

FIRE PROTECTION IN PUBLIC AND QUASI-PUBLIC BUILDINGS  
WITH ESPECIAL REFERENCE TO GOVERNMENTAL CONTROL  
AND SAFETY TO LIFE

BY

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## I. THE PROBLEM.

### 1. The Fire Waste.

In 1907 the total loss and expense on account of fire in the United States was nearly half a billion dollars, or nearly half the total cost of new buildings constructed during that year<sup>1</sup>. This loss was made up as follows:-

Direct fire loss (value of buildings and contents destroyed)	\$215,084,709.
Excess of insurance premiums over losses paid	145,604,362.
Annual expense of fire departments	48,940,845.
Annual expense of waterworks chargeable to fire service	28,856,235.
Annual expense of private fire protection	<u>18,000,000.</u>
	\$456,486,151.

plus at least 3,000 or 4,000 lives, and thousands of injuries.

In 1906 the direct fire loss exceeded \$500,000,000, including the San Francisco conflagration. In general, the amount is continually increasing.

The average fire loss per capita is about the same in cities and in rural districts (about \$2.50 in 1907)<sup>2</sup>. The exposure hazard in cities is greater than in rural districts, but the protection is also greater. The latter, however, costs money. In the larger cities of Wisconsin the annual expense of fire department maintenance is from \$1.50 to \$2.00 per capita, which is three or four times the average rate for the whole country in 1907.

1. Bull. 418, Fire tax and waste of structural materials in the United States, U. S. Geol. Survey.

2. Ibid.

In other words, under present conditions the total loss and expense on account of fire in a growing city increases much more rapidly than the population. If any city tries to keep down this expense by reducing the fire department appropriation, the apparent saving will soon be offset by an increase in fire insurance rates and the city may, like Salem, find itself seriously crippled by a disastrous conflagration.

The foregoing figures do not include any allowance for the indirect loss due to interruption of business or employment. It is impossible to estimate the amount of this loss, but its importance is well known by every property owner who has been burned out. Witness the old saw - "Three removes are as bad as a fire".

The fire loss may be divided into two parts - conflagration loss, and loss in small or individual fires. Underwriters estimate that at least 27 per cent of the total loss comes from fires that extend beyond the buildings in which they originate. Using "conflagration" in the narrower sense of including only fires over \$500,000, we still find that the total of losses of this character averages well over \$20,000,000 yearly. Without citing further statistics, the bulletin already mentioned may be quoted - "No other country suffers such enormous conflagration losses. - - - An increase in the number and severity of conflagrations may be expected until there is a decided improvement in methods of construction".

Another sort of fire loss is the loss of life. In 1907, according to the same Bulletin, 1,449 deaths and 5,654 injuries were caused by fire, but "these figures are incomplete

and perhaps do not represent more than half the persons who were victims of fires". Even 3,000 deaths is probably too low an estimate. The big disasters - the Iroquois theater, the Collinwood school, the Triangle Waist company, the factories at Newark and Binghamton, the Missouri Athletic club - are most in the public eye, but it is the small fires that swell the total. In Wisconsin during the last half of 1913 the Fire Marshal reports 66 deaths by fire, and during the next three months 34 deaths were reported in the newspapers. Of the latter, four occurred in a village hotel and two in a cheap hotel in Milwaukee; the remainder were almost entirely in private houses. Assuming 100 deaths per year in Wisconsin, the total for the United States, at the same rate, would be about 4,000 per year. This estimate is conservative because the Wisconsin rate includes no large fires, and because fire prevention legislation and inspection in Wisconsin are above the average.

To emphasize the enormity of our fire loss, many comparisons and analyses might be made. Let the following suffice: The total annual fire loss and expense in Wisconsin is at least eleven million dollars. This is more than the entire assessed valuation of the city of Eau Claire. We are told how, in olden days, the wrath of the gods was often appeased by the vicarious sacrifice of some devoted individual who gave his life to save his tribe or his city. If the fire god were to set a price for which he would leave the state of Wisconsin in safety for one year, that price would be the complete destruction of the city of Eau Claire - not only her buildings and their contents, but her real estate as well, transforming her site into a desert waste; while

100 or more of her citizens perished in the flames, hundreds more were injured, and the remainder driven forth to seek new homes and new employment. This is in fact the penalty which we actually pay each year to the fire god, except that instead of being concentrated in a single city, the loss of life and property is scattered through the length and breadth of the state.

## 2. Reduction of the Fire Waste.

Is this enormous and increasing loss of life and property necessary and inevitable? There are reasons for believing that it is not.

In Europe the fire loss, the cost of fire insurance, and the expense of fire fighting, figured on a per capita basis, all are but a fraction of what they are in the United States. From a report of the consular service<sup>3</sup> the National Board of Fire Underwriters has computed that in Germany, France, Austria, Italy, Switzerland and Denmark the average annual fire loss per capita is 33 cents, against \$2.51 for the United States. "For many years Trieste (population 193,000) has not had a large fire. All the fires in 1904 were confined to the buildings or floors where they originated<sup>4</sup>". In Rotterdam (372,000 people) in 1904 there were 361 fires, "of which 44 were regular conflagrations" - but of these "conflagrations" only 10 spread beyond the floor on which they originated, and only one got outside of the building (compare Superior, Wisconsin, with 44,000 people and 205 fires yearly). Zurich (population 163,500) had 72 fires in 1904, none extending

<sup>3</sup> Insurance in Foreign Countries, Vol. 38, Spec. Consular Rpts.

<sup>4</sup> Ibid.

to adjoining buildings. Birmingham, with 550,000 population, averages 503 fires yearly. These are typical examples.

