May 16, 1933. C. H. FOX 1,908,969

AERIAL LADDER TRUCK

Filed June 23, 1930 6 Sheets-Sheet 1

Fig. 1

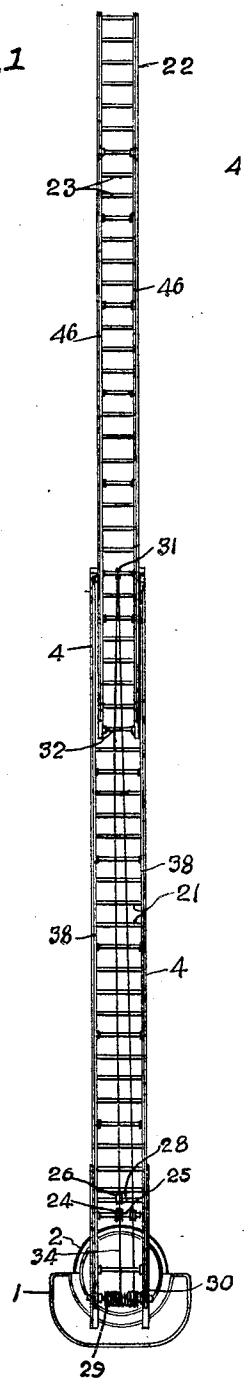


Fig. 2.

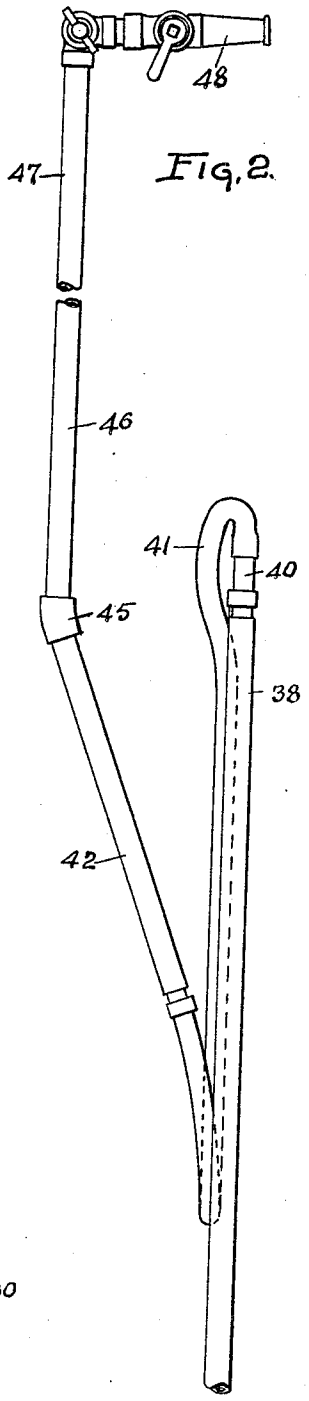
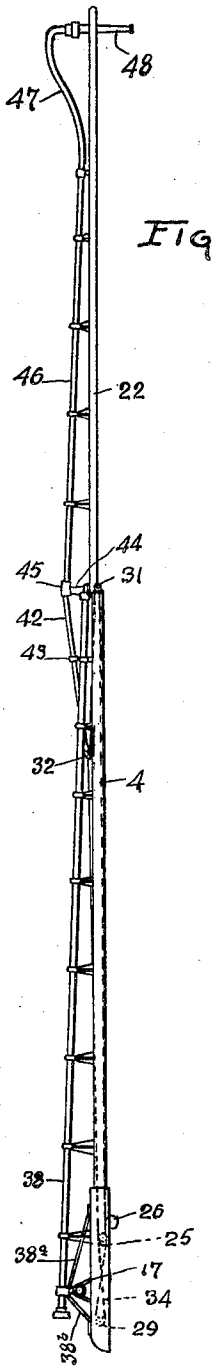


Fig. 3.



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May 16, 1933. C. H. FOX 1,908,969

AERIAL LADDER TRUCK

Filed June 26, 1930 6 Sheets-Sheet 2

Fig. 4.

