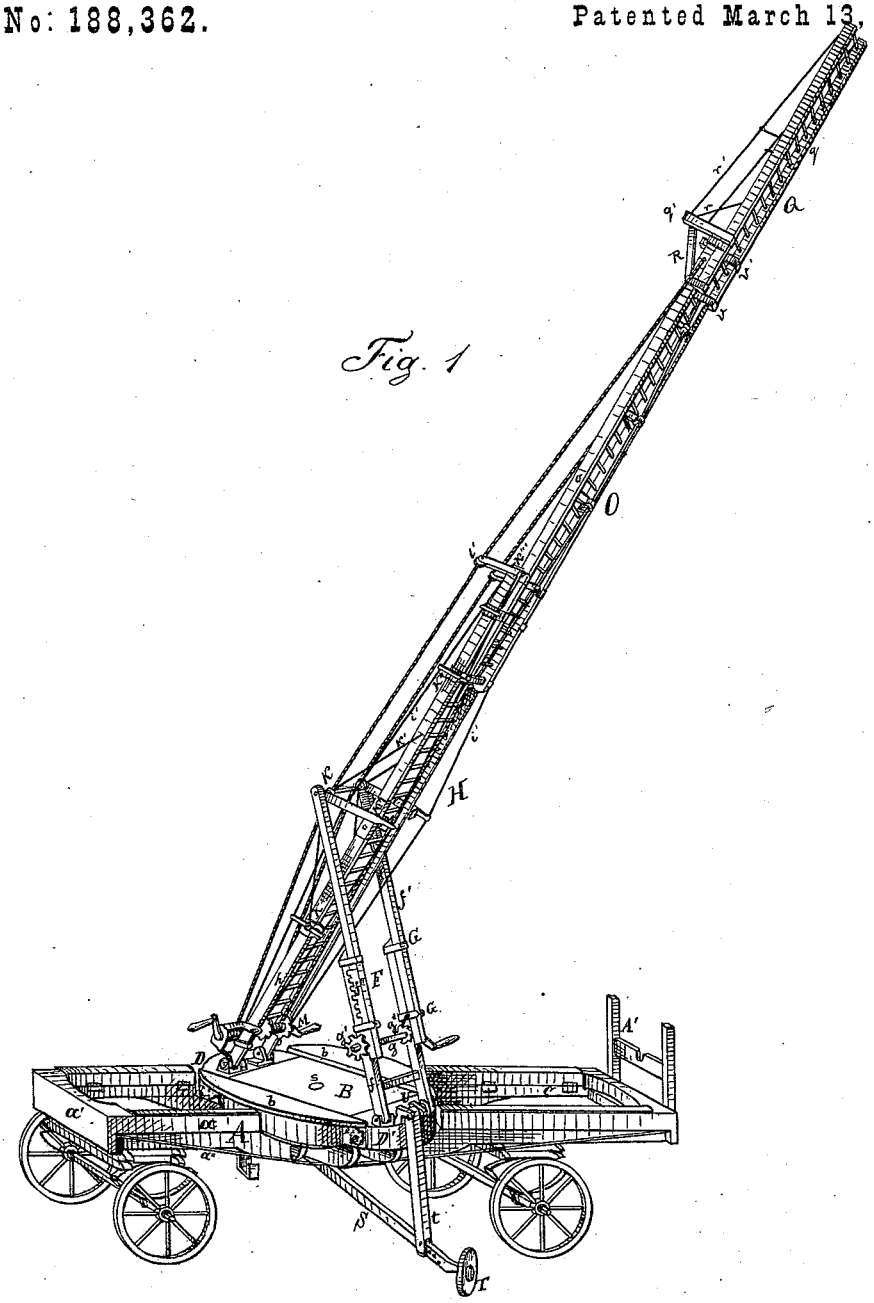
3 Sheets—Sheet 1.

J. HEUERMANN.

FIRE-ESCAPES.

