(No Model.) 3 Sheets—Sheet 1.

R. BELCHES.

FIRE ESCAPE.

No. 402,389. Patented Apr. 30, 1889.

Fig. 1.

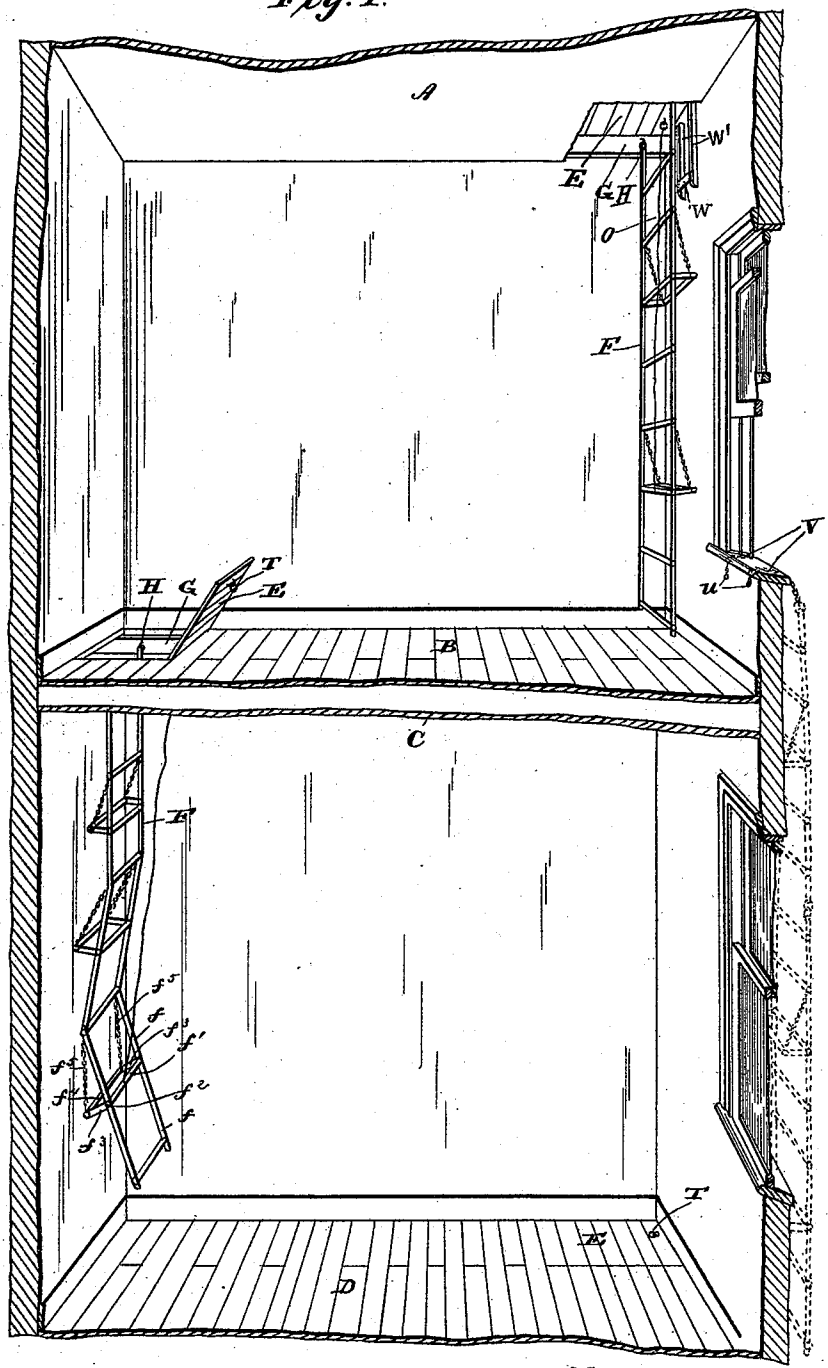
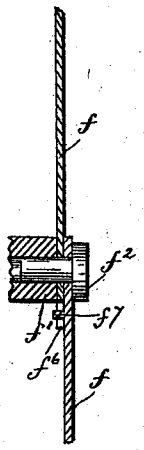


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

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FIRE ESCAPE.