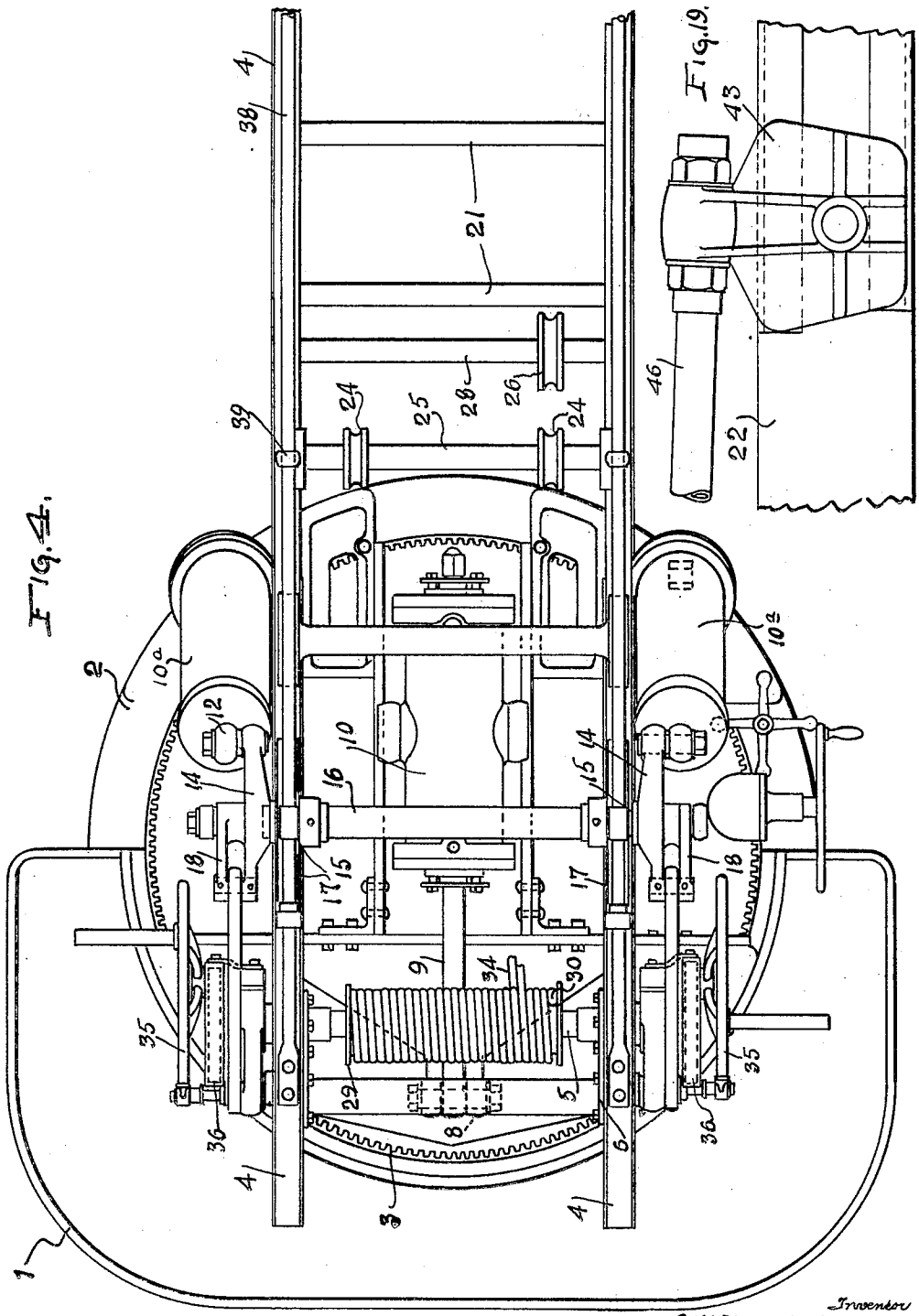

Fig. 19.

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May 16, 1933. C. H. FOX 1,908,969