No. 188,362. Patented March 13, 1877.

Fig. 1



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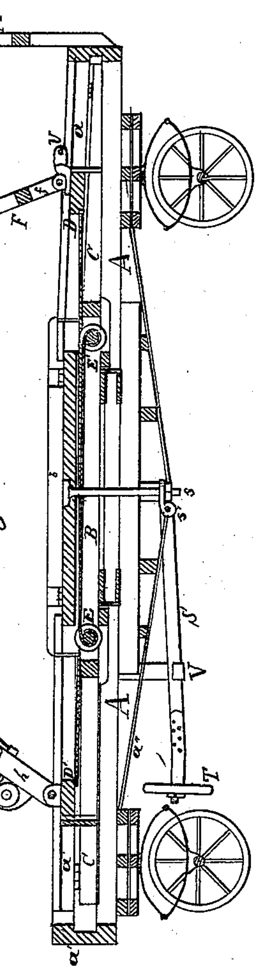

Fig. 3.

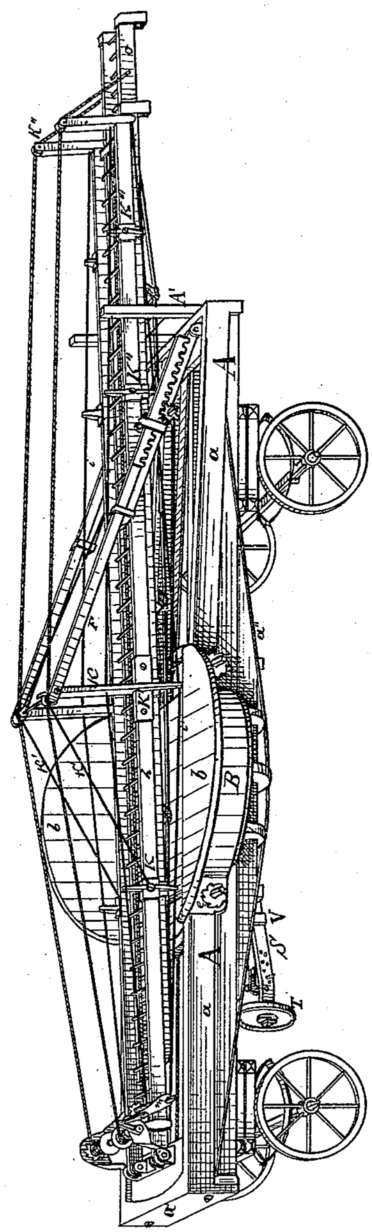

Fig. 2

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3 Sheets—Sheet 3.

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FIRE-ESCAPES.