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Fig. 3.

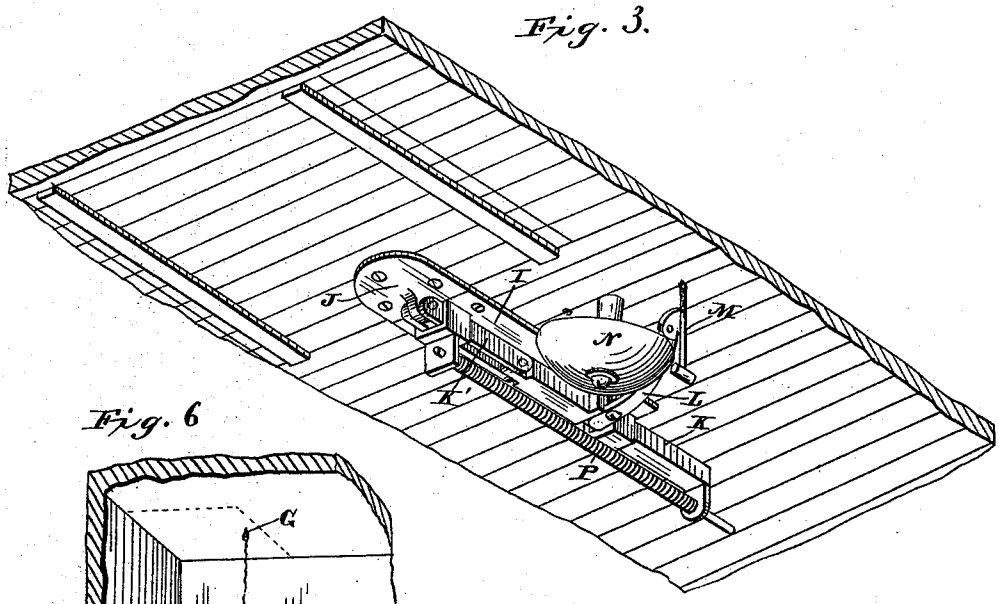


Fig. 6

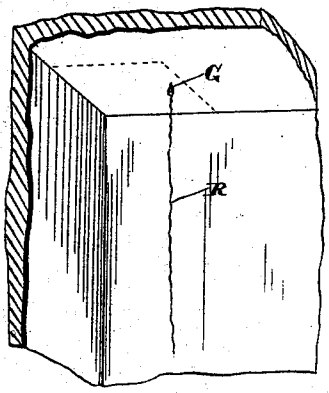


Fig. 4.

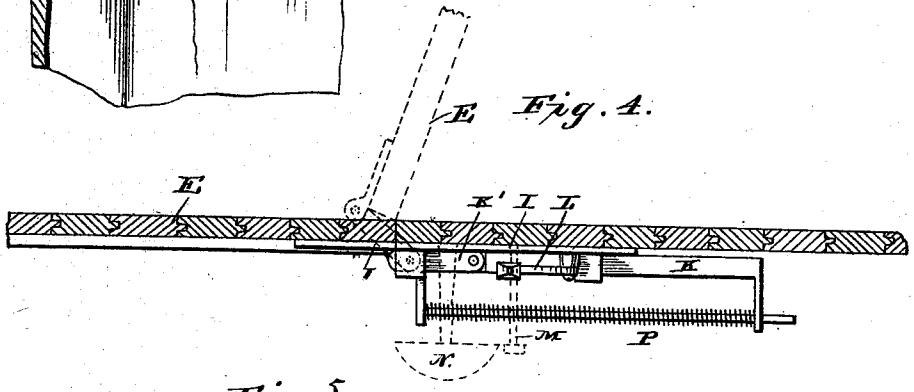
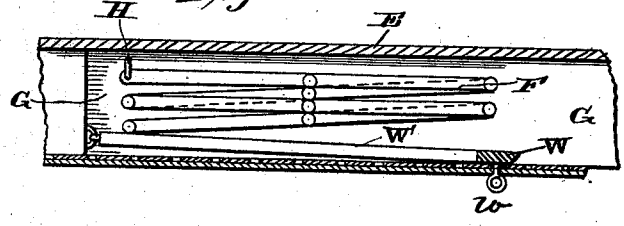


Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

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FIRE ESCAPE.

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Fig. 9.

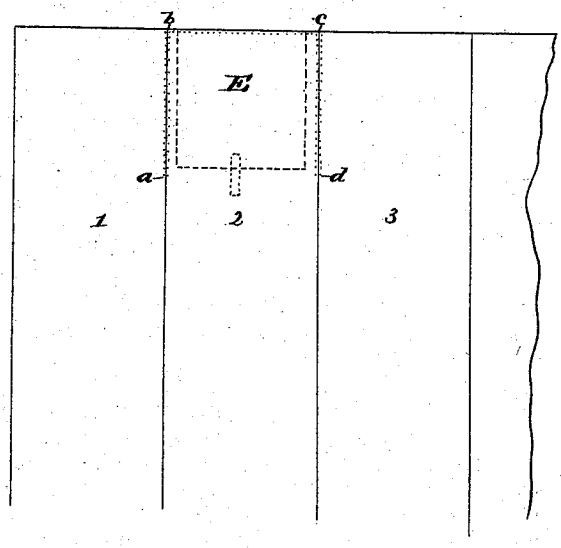


Fig. 7.

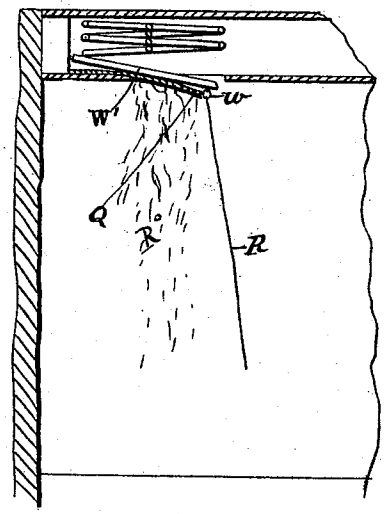


Fig. 10.

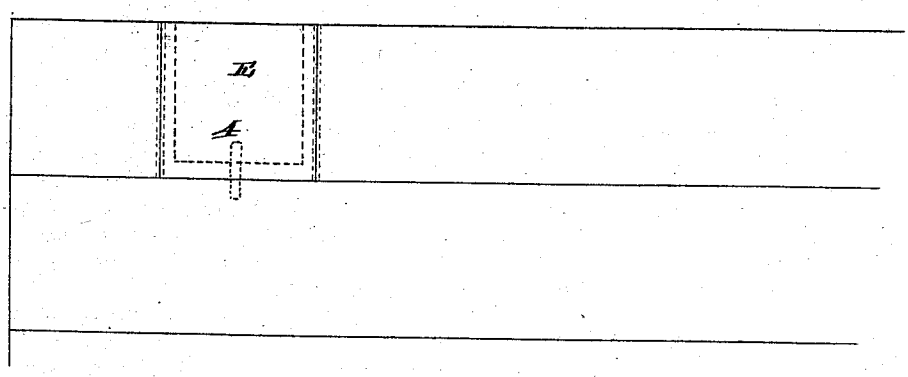
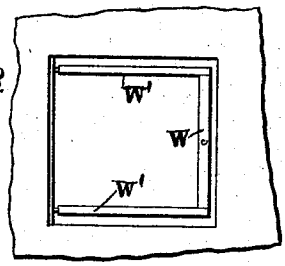


Fig. 8.



