotally mounted on said side frames, a ladder carried by said main booms, a secondary lifting boom pivotally mounted on said turntable in operative relation to each of said tubular main booms, slidable members in said tubular main booms, pivotal connections between said slidable members and said secondary booms, cables connecting said slidable members to winding drums, operating means common to said winding drums, whereby said winding drums can be simultaneously operated, to raise and lower said ladder.

12. A truck ladder comprising a truck, a ladder pivotally mounted thereon, and means for actuating said ladder, said actuating means having a power shaft, and said power shaft having a clutch member secured on its outer end and also a circumferential groove adjacent to said clutch portion, and an operating crank slidably mounted on said shaft, and provided with a clutch portion adapted to engage the clutch member on said shaft, and also having a spring-pressed pin adapted to enter said circumferential groove when said engagement is effected.

13. A truck ladder comprising a truck, a ladder pivotally mounted thereon, and means for raising and lowering said ladder, said means having a power shaft and said power shaft having a clutch member on its outer end portion, a crank slidably mounted on said power shaft, said crank having a clutch portion adapted to engage the clutch member on said power shaft, and means for releasably holding said crank with said clutch portions in locked engagement, said releasable holding means permitting said crank to be moved inwardly on said shaft out of the way.

Signed at St. Louis, Missouri, this 31st day of March, 1906.

THOMAS HAINES.

Witnesses:
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G. A. PENNINGTON.