

doors and sashes, wooden furniture, and, as in the case of hotels, etc., thickly upholstered furniture, curtains, portieres, carpets, matings and the like, it follows that, even if in other respects fireproof, that is, if the building be destructible by virtue of its iron joists and concrete floorings, its brick partition walls and iron roofing, still does it and must it contain a large amount of combustible and smoke producing material, and the gases more than enough when ascending from one single lower floor or story to saddle all the inmates of the floor above. The smoke and heated gases from below will immediately ascend through every stairway, through every elevator or sliding cupboard, through ventilating and hot air or hot water flues, or recesses in the walls. They will follow up along and through the holes made and left by plumbers around soil and sink pipes, electric and other wiring, and they must be counted on as surely as the fact that they cannot be excluded, eliminated or got rid of.

It follows that as no one can face such smoke and heated air or gases for more than a few seconds at a time, without the risk of choking, the way out of the burning building must be immediate. To have to grope through a long and maybe winding corridor to reach a fire escape at the end of it is inadmissible, impracticable. No one can stand the smoke for a sufficient length of time to do so. The fire escape must be at hand. It must be everywhere, with nothing more to do to reach it than to step over your window sill on to an adjoining balcony, or, in the case of a person occupying a front room in a hotel, cross the corridor into and through the rear room opposite and through the window thereof on to the said balcony leading to the fire escape stairway. There is no other possible certainty of escape than by the means I propose. Portable fire escapes may be and have been efficient in cases of private residences, or buildings where there are only half a dozen, or a dozen people to be saved, the brigade having time to mount the ladder and make as many trips up and down as there are human beings to remove before the fire gets sufficient headway to render escape impossible by that means—but many impediments exist nowadays to the free use of the fireman's ladder, such as lines of wire and cables for telegraphing, telephoning, electric lighting, and electric transit, and oftentimes the ladder cannot reach the higher upper floors or stories.

Elevators cannot be relied on for evasion in case of fire, as, though the car and its surroundings be thoroughly fireproof and the fire or flames cannot travel through them from one floor to another, they act as chimney flues, the smoke and heated air rising through them to the exclusion of any possibility of escape in that direction. The iron stairways stipulated in the Boston and New York fire acts are no better than the elevators just alluded to, except that until invaded by smoke and hot air from a fire below, a larger number of inmates might pass out in much less time, than by the comparatively slower elevator process, due to the necessary intermittency of its trips up and down.

Fire escape ladders attached to outer walls are now to be found in very many instances, and it is unfortunate that we attach too much importance to their existence and seem to think that provided buildings have such ladders all is right and safe. Now, this is in most cases quite the contrary. Such ladders are no doubt of some use to able-bodied men and women, but of what use, let me ask you, gentlemen, is such a ladder to a child, to a young and delicate female, to an old man or woman, to an infirm person, even if it could be easily reached from any part of the building, which it never is, and never can be, since, as before stated, no man, woman or child can before being stifled reach such a ladder through a long and winding corridor. Again, there are those who, though otherwise able to take care of themselves, become dizzy and helpless the moment they look down from any height, as from the upper floors of a building, and to whom the ladder would also prove useless. For a factory, no doubt, a ladder may answer, as the inmates are all able-bodied persons; but what about an asylum for the old and infirm, what about a convent, a college, with dormitories generally in the attic or upper floors, the other stories being used as class rooms, etc.; what is to be done in the case of a hotel with bedrooms in the upper flats and not extending below the third.

I think I may be allowed to say in my own name and in the name of the whole profession that nothing but a regular and commodious stairway can be considered safe under the circumstances, and this stairway must have no direct communication with any part of the building from which escape is to be had. This is imperative, and a *sine qua non* of the absolute safety of the proposed system: for, as already stated, if the stairway to be used as a fire escape does communicate with the building or apartments to be subserved, and if any one of these apartments be on fire, the ascending column of smoke and heated gases will effectually prevent escape in that direction. The communication must be indirect, that is, it must be from the building to an outer landing and from the latter to the stairway, thus preventing the possibility of the existence of any current through the shaft, capable of drawing the smoke and heated air into it.

Now, the proprietor of the hotel, if it be one, will not (you may take your oath on it) for the sake of an eventuality which may never occur, deprive himself of a single foot of otherwise available space within the walls of the buildings; and if the stairs were built within the building, and taking up, as they would and must do, the space of an ordinary upper floor bedroom, that is one room on each flat or 5 to 6 rooms in the total height, the scheme would be objected to and no proprietor might be found to carry it out. And not only must no otherwise available space be devoted to the purpose or sacrificed as it would be said to be, to a doubtful eventuality; but neither would the manager of the establishment allow of any of his arrangements or requirements being sacrificed in the premises. None of the communications from one apartment to the other on the ground or any other of the floors of the edifice must be in any way impeded.