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UNITED STATES PATENT OFFICE.

RICHARD BELCHES, OF HAYMARKET, VIRGINIA.

FIRE-ESCAPE.

SPECIFICATION forming part of Letters Patent No. 402,389, dated April 30, 1889.

Application filed August 23, 1888. Serial No. 283,531. (No model.)

To all whom it may concern:

Be it known that I, RICHARD BELCHES, a subject of the Queen of Great Britain, residing at Haymarket, in the county of Prince William and State of Virginia, have invented certain new and useful Improvements in Fire-Escapes; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

My present invention relates, particularly, to improvements upon the fire-escape for which Letters Patent of the United States No. 365,230 were granted and issued to me on the 21st day of June, 1887.

In my said former patented contrivance the ladder illustrated was of rope, and when folded up in the compartment between the floors its lower end was connected to a batten, which extended longitudinally of the laths at the bottom of the compartment, and a bolt passed up through the ceiling below was made fast to said batten, so that, when the bolt was pulled upon, it would cause the batten to pull out the lath or laths upon which it rested, and thus start an opening in the ceiling below, which could be enlarged and completed by grasping the protruding batten and swinging the ladder laterally.

While under ordinary circumstances a rope ladder is found to answer admirably, I have now, in order to meet some objections that might possibly be urged against the employment of rope, devised a ladder composed entirely of metal parts so jointed and arranged as that the ladder may be folded up into small compass and stowed away in the compartment, as before, and yet be perfectly safe from injury by fire, and I have, as a substitute for the batten arrangement above alluded to, provided within each compartment a stout stripping frame or bar, preferably bail-shaped and of metal, extending transversely across all the laths at the bottom of the compartment, and pivoted or hinged at the inner portions to the joist or other permanent object at one end of the compartment, said frame being formed of two bars, one at each side of the compartment adjacent the joists, united at the outer or free ends by a cross-piece, to the center of which is connected the eyebolt, so that when the eyebolt is pulled upon by a person in the room below the said frame will operate to forcibly strip off, one after the other, the several laths at the bottom of the compartment, and thus, with great expedition, provide an opening through which the ladder may drop down into the lower room.

In order that a neat clean-cut opening may be formed in the ceiling when the ladder is pulled through it, I preferably form the laths employed in forming the bottom of the compartment of such a length as to span the distance between the joists and lap over just enough on the joists to enable them to be lightly nailed thereto, and when the plastering is applied I cause a trowel to be run through each coat, save the last or finishing coat, on a line just beyond the ends of the laths, so that I may insert in the groove or crack thus formed a strip of paper or other material for the purposes of preventing the edges of the cut portion from reuniting. The last or finishing coat of plastering is applied over this joint and renders it unobservable. With the ceiling thus prepared a section of plastering with well-defined edges is detached whenever the ladder is pulled through.

By preference I locate the ladder-compartment in the floor of each room at a point remote from the ladder-compartment of the room next above and next below, so that no two compartments in adjoining floors will come opposite each other. Accidents in passing from floor to floor are thus avoided. I also preferably locate each ladder-compartment near one of the walls of the room, in order that when the compartment is opened and the ladder is let down the ladder will hang close to the wall of the room below, and, for the purpose of preventing the ladder hanging so close to the wall as to prevent the user from getting a proper foothold on the rounds or foot-rests, I provide the ladder at intervals with braces, which bear against the wall and keep the ladder off a suitable distance. These braces are preferably hinged to the ladder, so

that they may be folded up when desired, and small chains serve to maintain them in horizontal position when the ladder is in use.

