2 Sheets--Sheet 1.

A. MILLER.

Elevating Ladders.

No. 139,175. Patented May 20, 1873.

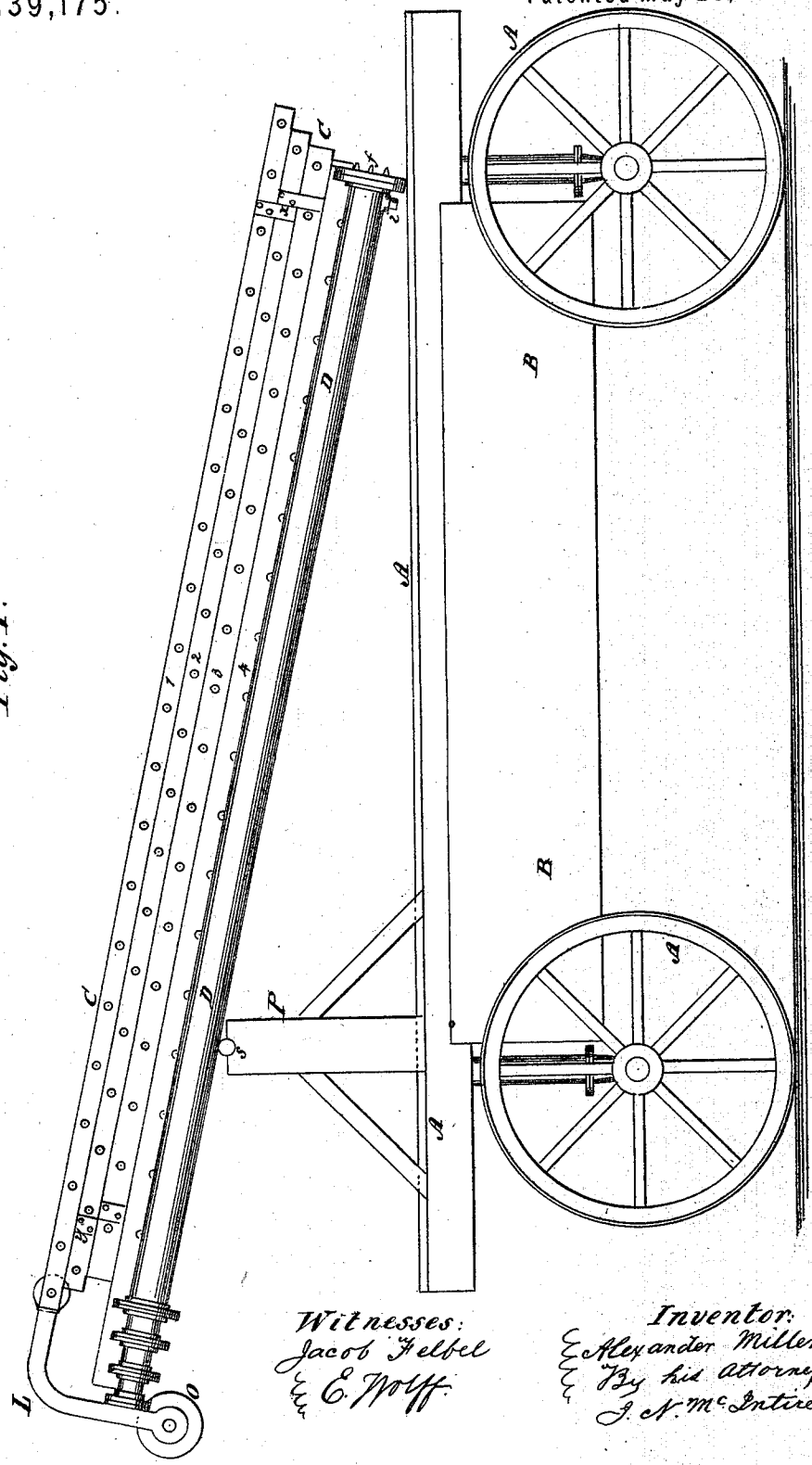

Fig. 1.

Witnesses:
Jacob Felbel
E. Wolff.

Inventor:
E. Alexander Miller.
By his attorney
J. N. McIntire.

