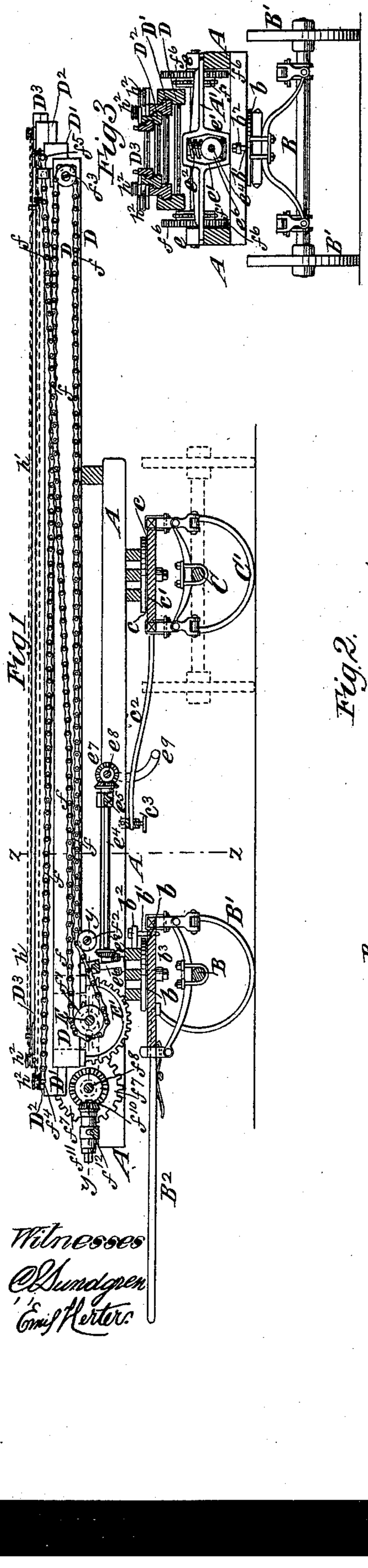
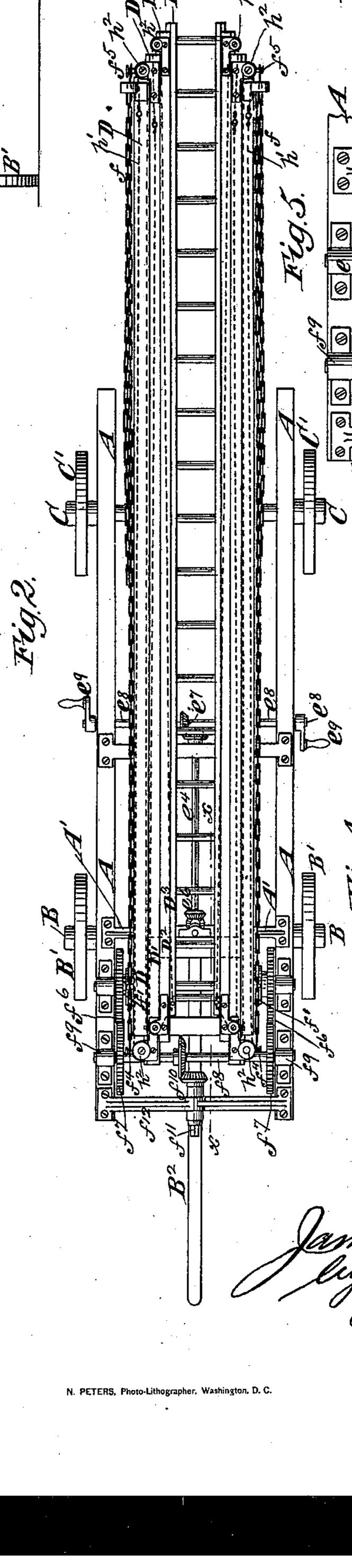
(No Model.) 2 Sheets—Sheet 1.