Another feature of my improvement relates to devices for closing the trap-door that forms the top or floor piece of a ladder-compartment. I provide each trap-door with a hinge that permits the door to swing open only slightly beyond the center, using, preferably, the hinge of my own invention, forming the subject-matter of an application for Letters Patent filed by me August 13, 1888, Serial No. 282,586, and I connect said trap-door below by means of a chain or other suitable connection to the lower portion of the ladder in such manner that when the ladder is let down said connecting-chain will prevent its lower portion from dropping to its full extent, so that when a person has passed safely down through the opening into the room below he will, when his foot bears upon the lower portion of the ladder, below the point at which the chain is connected to it, straighten out or fully extend the ladder, and thereby pull upon the chain and automatically close the trap-door above him. This closure of the trap-doors is of service in preventing in case of fire the draft of air from passing up through the opening, and thus feeding the flames. When the ascent is made from one room to that next above, the closed trap-door will respond to pressure upon it from below, and in opening it the lower portion of the ladder will be slightly lifted, as will be readily understood. The chain-connection is preferably so contrived that it may be thrown off and dispensed with when desired.

As the ordinary acceptation of the term "trap-door" is apt to cause objection to the employment of the device in a finely-finished room, I desire to explain the method by which it is in this case formed: When the workman who is laying the floor reaches the proper distance from the wall at which to begin preparing for the escape, he simply saws through each successive plank, following a line through the center of each of the joists selected to form the side of the opening, taking the precaution, of course, to remove the tongue of the plank which forms the edge of the opening, and to which the removable part of the floor is to be attached by the hinge. As he proceeds with his work, the ends of each plank thus separated are driven together, so as to close the joint that is made by the saw. The result, practically, is that the separation is barely discernible when the laying of the floor is completed. Battens hugging the joists are secured to the removable portion, preferably without raising the same, by a workman in the room beneath. The door thus formed is attached to the floor by the hinge before alluded to, and the result is that we have what is in reality a trap-door, but of such a character that the fact of its existence would pass unnoticed, except upon close examination.

It will be here noted that the sections of the ladder between the braces can fold in but one direction, folding in the opposite direction being prevented by the projection f^6 and stop f^7, located on the sections at the intermediate joints. At the braces, however, they can fold in either direction to enable the ladder to be folded into small compass to enter the compartments. (See Figs. 5 and 7.) When the ladder is extended, the braces rest against the wall, and as the joints intermediate the braces cannot give toward the wall a secure foothold may be obtained on every round.

One intermediate joint near the bottom of the ladder is made to bend in both directions, as shown in Fig. 1, and to the section below this joint is secured the door-operating device, as will be readily understood.

As in my former patent, the ladders of several compartments are susceptible of being removed and joined together when escape on the outside of the building is required or desired, the braces on the ladders in this event serving to keep the ladders sufficiently far off from the wall to enable a secure foothold to be obtained on the rounds in descending.

In the accompanying drawings, which show one embodiment of my improvement, Figure 1 represents a sectional elevation of parts of three floors of a house equipped in accordance with my invention. Fig. 2 is a detail sectional view of a portion of one of the ladders, illustrating the manner of connecting the metal side pieces to the rounds or foot-rests. Fig. 3 is a perspective view of the trap-door for covering one of the ladder-compartments and the hinge and alarm apparatus connected therewith. Fig. 4 is a sectional elevation of the same, showing in dotted lines the position of the trap-door when raised. Fig. 5 is a sectional view taken through one of the compartments, showing the folded ladder and the lath-stripping bar arranged therein. Fig. 6 is a view showing the eye-bolt and cord arrangement for drawing the ladder from an upper compartment to the room below. Fig. 7 is a sectional elevation showing the position of parts in the act of pulling the ladder from an upper compartment. Fig. 8 is a plan view of the open compartment with the stripping frame or bar within; Figs. 9 and 10, views showing the different ways of arranging a carpet to cover the trap-door and yet admit of the opening of the latter when desired.

Similar letters of reference in the several figures indicate the same parts.

The letters A and B represent, respectively, the ceiling and floor of an upper room, and C and D the ceiling and floor, respectively, of the room in the next lower story.

