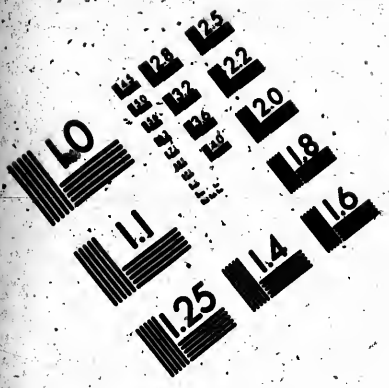


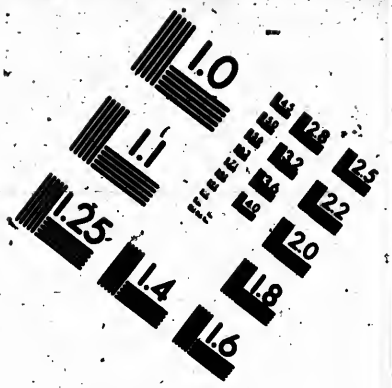


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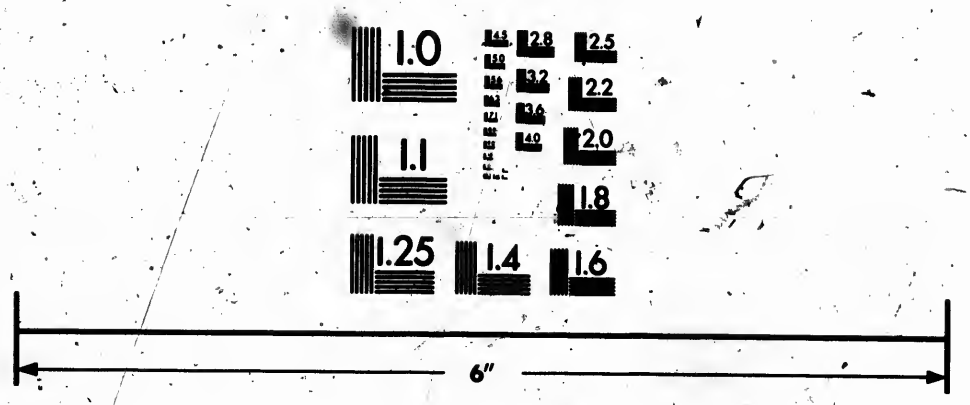


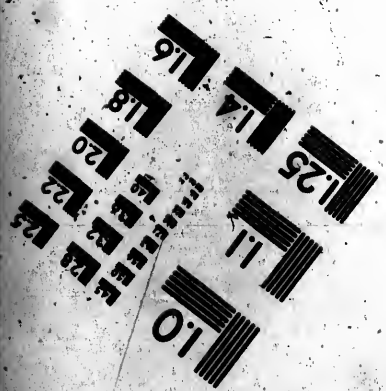



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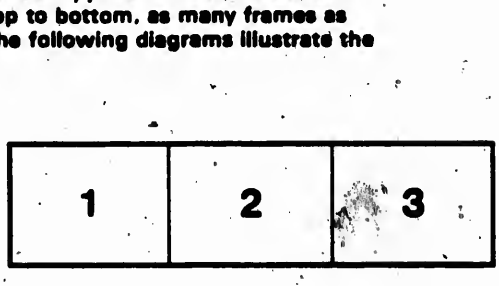


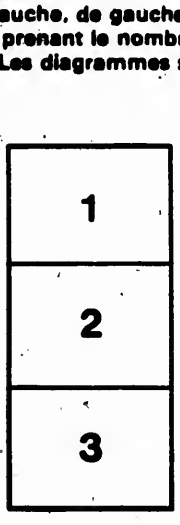


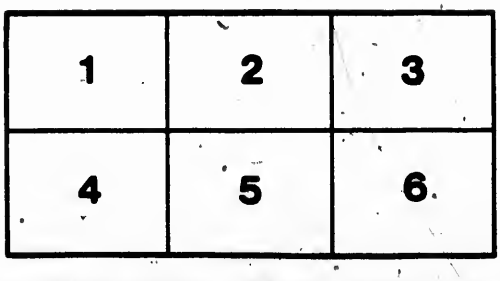

A practical Solution of the

# GREAT SOCIAL AND HUMANITARIAN PROBLEM

## ESCAPE FROM BUILDINGS IN CASE OF FIRE

*A paper read before the Royal Society of Canada during its May Session 1887.*

BY C. BAILLAIRGÉ A MEMBER OF THE SOCIETY

In 1876, after the disastrous fire at the Brooklyn theatre, where not less than 246 human beings perished in the flames; a public meeting was convened at Quebec and the city authorities requested to have a report prepared on the existing means of escape from its public buildings in case of fire, with suggestions as to such additional facilities as might be advisable.