AERIAL LADDER TRUCK

Filed June 23, 1930 6 Sheets-Sheet 3

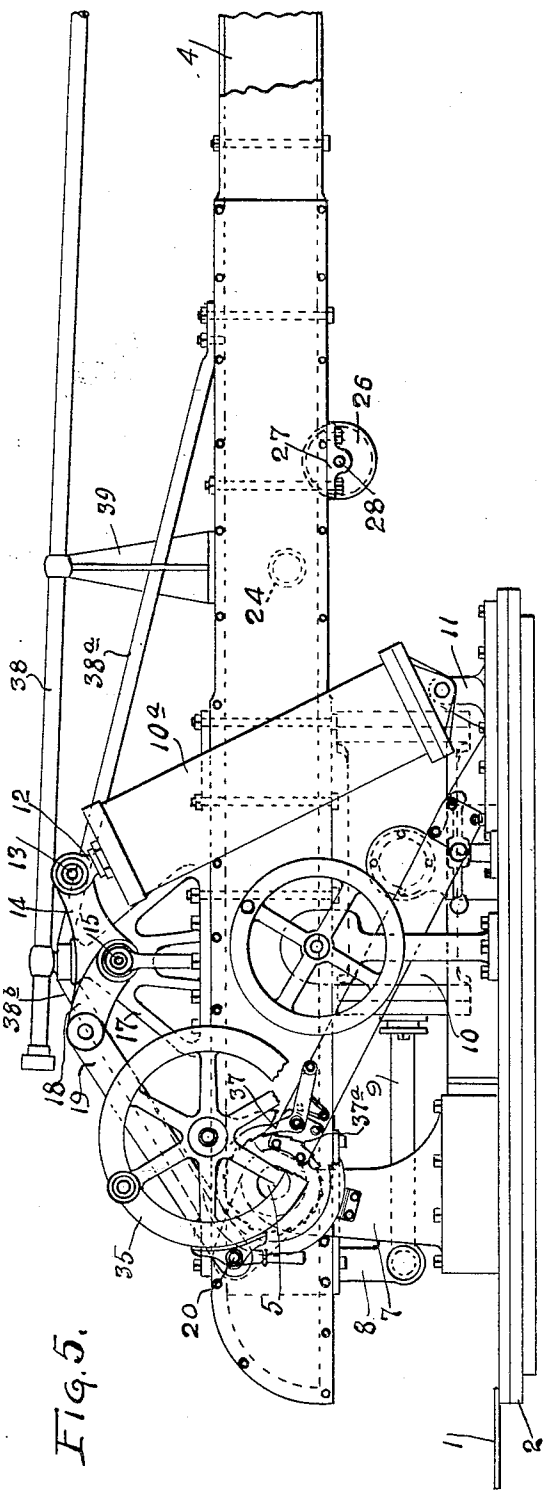

Fig. 5.

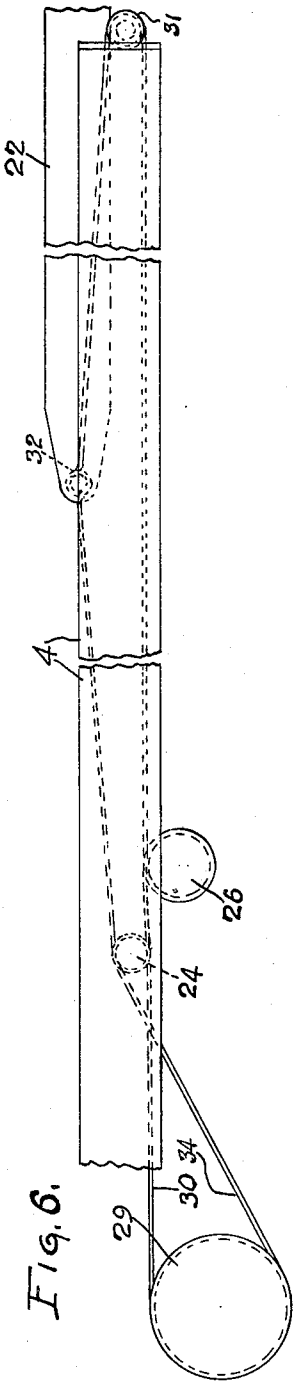

Fig. 6.

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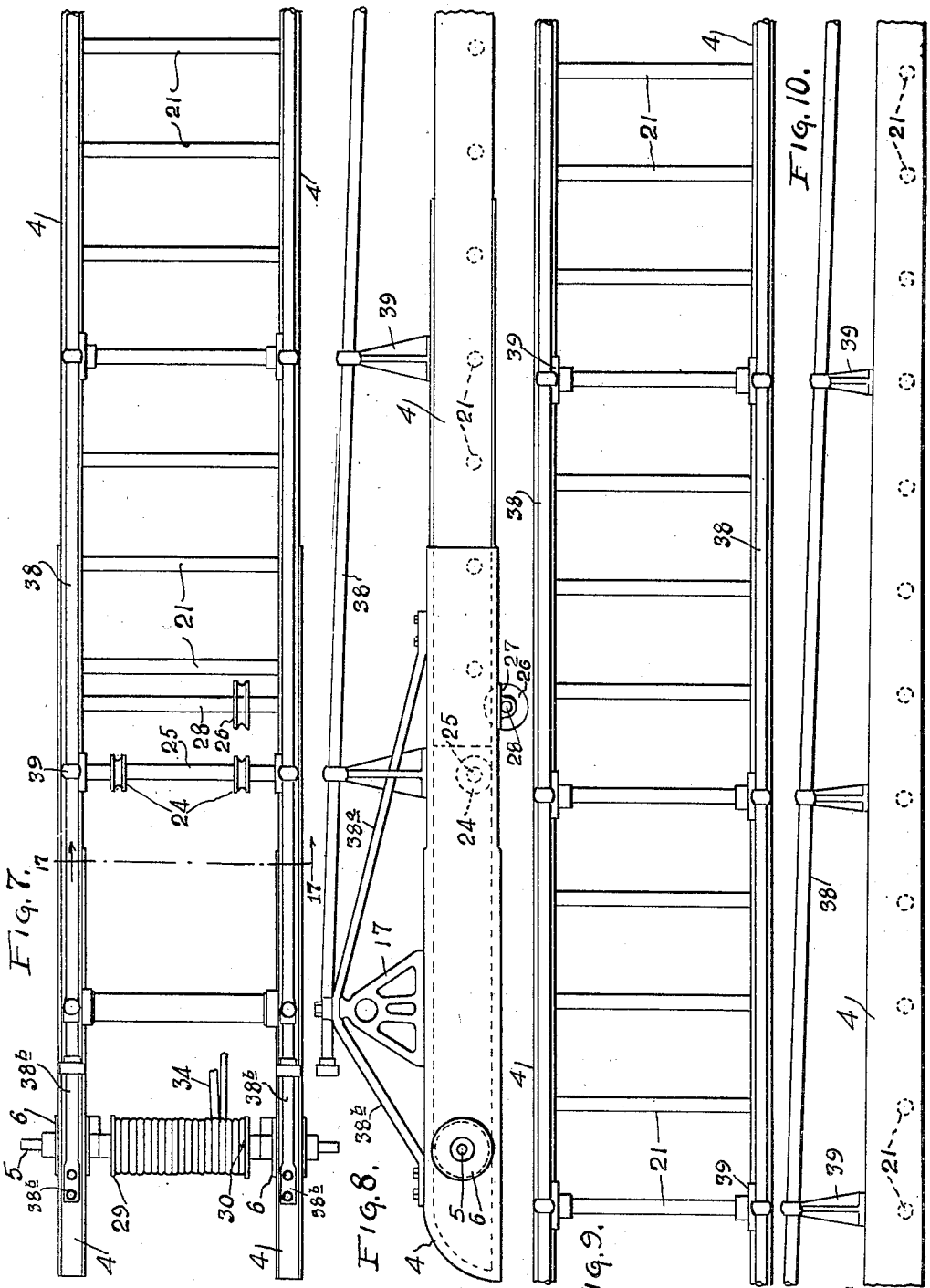
May 16, 1933. C. H. FOX 1,908,969