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Fig. 5

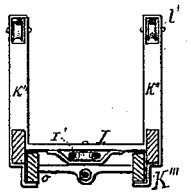


Fig. 6

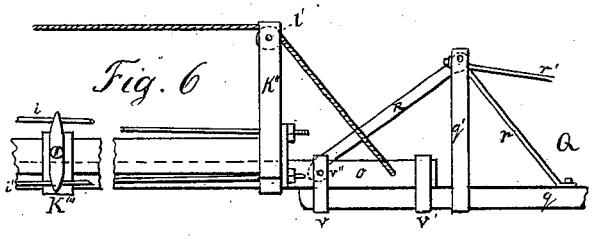


Fig. 4

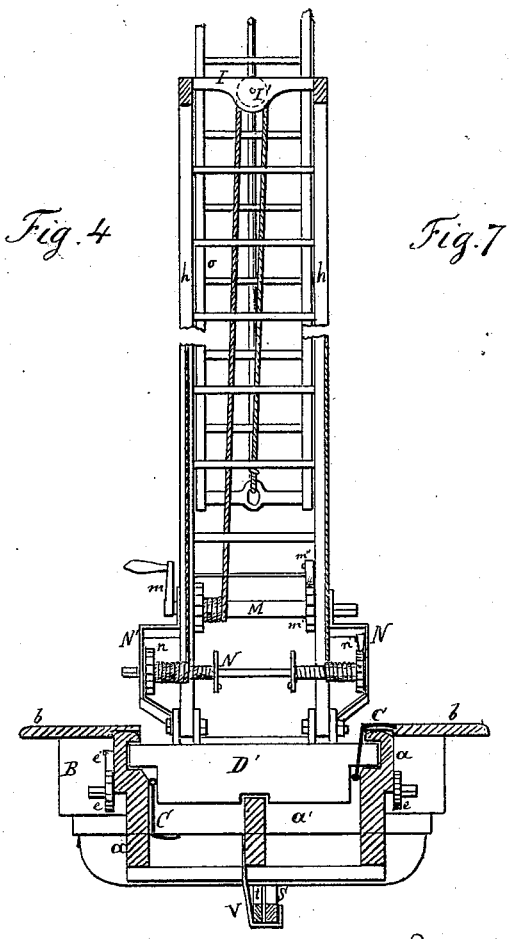


Fig. 7

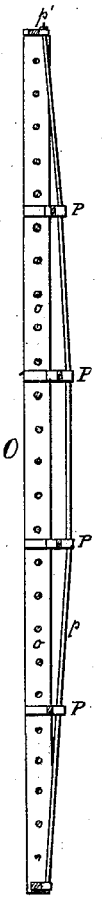


Fig. 8.

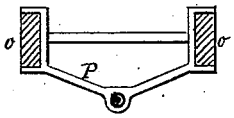


Fig. 9

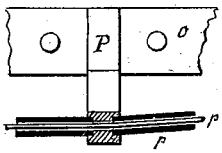


Fig. 10

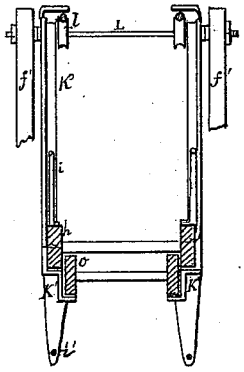


Fig. 11

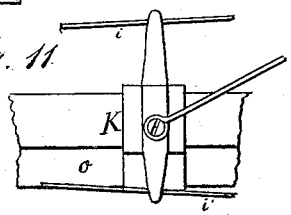
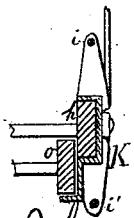


Fig. 12.



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UNITED STATES PATENT OFFICE.

JOHN HEUERMANN, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN FIRE-ESCAPES.

Specification forming part of Letters Patent No. **188,362**, dated March 13, 1877; application filed August 30, 1876.

To all whom it may concern:

Be it known that I, JOHN HEUERMANN, of Chicago, in the county of Cook and State of Illinois, have invented a new and Improved Extension-Ladder; and I do hereby declare that the following is a true and accurate description of the construction and operation of the same, reference being had to the accompanying drawings, being part of this specification, and to the letters and figures marked thereon.

This my invention relates to improvements in extension-ladders which are more especially designed for the use of firemen, and the nature of which consists in combining, with a long wagon-truck and a turn-table mounted upon its center, two cross-beams, sliding longitudinally in the body of said truck-frame, to the top of one of which is pivoted the lower section of the extension-ladder, and to the top of the other one of which is hinged the foot end of a supporting-frame, the top end of which is pivoted to the central truss-post of the ladder. Said cross-beams, when retracted, abut against the end beams of the truck-frame, and when the ladder is to be raised to an upright position they are, by means of ropes and windlasses, drawn toward the center and upon the turn-table, with which the raised ladder may be turned to the required angle with that of the truck.

Further improvements consist in certain attachments to the wagon-truck and turn-table as a protection, for winter use, against the formation of ice between the joints of the working parts, as more fully hereinafter explained.