In the case of all buildings with interior courts for light and air the proposed fire escape stairway must, as shown on the accompanying sketches, be erected in the rear of the building, where it can be done inexpensively of 12" or even 8" brickwork, instead of towards the front where it would have to be made an architectural feature of the building and, therefore, ten times more costly than where proposed, as in such case the galleries would also have to be made architectural features of the design and so much more costly on that account. The stairway being in the rear, and as, to render escape effective and complete, the front or open must be reached, then must a corridor be made right through and through the building, and this corridor must be fireproof to be of any real use; and to be fireproof it must be like the stairs themselves, cut off from all possible communication with the remainder of the building, or in other words there must be no other door or opening into it or leading from it than the doorway from the foot of the stairs towards the rear and the door at the front or the outer end of it. This corridor should be situated at ground floor level, the level at which the inmates must escape into the adjoining street. But this would cut off communication between those portions of the building on either side of the corridor. No other solution, therefore, presents itself than that of elevating the corridor to a height sufficient to pass under it.

Now, we all know what a mezzanine is, or an *entre sol* as they call it in France. This mezzanine or dwarf story has a most important function to perform by being taken in or left out to suit. For instance, say the clear height of the first or main story of the building, whatever it may be, is 18 or even 17 feet. This may be divided into a 9 or 10 ft., and a 7 ft. story with an allowance of one foot or less in height for the floor between the two, and while the entrance hall or vestibule, stores, dining, meeting and other large and important rooms on said first floor would be made of the full height of the story, or 18 feet, other rooms for secondary purposes and of smaller dimensions would only be made say 10 ft. high with a 7 ft. mezzanine above them, to be devoted to servants' bedrooms and other domestic purposes with convenient stairs for access to them here and there. Through this mezzanine or *entre sol* would the fireproof corridors therefore pass, as shown in section, and thus the proposed system of fire escape becomes complete, certain and effective, without the possibility of giving rise to one single complaint on the part of the proprietor, tenant, occupant or manager of the establishment; for an inspection of the plan and section will show that from every story of the building above the 1st from which escape can be had direct into the street, flight will be simultaneous and, so to say, instantaneous, every occupant of a rear room stepping out direct over his low window sill into a narrow iron gallery (of open lattice work, not to interfere with the light below) communicating with the stairway, while each occupier of a front room has merely to cross the corridor and pass through the room opposite his own to get access to the gallery staircase. There can be no jamming of the occupants of one floor by those of another, for since the exit from the room is simultaneous on each flat the occupants thereof will be simultaneously or at the same time descending their respective flights of stairs.

It only remains to say that in the case of a church or place of worship, a music hall, a theatre or circus, with more than a single tier of boxes or galleries, the fire escape galleries or balconies must of course be towards the street or open, in which case they would be made ornamental features in the design, as in the new theatre at Antwerp in Flanders where to each of the tiers of boxes there is an outer gallery or a balcony continuous around the building and 25 exit doors to each story with stairs descending from the fifth tier to the fourth, from fourth to third and third to second, whence the last flight of stairs or that to reach ground level is temporarily suspended to preclude entrance to the buildings and released in case of fire by merely pressing the foot upon a spring.

Now, gentlemen, you will be naturally curious as to the cost, that is, the additional cost of carrying out the scheme, and to leave no room for doubt in the premises I annex an estimate thereof, founded on a closely detailed calculation of all the quantities, where on cubing the building at only to cents a foot we get say \$160,000 for a hotel 200 feet by 100 feet and 100 feet in height or five stories, exclusive of basement and attics or mansard story (7 floors in all). The fire escape, including, as already set forth, iron galleries around each of the two inner courts, one to each story above the first or main floor, with two stairways, one to each court and corresponding fire proof corridors and stairs to street level, comes to \$6,546 or very nearly 4 1/10 per cent. of cost of building. In the case of a similar building used for manufacturing purposes and composed of large apartments and where the furniture and upholstering being a minimum and the smoke from an incipient fire below much less in quantity and less intense, and therefore less hurry required in vacating the premises, the length of gallery to each floor might be reduced by half, which would reduce the additional cost of carrying out the system to something less than 3 per cent. of the cost of the structure.

ESTIMATED ADDITIONAL COST OF FIRE ESCAPE FOR ANY BUILDING CARRYING OUT THE SYSTEM.

Taking the building to be 200x100 ft. or 20,000 sq. area with deduction of two open courts of 40x50, we get net area of 16,000 ft., which into 160 ft. high, gives 1,600,000 ft. cube at 10c=160,000.00.

FIRE ESCAPE.

Grth of courts, 180 ft. x 2 = 360 ft. x 100 ft. x 100 ft. lin. in.	
balcony 2 1/2 feet wide (see detailed estimate of fl. lin.) at \$1.85	\$3,330.00
Add cost of enclosure walls to stairs (see detailed cat.) 3800 x 2	1,600.00
Add cost iron stairs (see also detailed estimate) 225.00 x 2	630.00
Add cost of fire proof corridors through the building from rear to front (see detailed estimate on sheets of diagrams, \$493.00 x 2	986.00

not quite 4 1/10 % of cost of building. \$6,546.00