AERIAL LADDER TRUCK

Filed June 26, 1930 6 Sheets-Sheet 4



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May 16, 1933. C. H. FOX 1,908,969

AERIAL LADDER TRUCK

Filed June 23, 1930 6 Sheets-Sheet 5

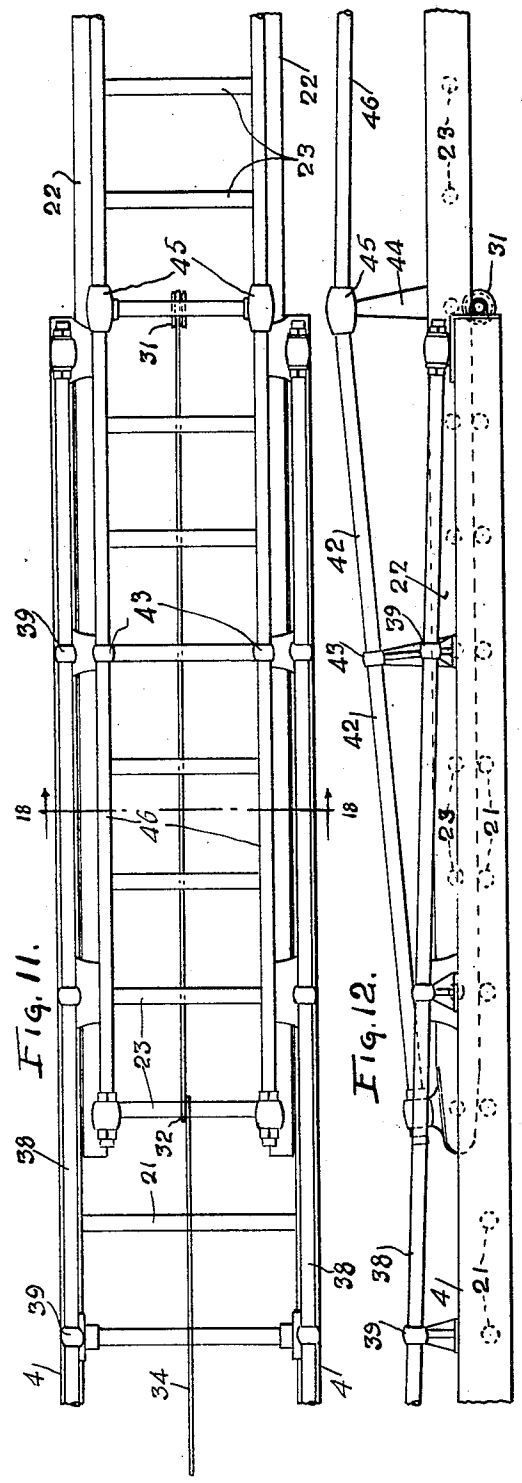

Fig. 11.

Fig. 12.