In the drawing, Figure 1 represents a perspective view of the ladder when extended; Fig. 2, a perspective view when retracted; Fig. 3, a longitudinal section of the truck; Fig. 4, a sectional end elevation of the truck and ladder; and Figs. 5 to 12, detail views of the same.

A truck-frame, A, built of heavy side beams *a*, connected by cross-beams *a'*, and additionally strengthened by truss-rods *a''*, is supported at its ends by suitable wheels, in the usual manner. At the rear end of said truck-frame two standards, A', with a connecting cross-piece, form a saddle for the ladder to rest in when retracted. Upon the center of this truck-frame A is pivoted a turn-table, B, which, for more easy movements, may be supported at its rim by a series of anti-friction rollers. The two opposite sides of this turn-table are recessed to make room for two sliding cross-bars, D and D', while the two sides right angular thereto are provided with hinged leaves *b*, which, when the ladder is retracted, may be turned upward to a vertical position; but when the ladder is raised they are turned down to a plane with the turn-table, when their projecting edges will exclude the water from getting in below the turn-table, and thereby will prevent trouble and delay in operating the ladder during winter-time. The side beams *a* of truck-frame A, for a like purpose, have hinged to their inner sides L-shaped metal sheets C, which, after the ladder is raised, may be turned upward, so as to cover and protect said side beams against ice.

Two windlasses, E and E', are secured in journal-boxes below the recessed ends of the turn-table B, the ends of their shafts projecting through the sides of the turn-table, where they are squared for the attachment of a crank, and are provided with a ratchet-wheel, *e*, and pawl *e'*.

Two cross-beams, D and D', shaped at their ends so as to be guided in grooves cut longitudinally in the inner face of side beams *a* of truck-frame A, have a rope or chain secured around their ends, the ends of which are attached to the windlasses E and E', by means of which said cross-beams D and D' are drawn toward the center and upon the turn-table B, against the shoulder provided by the recesses thereon, where they will form part of said turn-table, and will move in a circle therewith.

Upon the top of each cross-beam D and D' are firmly secured bifurcated plates, the one secured upon cross-beam D to form the pivot for the foot end of a supporting-frame, F, and the other one secured upon cross-beam D' to form the pivot for the bottom end of ladder H. The supporting-frame F, the upper end of which is pivoted to the central truss-post *k* of the lower section H of the ladder, is arranged to be lengthened or shortened. Each

side of the supporting-frame consists of two timbers, *f* and *f'*, placed one against the other, and held together by two stirrups, G. A crank-shaft, *g*, with pinions *g'* and ratchet-wheel *g''* attached thereto, is journaled to the timbers *f*, and racks *f''* are secured to timbers *f'* to gear into pinions *g'*.

By this arrangement the ladder, after being raised, can be adjusted to the required inclination.

In the drawings, Fig. 5 represents a sectional end elevation of ladder-section H; and Fig. 6, a side elevation of the top end of the ladder-section H, with the ends of ladder-section O projecting, and ladder-section Q coupled thereto. Fig. 7 represents a longitudinal section of ladder-section O; Fig. 8, a cross-section of same at *y y*, and Fig. 9 part of an enlarged longitudinal section through center of same. Fig. 10 shows a section on line *x x*, through the central part of ladder-section H; and Figs. 11 and 12, respectively, represent a side elevation and sectional end elevation of guide-plates K and K''.

The extension-ladder consists of three sections. The middle section is arranged or constructed to telescope with the first or lower section, while the third or uppermost section is to be coupled to the upper end of the middle section before the ladder is raised.

The first or lower section H consists of two standards, *h*, with the steps between in the usual manner, its bottom ends being pivoted to the sliding cross-beams D, while its top ends are rigidly connected by a cross-bar, I, (see Fig. 4,) to which a pulley, I', is journaled. To the outer sides of the standards *h* are bolted four iron guide-plates, K, K', K'', and K''', at equal distance apart, for the middle section O of the ladder to slide up and down in. The guide-plates K, K', and K'' also form the shoes for right-angularly projecting truss-posts, through the eyes at the ends of which iron truss-rods *i* and *i'* are passed, and rigidly secured at their ends to the top and bottom ends of standards *h*. Thus, by a double truss, great strength and solidity is given to this ladder-section.