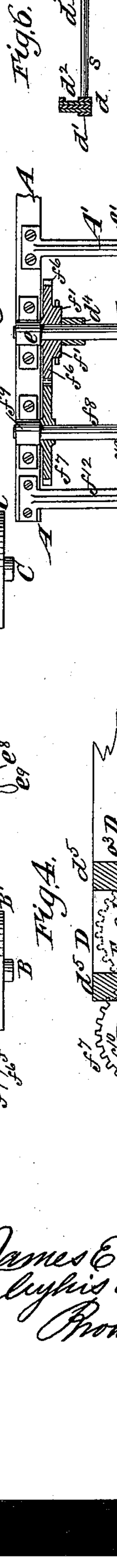
J. E. GILLESPIE.

FOLDING EXTENSION LADDER AND TRUCK.

No. 363,889. Patented May 31, 1887.







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(No Model.) 2 Sheets—Sheet 2.

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Fig. 8.

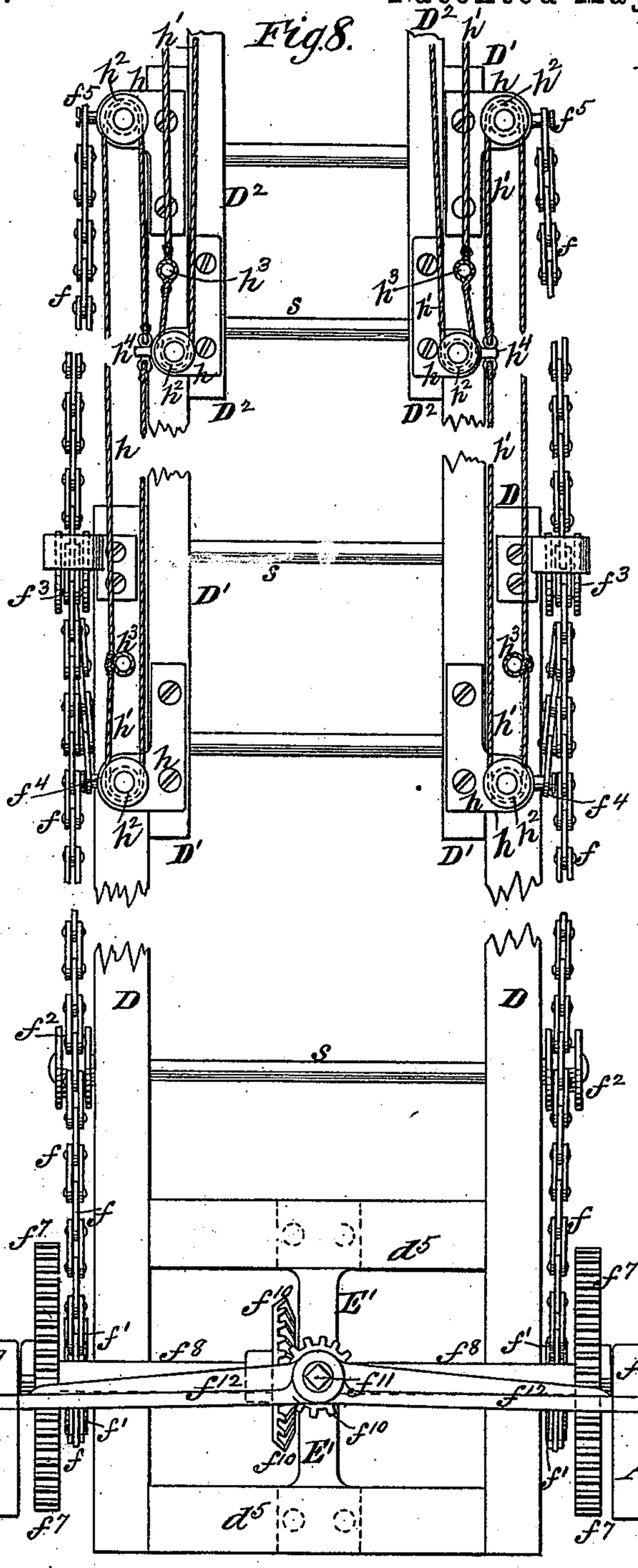
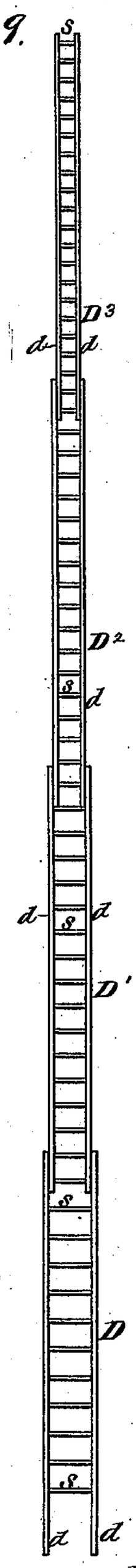


Fig. 9.