E represents the trap-doors of the several ladder-compartments; F, the ladders; G, the joists or beams having screw-eyes or staples

H, to which the upper ends of the ladders are adapted to be hooked. Each ladder F is composed of side bars, *f*, Fig. 2, preferably of strap-iron, and rounds or foot-rests *f'*, of iron piping, jointed together by means of headed pivot-bolts f^2, passing through orifices in the lapped ends of the side pieces and driven into the piping *f'*, as shown clearly in Fig. 2. This mode of connection enables the ladder to be readily folded up into small compass within the compartment when not required for use.

At intervals on the ladder—say at every second or third joint—additional pieces, f^3, of strap-iron, are hung upon the connecting-bolts f^2, and these in turn are connected to cross-pieces f^4, which may be tubing like the rounds *f'*, the whole being held in position by means of suitable chains, f^5 f^5, and constituting the braces hereinbefore alluded to for keeping the rounds of the ladder away from the surface of the wall.

The sections of the ladder—preferably only those between the braces—are provided with extensions f^6, that project beyond their point of connection with the cross-pieces *f'*, and these extensions engage with stop-pieces f^7, so as to prevent the joint turning but one way. This provision gives lateral stiffness to the upper portion of the ladder and enables a person in the room below, by grasping said upper portion, to detach the ladder from the upper fastening in the compartment when desired.

The hinge for the trap-door (best shown in Figs. 3 and 4) has its base-plate I secured by screws or otherwise to the under side of the floor, with its front edge in proximity to the division-line or trap-door opening and with its hinge-plate J secured to the trap-door, as shown. When the door is opened, it pivots or turns on the edge of the opening, and, first drawing the bolt K K' straight out, causes the arm L, which is worked by the bolt, to trip the bell-hammer M and ring the bell or gong N. As the door continues to open, however, the shorter pivoted section, K', begins to turn and rise till the door assumes the position shown in Fig. 4, slightly back of its center, where it will remain till it is moved forward over the center either by hand or through the instrumentality of the chain O, Fig. 1, connecting it to the ladder, as hereinbefore explained. As the door goes over the center, the spring P, which was compressed by the opening of the door, will assert itself and draw the bolt back to first position and close the door.

By the provision of the alarm-bell N it will be seen that the trap-door cannot be raised without giving warning of the fact, and to prevent access being had to the compartment from below without an alarm being sounded a bell may be arranged to be rung whenever the ladder is drawn down or disturbed; or, as suggested in my former patent, a system of electrical signals may be adopted which would prevent the use of the ladder from either above or below without due notice being conveyed to the office, if in a hotel, or to some other central point of buildings of a different character.

For the purpose of making the ladder-compartments as thoroughly fire-proof as any other part of the floor structure of the building, I propose to line said compartments with sheet metal throughout, including a sheet-metal lining to the trap-door and a lining to the bottom of the compartment.

The lining on the bottom of the compartment is placed just above the laths, and when the stripping frame or bar is pulled to open the compartment this lining assists in deflecting the falling plaster against the side wall of the room, as shown in Fig. 7, Q representing the lining, and R° the detached plastering.

Most if not all of the fire-escape contrivances that have up to this time been put into practical use to any extent present a more or less unsightly and cumbersome appearance whether applied interiorly or exteriorly of a building; but my appliances are so thoroughly hidden away from view in the compartments between the floors that only the pendent cord R and pulling-hook S in the ceiling on the one side, Fig. 6, and the ring T, Fig. 1, for raising the trap-door on the other, are at all visible.

I should perhaps add that where the floor in which the trap-door is located is to be carpeted the carpet is preferably laid, if practicable, with breadths running parallel to the length of the door, as indicated in Fig. 9, in which case the end of the breadth 2, which covers the trap-door, is lightly tacked along the edges *a b* and *c d*, instead of being sewed to the adjacent breadths 1 and 3, and is also lightly tacked at the end from *b* to *c*, so that when the trap-door is raised the flap of carpet will readily be detached and lifted with it.