Guide-plates K', Fig. 10, which are placed exactly in the center of ladder-section H, have more extended *k* posts on their top or front side, which are right-angular to the ladder-standards *h*, and, for additional strength, are braced at their extreme ends to the guide-plates K and K'', each by two rods, *k'*. A fulcrum-pin, L, passes through eyes in the ends of these posts, and through the upper ends of the supporting-frame F, thus forming the pivot by which the ladder is raised. This pin L also forms the pivot-fulcrum for two rag-wheels, *l*. Two similar posts, *k''*, Figs. 5 and 6, are cast to the ends of the cross-bar I, which (each of them) has furcated ends, into which also rag-wheels are fulcrumed. To the rear side, and near to the foot end of ladder-section H, a windlass, M, is secured in journal-boxes, the projecting shaft ends of which are squared for the attachment of cranks *m*, while on the sides next to the journal-boxes it is provided with ratchet-wheels *m'*, to be locked by pawls *m''*, pivoted to the inner faces of ladder-standards *h*. A rope secured to the bottom cross-beam of the middle ladder-section O, thence passing up and around the pulley I' in top end of ladder-section H, and thence down to the windlass M, will, by turning said windlass, extend the ladder-section O out from the ladder-section H, and, by locking the pawls *m''* with the ratchet-wheels *m'*, it will hold it in any extended position.

A double windlass, N, in front or top, and near to the foot end of ladder-section H, being journaled in two iron side frames, N', which are rigidly attached to the sides of standards *h*, is provided with two ratchet-wheels, *n*, and pawls *n'*, and has squared shaft ends for the attachment of a crank. A rope, one end of which being secured to one of the two windlasses N, is passed upward over the rag-wheels *l* and *l'* on one side of the ladder; thence it is passed through holes across the top end of the ladder-section O, and thence downward again over rag-wheels *l'* and *l* on the opposite side of the ladder, where the other end is secured to the other windlass N.

This rope not only has to assist in telescoping the ladders after use, but it has the very important duty, also, of trussing the ladder in its first two sections after the same has been extended, as by stretching said rope the strain upon the ends of the second ladder-section O is transferred upon the end posts *k''*, and thence to the posts *k* of ladder-section H, thus bringing about a truss which will accomdate itself to any required length the ladder may be extended to, thereby insuring said ladder against bending and breaking.

The second or middle section O of the ladder consists of two standards, *o*, which, besides the steps between, are firmly secured a right distance apart by a series of iron cross-braces, P, Figs. 8 and 9.

These cross-braces consist of two channel-shaped shoes, each to grasp one of the standards *o*, and are connected by bars, which, for the central brace, are V-shaped, and are nearer to a straight line as the braces are nearer to the ends of the ladder-section. The central portion of said connecting-bar forms an eye, each side of which is recessed, as a bearing for the end of a piece of gas-pipe, *p*. Pieces of gas-pipe of proper length are placed between the cross-braces P, and a round iron rod, *p'*, is passed through all of them and through the eyes in the cross-braces, from end to end of the whole ladder-section, where its screw-threaded ends are secured and drawn up tight by nuts. This truss will strengthen this ladder-section against strains from either side. To the top of each ladder-standard *o* are firmly secured two stirrups, *v* and *v'*, for coupling ladder-section Q, as will be more fully explained.