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Inventor:
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UNITED STATES PATENT OFFICE.

JAMES E. GILLESPIE, OF WARWICK, NEW YORK.

FOLDING EXTENSION-LADDER AND TRUCK.

SPECIFICATION forming part of Letters Patent No. 363,889, dated May 31, 1887.

Application filed February 1, 1887. Serial No. 226,124. (No model.)

To all whom it may concern:

Be it known that I, JAMES E. GILLESPIE, of Warwick, in the county of Orange and State of New York, have invented a new and useful Improvement in Folding Extension-Ladders and Trucks therefor, of which the following is a specification.

In my Letters Patent No. 345,427, dated July 13, 1886, I have shown and described a truck having a fire-ladder pivoted or hinged at its foot adjacent to and parallel with the rear axle of the truck, so that when the truck arrives at a fire it can be backed up toward the building, and the ladder, which ordinarily folds forward upon the truck, can be swung upward and backward, so as to rest against the building, if desired. In the use of the ladder described in said Letters Patent the front axle is intended, when the ladder is to be used, to be swung or turned to cramp the wheels, so that the front axle will stand nearly longitudinally of the truck, and will thus brace and hold the truck against forward movement. I have now discovered that good results can be attained by pivoting or hinging the ladder near the front axle, and by providing a locking device whereby the turn-table or fifth-wheel connection between the truck-body and front axle may be locked or made inoperative, so as to fix the axle transversely to the truck-body, and by further providing a fifth-wheel or turn-table connection between the truck-body and rear axle, so that the rear axle can be turned into position lengthwise of the truck to hold the truck against movement when the ladder is in use.

My invention also relates to mechanism employed for extending the several sections of which the ladder is composed.

My invention also relates to a novel construction of the side bars or portions of ladder-sections, whereby they may be more readily attached to each other for sliding one on another, and whereby their strength is increased.

In the accompanying drawings, Figure 1 is a longitudinal section of a truck and ladder embodying my invention, the section being taken immediately inward of one of the side frames of the truck. Fig. 2 is a plan of the truck and ladder. Fig. 3 is a transverse section thereof upon about the plane indicated by the dotted line *z z*, Fig. 1, looking toward the left hand from said line. Fig. 4 is a longitudinal section upon a larger scale and upon about the plane indicated by the dotted line *x x*, Fig. 2, showing more clearly the gearing for raising and lowering the ladder and for extending its sections. Fig. 5 is a horizontal section upon the same scale as Fig. 4, and upon about the plane indicated by the dotted line *y y*, Fig. 1. Figs. 6 and 7 are transverse sections of a ladder, showing my novel construction of the side bars or portions thereof. Fig. 8 is a front elevation, upon a larger scale, of a portion of the ladder, showing it as raised into an upright position; and Fig. 9 is a view, upon a small scale, of the extended ladder, showing its rungs as arranged at a decreasing distance apart toward the top.

Similar letters of reference designate corresponding parts in all the figures.

A designates the truck-frame, which may be of wood or metal, and B C designate, respectively, the front and rear axles, on which are the front and rear wheels, B′ C′. These axles are respectively connected with the truck, in this example of my invention, by fifth-wheel or turn-table connections *b c*, so that their axles may be swung relatively to the truck-body. I also provide means whereby either the front or rear axles, B C, may be locked or fixed in position transversely of the truck-body, for a purpose hereinafter described, thus rendering either turn-table or fifth-wheel connection with the body inoperative. In this example of my invention, I have shown in Figs. 1 and 3 a locking pin or bolt, b', which passes through a lug or ear, b^2, upon one part of the turn-table or fifth-wheel connection at the front axle, and engages with another part, b^3, of such connection. I have shown the portion c' of the turn-table connection *c* at the rear axle, C, as provided with a tongue or lever, c^2, which may engage with a catch, c^3, to hold the axle fixed in position transverse to the truck-body A, and which, when disengaged from said catch, serves as means of turning the rear axle to the position shown by dotted line in Fig. 1, in which it stands longitudinally to the truck-body A.