Where it is necessary or desirable to run the breadths of carpet the other way across the room, as shown in Fig. 10, it is only necessary that the portion 4 of the breadth covering the trap-door be cut, and that the resulting raw edges be turned or bound, so as to make a neat smooth joint.

The mode of uniting my improved appliance is in the main the same as that indicated in my former patent.

To descend from a higher to a lower room, it is only necessary to raise the trap-door in the floor by means of the hand-ring resting on the carpet, the carpet disengaging itself from the floor at the same time, push it as far back as the hinge will permit it to go, and press sharply with the foot upon the rung of the ladder that now comes into view, so as to break out the bottom of the compartment and permit the ladder to unfold and drop down into the room below. Descent through the compartment-opening is then easy. In ascending from a lower to a higher room, the

ladder in the compartment above is liberated and caused to drop down by pulling upon the cord R, attached to eyebolt *w*, that connects with the piece W, uniting the side pieces, W′, and forming the stripping frame or bar. Where a descent is to be made from the outside through a window, two or more ladders may be hooked together and dropped out of the window, the uppermost one being made fast by means of short chains, such as V, and hooks U, provided beneath or upon the window-frame, as shown at the right of Fig. 1.

It will thus be seen that I have provided a means simple, reliable, and practical, devoid of all risk to those using it, and with almost a total absence of any objectionable features. It places at the command of any individual, no matter what may be his location at the moment, who suddenly finds himself confronted by the dangers of fire, a method whereby ascent or descent, as the occasion may demand, (these being the factors indispensable to his safety,) is immediately available, and this primarily within the building. Should, however, escape be alone possible by the exterior, which would in fact be but rarely the case, my escape provides for the necessity in a manner fairly comparable in point of efficiency with that of any of the exclusively outside appliances now in existence.

While the value of the device to those in jeopardy in providing them with the means of escape is thus great, it is as a means of enabling assistance to reach them not less so. There will be no necessity for awaiting the arrival of trained firemen with scaling and extension ladders before those below can hasten to the succor of those above. Neither in the generality of cases will the firemen have to depend, as at present, upon the above articles of their equipment for the proper performance of their risky duties. Not only will the device materially reduce the great personal risks they have to encounter, but also will greatly facilitate them in the execution of their work. Again, as a consequence of the automatic closing of the apertures in the floors after use, as hereinbefore described, it may fairly be assumed that every section of the building will remain closed after its vacation by the inmates, thus impeding the advance of the flames and incidentally adding greatly to the chances of their subjugation. It will also be readily perceived that from the ease of access it affords to all parts of the burning building from this last point of view it is again of great value to the firemen.

I claim as my invention—

1. The combination, with the ladder composed of the strap-iron side pieces jointed together at the rounds to fold toward each other in but one direction, of the braces pivoted to the ladder and extending on the side toward which the sections of the ladder fold, substantially as and for the purpose set forth.

2. The combination, with a trap-door and a flexible ladder, of a connection between said door and ladder, whereby upon fully extending the ladder the door will be automatically closed, substantially as described.

3. The combination, with a trap-door and a flexible or jointed ladder, of a connection between the ladder and door, which raises a portion of the ladder when the door is opened and automatically closes the door when the ladder is fully extended, substantially as described.

4. The combination, with the trap-door, of the hinge for holding the door off the center, the flexible ladder, and the door-closing connection between the door and ladder, substantially as described, for the purpose specified.

5. The combination, with the ladder-compartment between adjacent upper and lower rooms, of a stripping-bar in said compartment extending transversely across the laths, and a device, such as a bolt, extending through the ceiling below by which to operate the said stripping-bar from the room below, substantially as described.

6. The combination, with a ladder-compartment and a ladder therein, of a hinged stripping-bar extending transversely across the laths at the bottom of said compartment, substantially as described.

7. The combination, with a ladder-compartment and a ladder therein, of a bail-shaped stripping-bar extending transversely across the laths at the bottom and at each side of the compartment, substantially as described.

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