The author of this paper, at the time, visited and reported on some 93 buildings, comprising schools and other educational establishments, convents, asylums, hospitals, hotels, manufactories, theatres, churches, &c., pointing out in each case the existing facilities for escape and recommending others of an indispensable nature.

But alas for the inconsistency of our human nature: when the report was ready, in little more than six weeks after it was ordered, the whole matter had been entirely forgotten and the committee never met again to read the report or take any action on it.

Since that date we have read of the destruction of a theatre at Vienna, where more than six hundred persons lost their lives. Again another theatre at Bordeaux, France, was the scene of human cremation. Convents and schools have contributed their hundreds to the yearly list of casualties by fire; the latest horror being that of the hotel at Buffalo.

Hardly a day elapses but what the newspapers chronicle some disaster of the kind which is no sooner read than forgotten, in our shear heartlessness for the fate of our fellow beings.

These accidents are waxing more numerous than of old, due to the increasing consumption of light and resinous woods in the construction of buildings of all kinds; while in France where oak and other hard grained woods, as elm and the like, are almost exclusively employed, or have been for years, a disastrous fire is of the rarest occurrence.

The danger of fire seems to be enhanced also, now a days, by the varied modes of heating buildings by hot air and other furnaces, the pipes from which are allowed to be in absolute contact with the surrounding woodwork; and even electric light wires are suspected of doing mischief in many cases.

The remedy must not be costly, though sufficiently so to be effective and practical. It should not enhance the cost of any building by more than from 3 to 5 per cent of the total expenditure. Nor must it subject the inmates to any inconvenience, the proprietor to any yearly loss of rental, by taking up space which might be devoted to purposes of every day utility; for no man, woman or even child when old enough to know the difference, will ever consent to put up with daily and constant inconvenience of any kind, for the sake of an eventuality which, though it does happen every day in some part of the world or other; still, it may not happen, one is always led to hope.

Nor must the escape be any disfigurement to the structure; it must not in any, even the slightest manner, mar its appearence; for, as with the consideration of permanent inconvenience or loss of space, so would no permanent eye sore be tolerated, to guard against an event which may never occur.

The danger to inmates from fire, may no doubt be lessened by fire-proofing; that is by the introduction of none but brick partition walls instead of stud, iron joists in lieu of wood, with concrete filling in between them, iron frame work for the roof and other like precautions; but floors will continue to be made of wood, and doors and windows, cupboards, wardrobes, closets and the like; and even from the so called fire proof building, must there be some practical mode of exit in case of fire; as the amount of woodwork though so much less than in an unprotected building, must be always such as to cause intense heat, and such stifling smoke as to render escape impossible by the ordinary stairways of the interior.

The means of escape must be close at hand, they must not have to be sought for by ascending to or descending from a separate flat or story, nor by groping in the dark and smoke through any long stretch of corridor. In a word the escape must be in reach of the very window of the room occupied by the inmate, or he must have no more to do, no farther to travel than merely cross the corridor to get at a window in the rear, from any of which exit must be easy and certain.

For years have I sought in vain, throughout all the scientific publications of the world, for any thing bordering on a really practical suggestion, an approach even to the solution of the problem of escape from fire.

Some of those which have been devised, such as interior wells and staircases, have only acted in a way to increase the danger, hasten the destruction of the building and render escape doubly impossible; by acting as flues and ventilators, creating such a draught and suction of the flames as to cause them to invade the whole building, every story of it simultaneously.

Hundreds of rope, iron and other ladders have been devised: firemens' fire-escape ladders; ladders to be secured by one end to a window sill in the interior and the loose end thrown out as required; ladders to be hauled up from the exterior by first firing a ball of twine into the window by means of which the inmate can do the needful; ladders permanently fixed to buildings, either on the front or rear; certain water conductors made to act as such by the insertion of spokes, pegs, handles, treads or whatever you may please to call them, one of which I could have reached from the 7th or attic floor of the Palmer house Chicago, and at each corner of the building.

Again have there been a variety of hoists invented and patented for letting persons down by means of a bag or basket suspended from above: canvas and other shoots by which a person could slide down and the increasing velocity of descent be counteracted by extending the shoot from below; thus throwing it into a curve approaching to the horizontal, bringing the passenger nearly to a stand still on reaching the ground and thereby preventing any shock to the system: one of the best of all the proposed modes of escape and through which I have seen hundreds of men and boys descend for the mere fun of the thing from the 4th or attic floor gable end window of the old Château St. Louis, Quebec, now the Laval Normal School.

There are still other devices such as moveable towers on to the roof of which a person may leap from a window, an arrangement of springs breaking the fall.