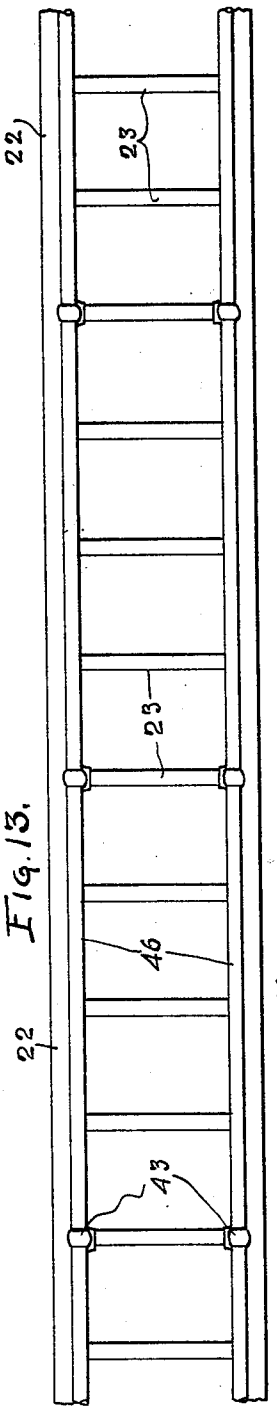

Fig. 13.

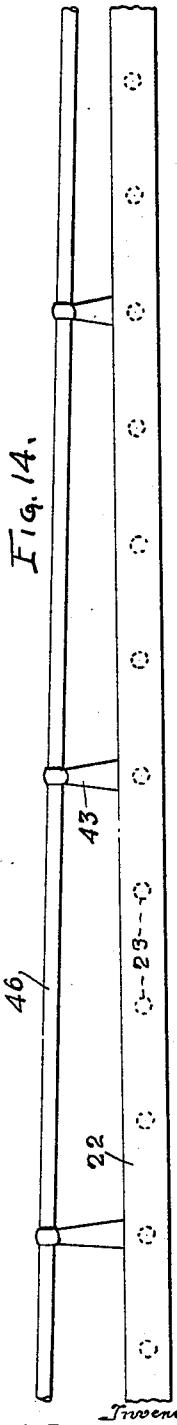

Fig. 14.

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May 16, 1933. C. H. FOX 1,908,969

AERIAL LADDER TRUCK

Filed June 26, 1930 6 Sheets-Sheet 6

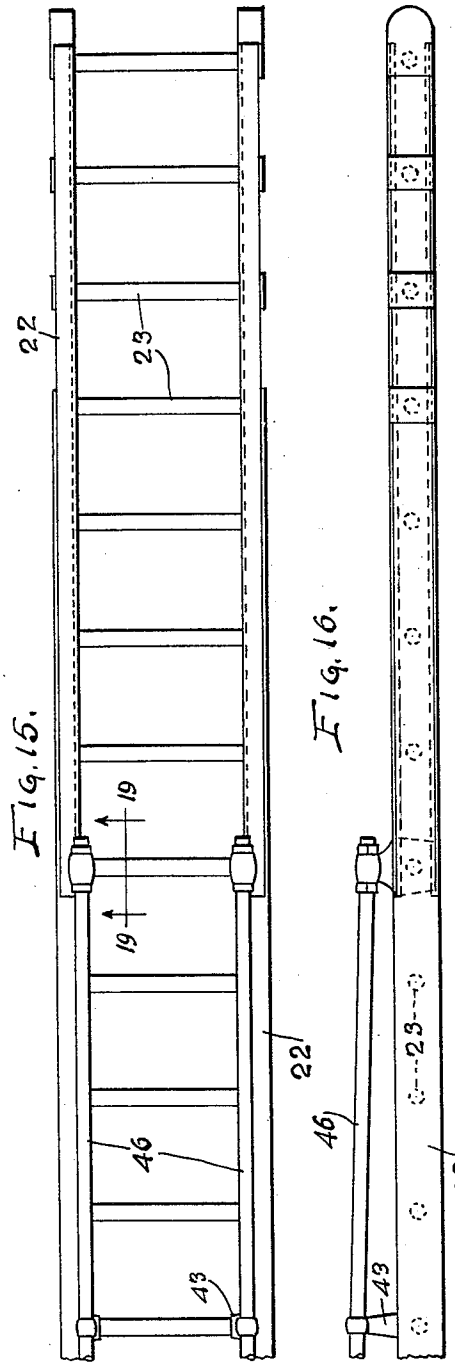

Fig. 15.

Fig. 16.