2 Sheets--Sheet 2.

A. MILLER.

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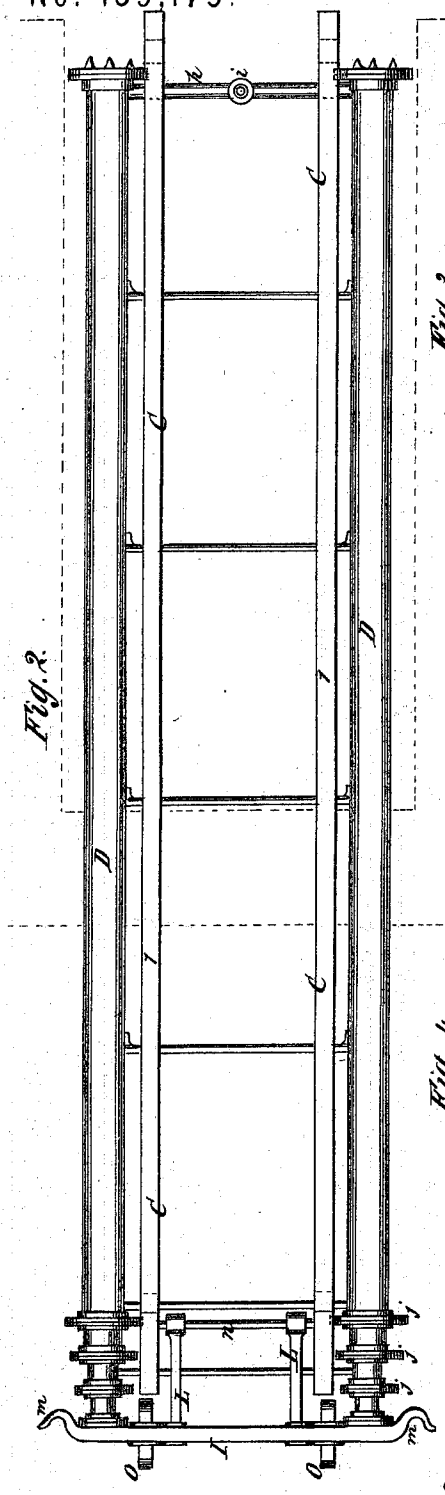

Fig. 2.

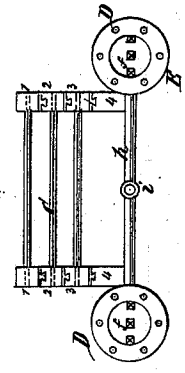

Fig. 3.

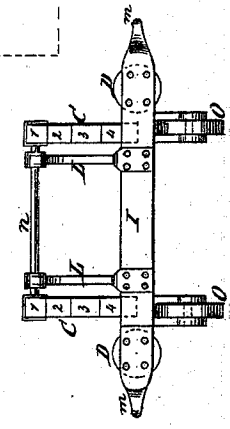

Fig. 4.

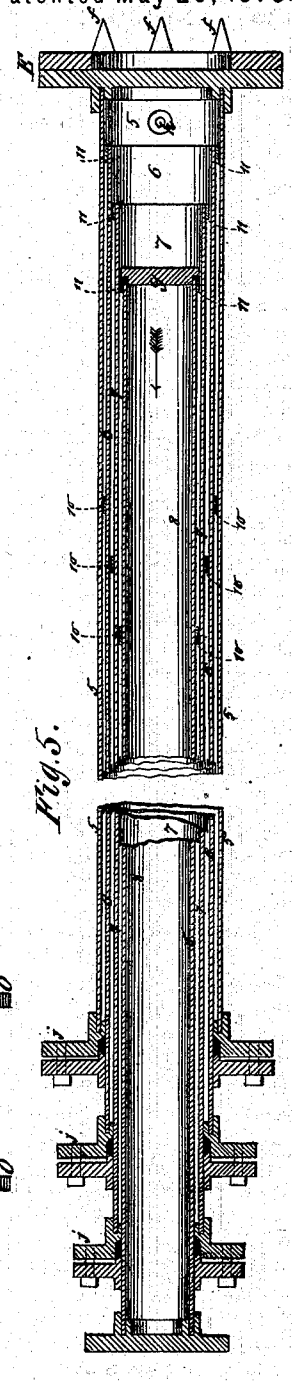

Fig. 5.