While free to admit that all and every the modes of escape alluded to, have now and then been effective in saving a few lives; it can not be denied that such means have been totally insufficient and impracticable in cases where women and children and old and helpless persons were confined in convents and asylums, the strength of whose arms is inadequate to support the weight of their bodies swinging from a rope or other ladder.

And even this may be ineffective to the able bodied man, woman or child, the ladder hanging as it must do from the window of an upper story; when in all likelyhood flames are issueing from the very windows beneath the one from which escape is thus rendered so to say impossible.

But if ladders could be and were formerly effective to some extent, they have come to be almost useless now, on account of the lines of poles in almost every street of every city supporting hundreds of telegraph, telephone and electric light wires, which prevent the erection of the firemans' ladder against the walls of the burning building or must so delay the operation while cutting the wires, that in the meantime the chances are, the inmate has been asphyxiated, stifled by the smoke and heated air.

All such means of escape, even when most efficient, are far too uncertain, far too slow where hundreds of human beings are aggregated in the upper floors or dormitories of a boarding school or manufactory or even for the less numerous inmates of a hotel.

Some other system must be devised: proper stairways by which the babe in arms may be safely secured with its mother; of which the younger children can avail themselves and down which old and enfeebled men and women may be safely conducted by their more able companions; for no woman can with one hand descend a ladder while the other is embarrassed with a child and could hardly do so even with both hands free.

The proprietor of the Buffalo hotel is reported to have said on the night of the fire or after it had done its dire work of destruction (of which he was an eye witness, and all but perished in the flames, himself, his wife and family) that never in his life again would he occupy a hotel which was not built fireproof and in addition thereto, provided with efficient means of escape in case of an emergency.

There is nothing like seeing the fire-fiend face to face, to bring one to such a common sense conclusion; but what is this fire escape? what must it needs be, to prove thoroughly practical and efficient?

The stairway I propose must be of iron with not one particle of wood about the structure and it must have no direct communication whatever whith the interior. It must be reached from each and every flat or story of a building, even to the uppermost or attic floor and with the sole exception of the ground floor, (from which escape is easy through the doors and windows to the street) by first passing out of a window, any window facing towards the rear of the building, to a narrow iron gallery surrounding the whole court yard and giving access to the stairs.

I say "narrow iron gallery" two to three ft. wide at most, that its projection into the inner open space, may not impede the light to windows beneath it, and to reduce its cost to a minimum.

Building lots now a days are almost invariably 25 ft. front and 100 ft. deep. One such stairway in rows or tiers of tenement and dwelling houses, may be made to suffice for two adjoining houses; and, so as to take up no otherwise available space, so as not to occupy space to the exclusion of any window or door; should be built opposite the division line or wall between the two dwellings, and always towards the rear; for as I have said before, and this must be borne in mind to secure the adoption of the scheme by every one: no one would put up with any such permanent excrescency from the front of any building, be it a dwelling or a public institution of any kind, for the sake of an eventuality which might never occur.

The foot of this stairway should lead directly to a passage way, not necessarily more, where mere dwelling houses are concerned, than three feet in width, running from rear to front of building or from yard or court to street. This passage way should be cut off from the remainder of the basement floor by a brick wall eight or more inches thick and roofed in or arched over with brick, or iron bearers and concrete, and should be closed towards the street by an iron lattice door, opening outwards but bolted from the inside.

It need hardly be said of course that where a gateway existed or carriage entrance from the front or rear, the additional passage way just alluded to could be altogether dispensed with.

One such stairway might be made to suffice for say 4 houses, or for every 4 houses or for each 100 ft. lineal of building, whether dwelling houses or structures used for other purposes.

Suppose now a building faced on two or more streets, as in the case of a hotel taking up the half or the whole of a block; the iron galleries should run around all the rear walls, forming a complete circuit of the court yard where the building faced on the 4 streets, three sides where on three streets, two where on two.

If the building were of such extent as to leave an interior space or yard or open court of say 50 ft. square, then might there be, say from two to four stairways, or one to each side of the court; and if the building were of greater extent and such as to require some of the central, or interior space to be utilized for wings with rooms, there would be in such case, two or more court yards or open spaces, each of which should be surrounded on all sides by the iron galleries alluded to; and in each court one or more flights of stairs leading to the ground level and, by which exit could be had through the building to the street, by the gate or carriage way made fireproof — roof and walls — and closed at night against burglars by an iron lattice door bolted from the inside, but opening outwards.

I say the gateway towards the street should be closed by an open iron grating or the upper part of it at least, and this is essential that those waiting in the passage way or tunnel, might not be stifled by the hot air and smoke within the court yard, which would be the case to some extent with a closely fitting gate; while an open lattice would admit the colder fresh air from the street and by the suction or vacuum within the court caused by the ascending heated air, cause such a current of the cooler air from front to rear, as to guard against the possibility of any one being asphyxiated while awaiting the opening of the gate leading to the exterior.