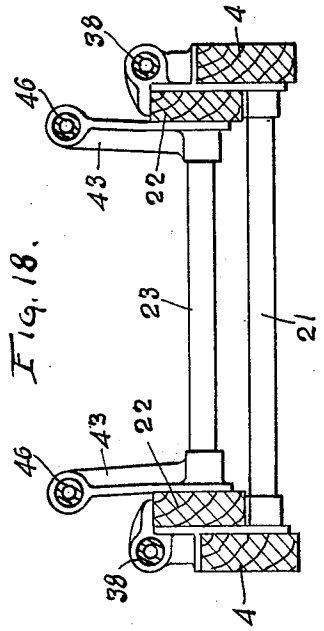

Fig. 18.

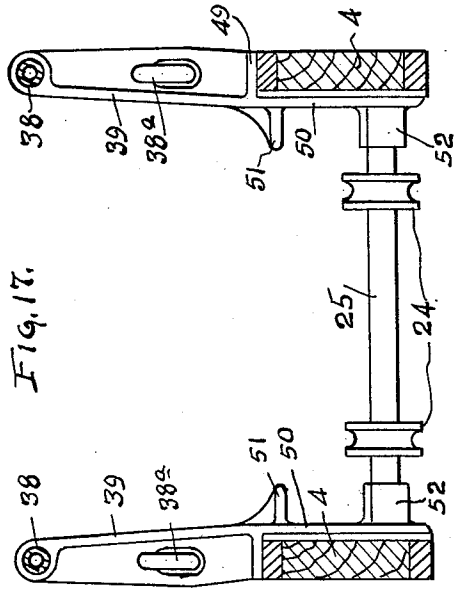

Fig. 17.

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UNITED STATES PATENT OFFICE

CHARLES H. FOX, OF CINCINNATI, OHIO, ASSIGNOR TO THE AHRENS-FOX FIRE ENGINE COMPANY, OF CINCINNATI, OHIO, A CORPORATION OF OHIO

AERIAL LADDER TRUCK

Application filed June 26, 1930. Serial No. 464,089.

My invention relates to a combined aerial ladder and water tower.

It is an object of my invention to provide an aerial ladder that can be rapidly erected and elevated; which will resist the strains incident to its load and delivery of water through the hose supported from the ladder in both fore-and-aft directions.

It is a further object to provide an aerial ladder which will serve as a water tower in that the bracing of the aerial ladder can be used for transmitting the water, thereby combining a telescopic aerial ladder braced against the effect of the load it carries and the discharge of the water, and which will carry water through the bracing for discharging the water to whatever degree the ladder is telescoped or untelescoped; and at the same time to provide a ladder that may be swung to any degree of rotation and elevated at the desired angle.

Referring to the drawings:

Figure 1 is a top plan view of the ladder extended;

Figure 2 is a diagrammatic view partly broken away to show the connection between the respective braces of the respective ladders and the connection to a nozzle when the bracing is used for conveying fluid to the nozzle on the upper end of the upper ladder when the apparatus is used as a water tower as well as an aerial ladder;

Figure 3 is a side elevation of Figure 1;

Figure 4 is a top plan view of the elevating and rotating mechanism on which the ladders are supported;

Figure 5 is a side elevation thereof;

Figure 6 is a diagrammatic view of the upper end of the lower ladder and the lower end of the upper ladder and of the guide sheaves and cable arrangement for extending or telescoping the two ladders;

Figure 7 is a top plan view of the lower end of the lower ladder and its bracing;

Figure 8 is a side elevation thereof;

Figure 9 is a top plan view of the upper end of the ladder and its bracing;

Figure 10 is a side elevation thereof;

Figure 11 is a top plan view of the ladder where they overlap showing the top of the lower ladder and the bottom of the upper ladder and the arrangement of their bracing;

Figure 12 is a side elevation thereof;

Figure 13 is a top plan view of the intermediate upper portion of the upper ladder;

Figure 14 is a side elevation thereof;

Figure 15 is a top plan view of the upper end of the upper ladder;

Figure 16 is a side elevation thereof;

Figure 17 is a section on the line 17—17 of Figure 7;

Figure 18 is a section on the line 18—18 of Figure 11;

Figure 19 is a section on the line 19—19 of Figure 15.

Referring to the drawings in detail, 1 is a platform beneath a portion of which is mounted the transversing ring 2 having the teeth 3. This ring is rotated in the usual manner by a driven pinion, not shown. This phase of the apparatus forms no part of my invention.

The lower ladder is comprised of the side frames 4 which are mounted upon an axle 5. The axle 5 turns in the bearings 6 in the side frame. The ladder is pivoted upon the side brackets 7 that are mounted upon the turntable ring 2. A bracket 8 depends from the underside of the lower end of the ladder and is connected to the piston rod 9 of the dashpot cylinder 10 which is filled with oil on both ends of the piston and serves to either lock the position of the ladder or to regulate the speed with which the ladder is elevated or lowered.