Witnesses:
Jacob Felbel
E. Wolff

Inventor:
Alexander Miller
By his Attorney
J. N. McIntire.

UNITED STATES PATENT OFFICE.

ALEXANDER MILLER, OF NEW YORK, N. Y., ASSIGNOR TO GRAFTON T. NUTTER, OF JERSEY CITY, NEW JERSEY.

IMPROVEMENT IN ELEVATING LADDERS.

Specification forming part of Letters Patent No. **139,175**, dated May 20, 1873; application filed December 20, 1872.

To all whom it may concern:

Be it known that I, ALEXANDER MILLER, of New York city, in the State of New York, have invented certain new and useful Improvements in Elevating Ladders; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawing making part of this application.

My invention has for its object to render perfectly practicable and successful a system for affording means of escape from and access to buildings—viz., that in which a gang or series of sections of ladders is employed, provided with a means for sliding the sections one on the other, and elevating them against the building. I propose to overcome all the practical difficulties, which have so far rendered this system comparatively valueless, by the employment of hydraulic pressure applied directly to the system of ladders to be raised; and to this end and object my invention consists in the use, in connection with a suitable system of sliding ladders, or a gang of ladders adapted to slide one on the other, so that the series can be extended out to form a long ladder, and which may be conveniently transported on a truck or carriage, of a system of sliding tubes adapted to receive the action of a column of water from a hydraulic pump or engine, and which may be moved longitudinally one within another by such hydraulic pressure, all as hereinafter to be more fully explained.

To enable those skilled in the art to make and use my invention I will proceed to more fully explain the construction and operation of an apparatus made in accordance therewith, referring, by letters, to the accompanying drawing, in which—

Figure 1 is a side elevation; Fig. 2, a partial top view; Fig. 3, a detail end view, showing the base or lower ends of the hydraulic elevating-tubes and ladders; Fig. 4, a similar view taken at the opposite end; and Fig. 5, a detail (partial) longitudinal section of one set of tubes, on an increased scale, showing their construction and arrangement together.

In the several figures the same part is designated by the same letters of reference.

A represents any suitable truck or carriage adapted to carry the ladders and the hydraulic apparatus. This truck may be provided with a tank, B, to contain the supply of water necessary for the manipulation of the hydraulic pump or engine, and may have attached to it, either at the sides or on top, as may be found most convenient, one or more such pumps, provided with suitable brakes, to be worked by hand-power or adapted to be driven from an engine.

I have not shown in the drawing the pumps and their connections, as their construction and particular manner of their arrangement are not all material and form no part of my invention.

C is a gang of ladders, or a series of ladder-sections, marked 1 2 3 4, which are arranged together so as to slide freely endwise one on another, in a manner well known; and D D (see Figs. 1, 2, 3, 4) are the hydraulic elevator-tubes, by means of which the several sections of the gang of ladders are raised. These elevator-tubes D D are secured, one on each side of the gang, to the lower section 4 of the series of ladder-sections, as shown, and are constructed and operate in a manner to be presently described.

The construction and operation of the tubular elevators or lifters will be best understood by reference to Fig. 5, from which it will be seen that each one of them is composed of four tubes, 5 6 7 8, arranged to slide one within another, after the fashion of telescope-tubes.

The lower end of the outer tube 5 is closed up with a suitable head, E, which may be provided with points *f*, or other means for assisting in preventing any slip on the ground or sidewalk when raising the gang of ladders, and the lower end of the inner tube 8 is closed by a head, *g*, against which the water-pressure is made to act, as will be presently explained. *h* is a pipe connecting the interiors of the tubes 5 5 of the two sets, and provided near its middle with a nozzle, *i*, to permit the coup-

ling therewith of one end of a hose or tube employed to make the connection with the pumps. *j j j* are ordinary stuffing-boxes arranged on the tubes 5, 6, and 7, near their upper ends, as shown, within which the tubes 6 7 8 work or slide. On each of the tubes 8, 7, and 6 are securely fastened two encircling bands or collars, 10 and 11, one at the lower end of the tube, the other a short distance above, (see Fig. 5,) which just fit, respectively, the internal bores of the tubes 7, 6, and 5, the object of which is this, that, when the several tubes are drawn out to the fullest extent, the upper collars 10 shall come against suitable stops, which may be either the inner boxes of the stuffing-boxes *j j j* or other applied stops, and insure the retention within each other of a sufficient length of each tube to afford a stiff support to the distended series of tubes, and a proper bearing of each tube in the upper end of that one which surrounds or encircles it.