It remains for me to say that the stairs should be enclosed by a brick wall some 4 to 8 inches in thickness and have no other opening than the doorway at each side thereof leading to it from the iron galleries mentioned: the object of closing in the stairs, that of preventing them from becoming too hot to handle or to use, and to protect the outgoing inmates from being scorched or stifled on their way down, by the heated air and flames issueing from the windows opening on the court.

Finally, I would insist on the necessity of the escape gateway for fire being that in every day use for domestic purposes, as there must be no such thing heard of again as the iron doors of the Vienna theatre which, having been unused for years were entirely forgotten; and when discovered, their bolts and fastenings found to be so hopelessly rusty and immoveable, that no use could be made of the doors and no one rescued by their utilization.

The doors leading from the superposed tiers of galleries to the stairs should be simple openings of a size to allow one to pass and nothing more and not shut off in any way by doors or barriers of any kind, excepting may be some slight wooden lattice work to preserve children from accidents.

The proposed stairs would occupy but little space, not necessarily more than 7 x 9 feet from out to out: width of stairs 3 feet or even 2½, newel 8 to 12 inches, brick walls 4 to 8 inches each, the additional two feet, to make up the 9, being the breadth of gallery from which the stairs must stand out clear to allow of access thereto, from either side.

And as to cost, a detailed calculation which I have made brings out the stairs at $1.50 per step and the galleries at $1.50 per lineal foot and the brick enclosure wall at $1.60 per vertical foot or per lineal foot of height; so that for a 5 story house or 4 stories and attics, there would be 4 galleries each 25 feet or 100 feet lineal of gallery at $1.50 ..... $150 00
Four flights of stairs at $25 ..... 100 00
Enclosure walls to stairs inclusive of foundation and iron roofing ..... 100 00

Together ..... $ 350 00

or as already stated, say 5 % on cost of building at $7000.00.

If two dwellings used the same stairs, the cost would be reduced by $100 or to $300 each house, while for larger buildings as hotels, asylums, convents, theatres, etc., the additional cost of providing for escape from fire would hardly exceed 2½ to 3½ per cent and probably be less.

With the proposed arrangement, the inmates of all the rear rooms of any building would in case of an emergency, only have to open a window and step out on to the gallery to reach the stairs and escape to the street; and those occupying the front of the building, as already stated, have no further to go than across the corridor and through the rear room opposite, to reach the gallery and escape thereby.

But to render the scheme effectual, man must be protected against himself by legislative enactment. The proprietor of a range of tenement houses, or of a hotel or manufactory, or of a theatre, or school or convent or asylum, would likely not go to the trouble of even giving the thing a thought; much less incur even the trifling additional expense of providing for escape in case of fire; and again I say: the law must step in and enforce the necessary action in the premises.

Have we not already laws in certain cities to prevent the erection of wooden buildings, as were enacted for the City of Quebec after the great fires of 1845, and this, to what purpose?

not to guard against loss of life, but to save us and insurance companies from mere material loss. How much more important then that the law should be appealed to to force us to provide against accidents to life.

This subject, it may perhaps be argued, is one of too unscientific a nature to form the subject of a paper to be read before and published in the transactions of the Royal Society of Canada; but when considered in its true light as foreshadowed in the title, and it is assuredly nothing less than of great social and humanitarian import; I say that when it is considered that in dealing with this question we have to be thoroughly acquainted and impressed with the idiosyncracies of our human nature, and know just what a man will do or will consent to do, or how far he may be made to go in providing in advance for his own safety and that of others, against such an emergency as fire, which may occur several times in a life-time and has occured; but which may also not occur; the solution of the problem becomes one, not of a merely architectural, engineering or constructive nature, but must be ranked side by side with the most pertinent and important questions of the age.

I must sincerly congratulate the Honorable M. Flynn on his introducing into our local parliament a bill to provide for escape from fire, even though it be by the instrumentality of the comparatively useless rope ladder of which children even up to 10 & 12 years of age could hardly avail themselves; but it is certainly a move in the right direction and must educate us in advance to the necessity, the imperious obligation on part of the Federal Government, of enacting a thoroughly stringent and effective measure of protection against the recurrence of the direfull calamities which ever and anon bring sorrow to so many households.

Sir Hector Langevin, minister of Public Works of the Dominion, is the man to do the needful and at the very next session of the Dominion Parliament a law to this effect should be enacted.

(Signed) C. BAILLAIRGÉ,
M. A.,
F. R. S. C.,
City & Civil Engr., Arct. &c.

Quebec, May 1887.