The ladder is elevated through the use of air cylinders 10*a*. 10 is a dashpot cylinder for regulating the speed of elevation or lowering of the ladders. The cylinders 10*a* are pivotally mounted upon the ring 2 by means of the brackets 11 and are caused to rock back and forth about these pivotal centers according to the upward and downward movements of the ladders. The piston rods 12 of these cylinders are secured to the two part bell cranks 14 as at 13, the bell cranks being pivoted to the shaft 16. The shaft 16 is held to the frame 4 by means of the brackets 17. To the other member 18 of the two part bell cranks is secured a link 19, the other

end of which is connected to the lower ladder, as at 20, beyond its pivotal support on the bracket 7. By controlling the application of air to the cylinders 10*a* the ladder is raised and lowered about its pivot on the bracket 7.

The lower ladder is broader than the upper ladder so that the upper ladder will slide upon the lower ladder and within the side members of the lower ladder. The lower ladder is provided with rungs 21. The upper ladder is provided with side frame members 22 and the usual rungs 23.

The lower ladder is provided with guide sheaves 24 on the axle 25. The lower ladder is also provided with a larger guide sheaf 26 carried on the axle 28, which is held to the frame 4 by means of the brackets 27.

On the axle 5 is mounted a cable drum 29 which has one end of the cable attached to it, as at 30. This cable extends beneath the laterally slidable guide sheaves 24 over the laterally slidable guide sheaf 26 and over pulley 31 carried on the upper end of the lower ladder and thence it is connected at 32 to the lower end of the upper ladder 22. A second cable 34 extends downwardly over one of the sheaves 24 to the bottom of the drum 29 to which it is suitably connected. The cable connected at 30 when wound on the drum elevates the upper ladder 22 and at the same time the cable 34 is unwound from the drum; when the ladder is being telescoped the cable 34 is wound on the drum and the cable that is attached at 30 is paid out. This drum 29 is operated in any suitable manner, as by the hand wheel 35 which operates a suitable train of gearing for the gear box 36. The ratchet 37*a* and the pawl 37 serve to retain the drum in any predetermined position to hold the ladders in any extended position desired.

Turning to specific features of my invention, it will be understood that heretofore the difficulties with aerial ladders which limited their length, their size and usefulness have resided in the fact that it was difficult to support a load on the top of an upper ladder and when such a load was applied with the ladder tilted at the usual angle the upper ladder would bend over toward the ground and toward the buildings to which the ladder was directed; and upon carrying a hose to the top of this ladder, when the water was turned on the result would be that the ladder would be driven backwardly away from the building and would bend in the other direction. These regular and conflicting forces would cause the ladder to bend back and forth or wave and thereby set up serious difficulties in the handling of this type of equipment.

It was further necessary to have two different types of equipment; one was the aerial ladder and the other was a water tower. The aerial ladder was for the purpose of taking people from high buildings that were burning or for carrying up hose while the water tower was for the well known purpose of applying water at great heights. The aerial ladder of today has not been equal to sustaining the force due to the reaction of a heavy fire stream. There has been no means for strengthening the fly ladder or upper ladder in such a manner that it would be sufficiently light and strong while at the same time being capable of being extended. Any bracing that merely takes care of the load which is directly imposed upon the upper or working side of the ladder structure is insufficient. The difficulty with water towers has been that the heavy fire streams they deliver are materially lower than the top of the aerial ladders.

Accordingly, I have provided tubular trusses or braces of the following character: Straight diagonally disposed tubular members 38 mounted at their rear ends upon the brackets 17 and towards their forward ends upon the brackets 39 on the side frame members 4 of the ladder, decreasing in width from the bottom of the ladder to the top, thereby forming a triangular truss with the side frames 4 of the ladder. Supplementary brace members 38*a* and 38*b* are attached to the brackets 17 and the rod 38 at its lower end. The weight of these supports 39 decreases as the top of the ladder is approached and thereby the lesser the weight the higher you can go up the ladder. This tubular member 38 being hollow serves as a passageway for water. Its upper end may have connected thereto, as at 40, a hose 41, the other end of which is connected to the diagonal tubular brace 42 carried on the bracket 43 on the side frame of the upper ladder. This diagonal brace proceeds a short distance from the bottom of the upper ladder upwardly to the brace 44 where it is connected by the union 45 to an upwardly extending tubular brace 46, the upper end of which may have connected thereto a hose 47 that in turn is connected to a nozzle 48 that is carried on the upper end of the ladder.

These braces being carried directly on the side frames of the ladder do not interfere with each other or the braces of the respective ladders when they telescope. Such braces are light because they are hollow; they are capable of conveying water and have the primary virtue of resisting load on the working side of the reaction of the water from the other side, so that ladder will not bend in either direction. To provide triangular trusses for resisting such load the major weight of the truss is at the bottom of the ladder.