The length of this bearing will, of course, be the distance between the collars 10 and 11 of each tube, and this may be varied according to circumstances and the judgment of the constructor of the machine. In the apparatus shown I have made this distance about four feet in a set of tubes designed to elevate the top of the ladders to about one hundred feet.

To the upper ends of the inner tubes 8 is secured a cross-bar, I, (see Figs. 2 and 4,) which permanently connects these tubes, as shown, and which may be formed or provided, at *m m*, with suitable hooks for conveniently carrying up hose. From this cross-bar I extend arms L, permanently attached thereto, which are connected or coupled to the top rung *n* of the uppermost section 1 of the gang of ladders, and to said cross-bar are secured projecting casters or wheels *o o*, which are designed to bear against the surface of the wall of the house to facilitate the sliding up or raising of the ladders.

The gang of ladders, with its accompanying hydraulic elevator-tubes, &c., may be arranged on the truck or carriage, with a supporting horse or truss at P, (see Fig. 1,) in such a manner that the lower end of the gang can be conveniently lowered to rest on the ground, and the bearing-bar or trunnion of horse P made to serve as a fulcrum, and to assist in getting the gang into the inclined position with its caster-wheels against the wall of the house.

The operation of raising the ladders, after the gang C and its attachments are properly placed, is as follows: The nozzle *i* having been properly connected to the hydraulic engine, the pumps are set to work, and, by the hydraulic pressure created, the inner tubes 8 are forced outward or upward, (in the direction indicated by the arrow at Fig. 5,) and as they move along the cross-bar I, through the medium of arms L L, pulls along the upper end of the top section 1 of ladders, the caster-wheel O meanwhile traveling upward against the wall of the house. These inner tubes 8, with the section 1 connected thereto, continue thus to ascend, actuated by the force of the column of water, which presses against the lower heads *g* of said tubes, and as their collars 10 come against the stops on the internal faces (near the upper ends) of the tubes 7 7, the latter one forced or carried along upward, and as the collars 10 of these last-named tubes come against the stops, near the upper end of the bore of the tube of 6 6, these latter are carried on up, and so on until the series of tubes may be drawn out or distended to the fullest or the requisite extent. During this movement of the sliding tubes the first section 1 of the ladders slides along on the next section beneath it until the lugs *x* come against the stops *y*, when the next section 2 is carried along, this in turn, in a similar manner, carrying up section 3 until the requisite height is attained.

It will be seen that by this system of sliding tubes, moved by hydraulic pressure, and carrying the sections of ladders along, as described, a very simple and efficient means is afforded for elevating the sliding sections of a gang of ladders into the requisite position, and to any requisite height. And it will be understood, while, by such a plan as proposed herein, an immense motive power is attainable to raise the ladders and their tubes, the lowering of them may be accomplished by simply turning a cock to permit the escape of the column of water, and their descent be perfectly controlled by the simple manipulation of such escape-cock or faucet.

I have two sets of tubes arranged one on each side of the gang of ladders; but one or more of such sets may, of course, be used by varying the details of the contrivance or apparatus without departing from the spirit of my invention, the gist of which is in the idea of the application of hydraulic pressure by means of a distensible device connected in some suitable manner with the sliding ladder-sections.

In carrying out my invention, in lieu of one or more pumps, and a reservoir arranged on the ladder-truck, as described, the hydraulic engine and water-supply may be entirely separated from the truck, or the pumps alluded to may be worked by one of the steamers now in use, or the hydraulic ladder-raising apparatus may be connected with or made auxiliary to the ordinary steam fire-engine and usual water-supply.

All the various modes of carrying into effect my new method or plan, and the numerous modifications to which my invention is subject, may be perfected and brought into

successful operation at the will, and in the judgment of the skilled engineer and constructor.

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

In combination with a sliding ladder or series of ladders, a piston fitted to slide in a tube or a series of tubes, and operated by hydraulic power, substantially as and for the purpose specified.

In testimony whereof I have hereunto set my hand and seal this 19th day of December, 1872.

ALEXANDER MILLER. [L. S.]

In presence of—
J. N. McINTIRE,
S. F. HUBBARD.