B^2 designates a tongue or pole whereby the truck may be drawn, and which, when the truck arrives at a fire, may be removed, so as to enable the front end of the truck to be

brought up near to a building on which the ladder is to be used.

The ladder, as I shall hereinafter describe, is pivoted or hinged to the truck-body adjacent to and approximately parallel with the front axle, B, when said axle is fixed in a position transverse to the body by the use of the locking pin or bolt b'. While the truck is proceeding to a fire, the rear axle, C, is locked by the tongue or lever c^2 in its normal position to hold said axle fixed transversely of the truck-body, and the forward axle is free to turn as usual. When the truck arrives at a fire, the tongue or pole B^2 may be removed, the truck may be brought with its forward end near to the building, and the front axle, B, may be locked by the pin or bolt b', or equivalent locking device, so as to hold it in position transversely to the truck-body. The rear axle is then unlocked from its fixed position, and by means of the tongue or lever c^2 is swung into position longitudinally of the truck-body, as represented by dotted lines in Fig. 1. This rear axle with its wheels then serves to brace the truck and prevent its movement lengthwise away from the building in the same manner that the front wheels prevent such movement in the truck which forms the subject of my aforesaid Letters Patent.

The ladder may be composed of any desired number of sections; but, as here represented, it consists of a main section, D, which has no lengthwise movement, and second, third, and fourth sections, D' D^2 D^2, which slide lengthwise, the first upon the main section D, and the others upon each other, as is usual. The way in which the side bars, d, of these ladder-sections are combined with each other for sliding is best shown in Figs. 3, 6, and 7. Each side bar or portion d has upon its one side a tongue, d', and upon the opposite side a groove, d^2, and the tongues d', which are integral with the side bars of one section, slide into the grooves d^2, formed in the side bars of the section next behind or in rear of the first.

Ordinarily the side bars or rails of ladders have been made of a single piece of wood with whatever attachments may be necessary to fit them one to another for sliding; but according to my invention I compose each side bar of thin sections like veneers, which are aranged face to face in a vertical plane, as shown in Fig. 6, and are cemented together. The grain in the several thicknesses or veneers of which the side bar or rail, d, is composed will not be coincident with each other, and hence there is slight liability of the side bar or rail breaking, and they may be made lighter and smaller in transverse section than is possible where each is composed of a single piece of wood, and still have adequate strength. Between the several layers or thicknesses of wood which are arranged in a vertical plane to form a side bar or rail, d, I may interpose layers of paper, d^3, as shown in Fig. 7 by heavy black lines, and the several layers of wood and paper are cemented together, so as to form one structure.

The main ladder-section D is hinged adjacent to the front axle, B, and approximately parallel with said axle when it is locked in a fixed position transverse to the truck-body.

E designates a shaft which, as best shown in Figs. 4 and 5, extends transversely to the truck-body A, and is fitted to bearings e upon the opposite sides of such truck-body. The lower ladder-section, D, has lugs or ears, d', upon its under side, which fit and are adapted to turn upon the shaft E, and E' designates a worm segment or gear, which is secured to the cross portions d^5 of the main ladder-section D, as best shown in Fig. 4. Between the two side portions, A, of the truck-body extends a cross-bar, A', which, at about the middle of its length, is yoked, as shown at e' in Figs. 3, 4, and 5, and supports or forms bearings for an approximately upright worm-shaft, e^2, having a worm, e^3, engaging with the worm-segment E'.

e^4 designates a shaft which extends longitudinally of the truck, and is mounted in bearings e^5, and this shaft is, by bevel-wheels e^6, connected with the worm-shaft e^2, and by bevel-wheels e^7 is connected with a cross-shaft, e^8, which extends transversely to the truck-body, and is adapted to receive operating-handles e^9 upon its opposite ends, as best shown in Fig. 2. Two men may, therefore, be utilized in operating the worm e^3 through the shafts e^4 e^8, and by the operation of said worm e^3 upon the worm-segment E' the ladder will be swung upward or downward, as may be desired.