It is optional whether the trusses will be used for conveying fluid or not. When they are so used I provide the combined advantage of a water tower and aerial ladder; I eliminate the necessity of carrying the heavy hose to the top of the ladder and I provide

a means of applying water at great heights to tall buildings of present day construction.

The brackets 39 may be provided with slots for receiving the supplementary braces 38*a*. These brackets 39 have a flange 49 resting upon the upper edge of the side frame of the ladder and a depending inwardly arranged flange 50 on the inside of the side frame. On this flange 50 are mounted stationary guide ears 51 and collars 52 which guide the side frame and fly ladder. The collars 52 also serve to support the axle 25 on which the guide sheaves 24 are mounted.

It will be understood that I desire to comprehend within my invention such modifications as may be clearly embraced within the scope of my claims and invention.

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

1. In combination, transversing means, pivotal means for supporting a ladder mounted thereon, means for elevating a ladder on said pivotal means, bracing on said ladder to take strains in both directions transversely of the longitudinal axis of the ladder comprising a diagonally disposed tubular member mounted over the side frames of said ladder and either side thereof on the front of the ladder, brackets mounted on said side frames for supporting said tubular members, each of said tubular members being arranged with its upper end closer the upper end of the side frames than the lower end and means upon the lower ladder for actuating an upper fly ladder which is telescopically supported by the brackets upon the first mentioned ladder.

2. In combination, a main ladder, a telescopically mounted fly ladder, means of guiding the fly ladder in telescopic relationship with the main ladder, means of extending and telescoping the fly ladder on the main ladder, brace members mounted over the side frames of said ladders diagonally thereof and means connecting said brace members with the side frames on the working side of said ladders and forming supports and guides for the fly ladder.

3. In combination, a main ladder, a telescopically mounted fly ladder, means for guiding the fly ladder in telescopic relationship with the main ladder, means for extending and telescoping the fly ladder on the main ladder, brace members mounted over the side frames of said ladders diagonally thereof, means connecting said brace members with the side frames on the working side of said ladders without interfering with the telescopic arrangement and extension of one ladder with respect to the other, said brace members being tubular, and means for interconnecting the tops of the lower brace members with the bottoms of the upper brace members for conveying fluid therethrough irrespective of the relative positions of the said ladders.

4. In combination, a main ladder, a telescopically mounted fly ladder, means for guiding the fly ladder in telescopic relationship with the main ladder, means for extending and telescoping the fly ladder on the main ladder, brace members mounted over the side frames of said ladders diagonally thereof, means connecting said brace members with the side frames on the working side of the said ladders without interfering with the telescopic arrangement and extension of one ladder with respect to the other, said brace members being tubular, means for interconnecting the tops of the lower brace members with the bottoms of the upper brace members for conveying fluid therethrough irrespective of the relative positions of said ladders and a nozzle connected to each of the upper ends of said tubular brace members mounted on the upper end of the fly ladder for the control of the fluid therethrough and therefrom.

5. In combination, a main ladder, a telescopically arranged extension fly ladder, means for guiding the fly ladder on the main ladder, means for raising and lowering the fly ladder on the main ladder, brace means forming diagonally disposed trusses carried on the side frames of each ladder, the brace means of the lower of said ladders having brace members that extend upwardly and inwardly toward the side frames and the brace means on the upper ladder having brace members extending from the side frame upwardly and outwardly and thence upwardly and inwardly, said brace members being tubular, means for connecting the upper ends of the lower brace members and the lower ends of the upper brace members whereby fluid may be transmitted therethrough to the top of the fly ladder without disturbing the extension and telescoping of the ladders.

6. In combination, a pair of ladders telescopically mounted one on the other, means for bracing said ladders and means for conveying fluid through said braces irrespective of the relative position of said ladders.

7. In combination, a pair of ladders telescopically mounted one on the other, means for bracing said ladders and means for conveying fluid through said braces irrespective of the relative positions of said ladders, said braces being arranged to prevent movement transversely of the longitudinal axis of the ladders in either direction.

8. In an aerial ladder, a lower ladder having side members, a bracket on each side member, a brace for each side member on the bracket, each bracket having an ear and a sleeve, an upper ladder supported and guided by the ears and the sleeves, and a connecting member supported in the sleeves.

9. In an aerial ladder, a lower ladder having side members, a brace for each side mem-

ber including brackets, each bracket having an ear and a sleeve, means in the sleeves for connecting the side members, and an upper ladder supported and guided by the ears and the sleeves.

10. In an aerial ladder, a lower ladder having side members, a brace for each side member consisting of a longitudinally extending pipe and brackets on the side members, each bracket having an ear and a sleeve, means in the sleeves for connecting the side members, a second ladder supported and guided by the ears and the sleeves, and pipes on the second ladder adapted to be connected to the first-named pipes and forming therewith continuous water pipes.

In testimony whereof, I affix my signature.

CHARLES H. FOX.