Ladder-section Q, which will only be re-

quired on very high buildings, consists of two standards, *q*, held together by the steps between. At a point near to the bottom ends of said standards posts *q'*, right-angularly thereto, are rigidly attached, one to each standard. The top ends of said posts are braced to the ladder-standards, each by two diagonal rods, *r* and *r'*, the latter ones of which connect to the extreme upper end of the ladder-standards. To the upper ends of said posts *q'* are pivoted the ends of a pair of bars, R. This section Q is coupled to the section O by inserting the lower ends of its standards *q* into the stirrups *v*, attached to the upper ends of standards *o*, and by securing the lower ends of bars R to the standards *o* by a pin, *v''*, passed through holes in stirrups *v*, and through eyes in ends of bars R, as shown in Fig. 6.

For preventing the ladder from tilting while extended I have provided a supplemental adjustable support, consisting of a beam, S, one end of which is attached to the bottom end of the fulcrum-pin *s* of the turn-table B by a universal joint-link, *s'*, while its other end forms a bearing for a wheel, T. After the ladder has been raised and turned to the desired direction, but before it is extended, the beam S is swung out from under the truck-frame and braced to the cross-beam D by means of a brace-bar, *t*, the upper end of which, being secured in an iron shoe, U, which forms part of cross-beam D, while its lower furcated end is passed over the beam S, where it is secured by a pin put through its end and through one of a series of holes in beam S, so as to regulate its height, to accommodate the unevenness of the ground. When the ladder is retracted the bar S and brace *t* are suspended upon a hook, V, under the wagon-body.

The *modus operandi* for raising and extending this ladder is as follows, to wit: After the building is reached where the ladder is to be employed, the ladder-section Q is first coupled to section O. Now the cranks are attached to the windlasses E and E', and by turning the same the cross-beams D and D' are pulled upon the turn-table B, thereby raising the ladder to an inclined position, after which the windlasses are locked by the pawls, and the cranks are removed. Now, the turn-table B, supporting the ladder, is rotated until the ladder points in the required direction. The next is to turn the L-shaped metal sheets C over side beams *a* of truck-frame A, and to drop the leaves *b* upon the turn-table B, as a protection against water. The beam S is next lifted from its supporting-hook V, swung out and secured to the cross-beam D by brace *t*. After this is done the ladder is raised to a more vertical inclination by extending the supporting-frame F by means of crank shaft *g*, and now the ladder may be extended to its full height by windlass M, and the necessary counter-tension given to the truss-ropes by means of windlass N, when the ladder is in condition for the firemen to go up on it.

For retracting the ladder again after use, all the operations are vice versa to the ones described above.

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

1. A turn-table, B, mounted upon a wagon-frame, A, in combination with cross-beams D and D', as the supports for an extension-ladder, arranged to slide longitudinally in said wagon-frame, but when moved upon the turn-table to form part thereof and rotate therewith, substantially as and for the purpose described.

2. A turn-table, B, mounted upon a wagon-frame, A, and having windlasses E and E' attached, by which cross-beams D and D', sliding longitudinally in said wagon-frame, can be drawn upon said turn-table, and to rotate therewith, substantially as described and shown.

3. As a protection against ice, the L-shaped plates C, hinged to the side beams of the wagon-frame A, and the hinged leaves *b* upon the turn-table, substantially as described and shown.

4. The ladder-supporting frame F, consisting of sections *f*, having a crank-shaft, *g*, and pinions *g'*, and of section *f'*, telescoping with sections *f*, and having racks *f''* upon the lateral edges of its uprights, substantially as described, and for the purpose set forth.

5. The ladder-section H, arranged with plates K, K', K'', and K''' as guides for the telescoping ladder-section O, said plates being provided with rectangularly-projecting struts for the truss-rods *i* and *i'*, substantially as described and shown.

6. The ladder-section O, being braced by cross-bars P and trussed by pipes *p* and rod *p'*, substantially in the manner as described and shown.

7. In combination with the turn-table B and its fulcrum-pin *s*, beam S, wheel T, and brace *t*, substantially as shown and specified.

JOHN HEUERMANN.

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