As a means of extending the second section, D', of the ladder upon the main section D, I have represented chains or flexible connections f, which pass around sprocket or chain wheels f' upon the shaft E, and which pass over guiding-pulleys f^2 f^3 upon the main ladder-section D. The chains or flexible connections f are attached at one end, f^4, to the foot of the second ladder-section, D', one chain or flexible connection being at each side thereof, and at their other end the chains or flexible connections are attached at f^5 to the upper end of the second ladder-section, D'. It will therefore be understood that by the simultaneous turning of the two chain-wheels, f', which are at opposite sides of the truck, as shown in Fig. 5, the chains or flexible connections f will be rendered around the pulleys f^2 f^3 or traversed lengthwise, and the second ladder-section, D', will be moved in one or the other direction upon the main section D.

It will be observed that the chains which pass around the wheels f' are secured at their opposite ends to the second ladder-section, D', near its ends. It would at first seem that this arrangement of the chains f is a useless expenditure of chain over what would be required if endless chains were extended between the wheels f' and the sheaves or pulleys f^3 and attached at one point to a second lad-

der-section; but as a matter of fact this arrangement of the chains, which is best shown in Fig. 1, results in an important advantage. It is often desirable to have the second ladder-section, D′, extend below or (in this instance) forward of the end of the main section D, and by the arrangement of chains which I have shown it is possible to extend or move the second section for almost its entire length in either direction upon the main section. This arrangement provides for closing a ladder of a given length within shorter compass than would otherwise be possible.

As a means of operating the chain-wheels f' at opposite sides of the truck synchronously, I have shown, particularly in Fig. 5, that the two chain-wheels are secured rigidly to or formed integral with gear wheels or pinions f^6, and these gear wheels or pinions are operated synchronously by suitable gearing. As here represented, this gearing consists of corresponding wheels or pinions, f^7, secured fast upon a cross-shaft, f^8, which is mounted in bearings f^9 on the truck-body A, and is rotated by bevel-gearing f^{10} from a short shaft, f^{11}, to which a hand-crank may be applied. The shaft f^{11} is journaled in a cross bar or brace, f^{12}, connecting the opposite side portions of the truck-body A, as shown in Figs. 2 and 5. By the operation of the shaft f^{11} the chain-wheels f' will be rotated synchronously, and the second ladder-section, D′, will be moved in one or other direction on the section D.

The connections whereby each section of the ladder, after the first section, D, is caused to operate the section which slides within it, are best shown in Fig. 8, in which the ladder-sections are broken at the middle of their length in order to show the parts upon a much larger scale. From the previous description it will be understood that the section D′, which slides in the main ladder-section D, is operated by the chains f, before described, but the third ladder-section, D^2, which slides in the section D′, and the fourth section, D^3, which slides in the section D^2, and is not shown in Fig. 8, are operated in a different manner. I will describe the connection of the section D′ with the section D^2, and it will be understood that the other sections, be they more or less, are operated in a corresponding manner. At opposite ends of the section D′ are secured brackets h, which project laterally on the upper side of the main section D, and which support a substantially endless or continuous cable or flexible connection, h', passing around pulleys h^2 upon the brackets h. The cables or flexible connections h' which pertain to any one section, being carried by pulleys thereon, are secured between the pulleys to the section which is behind and to the section which is in front, and which slides in the section on which are the pulleys; and in Fig. 8 I have represented the cable or flexible connection h' as attached at h^3 to the main ladder-section D, which is behind the section D′, or in which said section D′ slides, and at h^4 to the section D^2, which is in advance of the section D′, and which slides in the section D′. It will from the above description be understood that as the section D′ is extended or moved outward in the section D by the operation of the chains or flexible connections f the pulleys h^2 will be advanced with the section D′, and will have a tendency to move bodily the flexible connection h'. This, however, is prevented by the attachment of the flexible connection h' at h^3 to the main ladder-section D, and the advancement or outwardly-sliding movement of the section D′ will cause the cables or flexible connections h' to render around the pulleys h^2, and by their attachment at h^4 to the third ladder-section, D^2, said section D^2 will be advanced in and projected from the section D′.

In order to enable a person to ascend a ladder readily from the bottom to the top, and without experiencing great fatigue or slackening his speed of ascent toward the top, I arrange the rungs of the ladder as represented in Fig. 9—that is to say, the rungs s in the lower portion of the ladder are arranged at a greater distance apart than the rungs s in the upper portion of the ladder. In the first section, D, for example, the rungs may be sixteen inches apart; in the second section, D′, fifteen inches apart; in the third section, D^2, fourteen inches apart, and in the fourth section, D^3, thirteen inches apart. These relative distances of the rungs from each other may be varied as found desirable in practice.

The locking device, whereby the front axle may be held from swinging horizontally, combined with the ladder pivoted adjacent to the forward axle, provides a novel and useful result. The end of the truck at which the ladder is hinged is the one adjacent to the building against which the ladder is to be used, and when the ladder is raised the weight comes upon the forward end of the truck, and if the axle were not locked and were slightly skewed or oblique that end of the truck might run out or away at the side and fail to properly sustain the ladder in the position in which it is placed. It is most desirable to have the ladder pivoted adjacent to the front axle, as it may then trail or extend behind the truck in passing through streets, and it is necessary to be able to cramp the wheels and axle most distant from the building against which the ladder is placed, in order to prevent the truck from running away from the building when the ladder is raised and weight comes upon it. It is also desirable to have the back axle rigid and incapable of turning by a fifth-wheel connection, as the truck can then be better controlled in passing through streets and around corners. For this purpose I provide fifth-wheel connections for both axles, and the locking devices for both fifth-wheel connections, combined with the ladder pivoted adjacent to the forward axle, produce useful results.

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

1. The combination, with a truck having a

turn-table or fifth-wheel connection between the forward end of its body and the front axle, of a locking device whereby the said axle may be fixed in position transverse to the body and a ladder pivoted or hinged at its foot adjacent to and parallel with the front axle when thus fixed in position, and arranged to swing backward and downward toward the rear end of the truck, substantially as herein described.

2. The combination, with a truck having turn-table or fifth-wheel connections between its body and axles, of locking devices whereby said axles may be alternately fixed in position transverse to the truck-body, the rear axle when the truck is to be drawn to a fire and the front axle when at a fire, and a ladder pivoted or hinged at its foot adjacent to the front axle and arranged to fold or swing backward and downward toward the rear end of the truck, substantially as herein described.

3. The combination, with a truck and an extension-ladder pivoted or hinged adjacent to one of its axles, of chains or other flexible connections passing over pulleys on the main ladder-section D, and secured at their opposite ends near the opposite ends of the second section, D′, and wheels f' on the main section engaging with the said chains or connections, and serving to operate them to extend the second section, substantially as herein described.

4. The combination, with a truck and the main and second ladder-sections, of chains passing around pulleys on the main section and attached to opposite ends of the second section, the chain-wheels f', attached to or formed with gear-wheels f^6, and engaging said chains, and gearing engaging with said gear-wheels and serving to rotate them and their attached chain-wheels synchronously, substantially as herein described.

5. The combination, with the sliding sections of an extension-ladder, of pulleys near opposite ends of each section, and substantially endless flexible connections passing around said pulleys and fixed between said pulleys to the sections behind and in advance of the section carrying the pulleys and connections, substantially as herein described.

6. The combination, with the sections D D′ D^2, of laterally-projecting brackets h, extending from the section D′ and carrying pulleys h^2, and cords or other flexible connections, h', passing around said pulleys and attached at the points h^3 h^4 to the sections D D^2, which are behind and in advance of the section D′, substantially as herein described.

7. In an extension-ladder, the combination of sections, each having its side bars provided on opposite faces with integral tongues d' and grooves d^2, which respectively engage the grooves and tongues of the adjacent section, the tongues being near the lower edges of the side bars and the grooves being near the upper edges of the side bars, substantially as herein described.

8. The ladder-sections herein described, having their side bars or rails each composed of a series of thin strips arranged face to face in a vertical plane and cemented together, substantially as herein set forth.

JAMES E. GILLESPIE.

Witnesses:
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