Fire insurance rates are correspondingly low. In Berlin in 1904 the rate of the mutual City Fire Insurance Association, including fire department maintenance, was 4- $\frac{3}{4}$  cents per \$100. This is very low, even for Europe. The average loss ratio alone of the American stock companies is about 50 cents per \$100, not including administrative expenses or profits, to say nothing of fire department maintenance.

These low fire losses are not due to excellence of fire-fighting brigades. On the contrary, "the fire department systems are ridiculously inadequate as compared with those of American cities". In Rotterdam, a city of the size of Milwaukee, whose small fire loss has been mentioned, the fire brigade is volunteer, its members serving gratuitously. The same is true of Zurich (163,500 people) and there is no fire alarm system. Fire department maintenance in Berlin in 1904 cost less than nine cents per capita, as against \$1.72 for Milwaukee and \$1.65 for Superior.

The causes for this remarkable difference between American and European fire losses are thus stated by J. K. Freitag<sup>5</sup>:

"First, Differences in the view point and in the civic responsibility of the individual in the United States and in Europe, and the consequent laws or regulations which govern the individual".

"Second, Differences in general character of buildings

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5. "Fire Prevention and Fire Protection".

outside of congested areas". Frame buildings are practically unknown.

"Third, Differences in thoroughness of construction and maintenance.

"Fourth, Differences in regulations and their enforcement, regarding especially hazardous materials and conditions". "The comparative immunity of Berlin from disastrous fires results, not from the efficiency of its fire department - though it does promptly and well what work it has to do - but from the absence of wooden houses and the solid, careful construction of all kinds of stone and brick buildings under the rigid scrutiny of the building police - - -. Another important factor in the case is the strict and carefully enforced regulations concerning the storage, handling, and transportation of highly inflammable substances and explosives".<sup>6</sup>

It may be argued that for a long time, at least, these causes, especially the first two, cannot be entirely eliminated in America. Fortunately we have further evidence which applies directly to existing American conditions. The New England factory mutual insurance companies take selected risks only, and insist on proper construction, equipment, and maintenance. As a result, the older companies have an average loss of about four cents per \$100, as against 50 or 60 cents per \$100 for the stock companies. The buildings insured are not, in general, fireproof; they are mostly of mill construction, usually sprinklered, and always provided with proper fire stops to isolate hazardous departments. Rigid inspection is an important factor in securing

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6. Insurance in Foreign Countries.

proper maintenance.

Similarly the bulletin of the U. S. Geological Survey, already quoted, refers to "the contrast between the small losses by fire to government buildings, due to the great care taken to make them fireproof, and the immense losses reported from the country as a whole." Unfortunately, exact figures are not given.

The foregoing evidence (full details of which may be found in the authorities quoted, and elsewhere) surely indicates that our fire loss can be greatly reduced; and further, that its reduction is to be sought, not by increasing our fire fighting departments, but by removing the preventable causes. These causes fall into two classes:

First, carelessness and poor maintenance.

Second, poor construction.

3. Economic Basis of Fire Protection.

After proving that American fire losses are enormous and can be reduced, the enthusiast sometimes proceeds to advocate the immediate adoption, regardless of expense, of every known mode of prevention. In particular he insists that where human life is at stake we must take absolutely no chances. Thus he demands that all tenements be fireproof, forgetting, as Lawrence Miller remarks, that many more tenement dwellers die by tuberculosis than by fire. The fact is that in fire protection, as in everything else, the saving resulting from an expenditure must be greater than the expenditure; otherwise the expenditure is not sound. In other words, the basis of all fire protection must be economic, not sentimental. The merchant who is urged to install a sprinkler system first calculates what he will save each year

in insurance and in the decreased danger of interruption to his business. If this saving will more than pay interest and depreciation on the sprinkler system, he buys it; otherwise he does not. His decision is perfectly correct, from the standpoint of his personal interest. Similarly, before the city or the state adopts any fire-protective measure, it should first make sure that the result will actually justify the expenditure. This principle is so obvious as to seem hardly worth mentioning, yet it is frequently overlooked.

One problem is here to be met. The cost of fire protection is in dollars and cents. The saving is in dollars, and also in lives. As we have seen, the annual fire loss and expense in the United States is roughly \$500,000,000 plus 4,000 lives.

The old arithmetic tells us that we cannot add horses and umbrellas, or apples and pennies. But the fruit-peddler taking stock at nightfall easily adds apples and pennies if apples are two for five. How is it with dollars and lives?

Economists and lawmakers have set various values on a human life. \$1,700 is a well-known figure. \$5,000 has been made the limit of liability for death in a railroad accident. The Wisconsin workmen's compensation act limits compensation for death to \$3,000; this was probably a compromise rather than a scientific determination. For the sake of argument let us take \$3,000 as the average economic value of a human life. If the figure were \$1,700, or \$5,000, the following discussion would remain equally valid.

This assumption that human life has a definite economic

value meets at once with two protests. If we say to an employer - "These five hundred men and women in your shop represent an investment of a million and a half of dollars, which you must protect" - he replies that if they work in a fire-trap factory they do so at their own risk; a fatal fire would be their misfortune, not his fault. On the other hand, many a man and woman who would resent the name of sentimentalist objects that it is outrageous to measure human suffering and death with the dollar sign; millions were well spent to save a single life.

The first objection is easily refuted. The workmen's compensation act is sufficient answer. It is now generally recognized that when any industry kills or maims a bread-winner, the industry, and not private or public charity, should contribute to the support of his dependents. In a remarkable address on "The Social and Human Cost of Fire"<sup>7</sup>, Miss Frances Perkins said "When one goes over the files of the Red Cross Society, which tried to relieve the families of these people who were killed in that fire (Triangle Waist Co.), one realizes that loss. Here was a family partly dependent on one son or daughter who was killed. They did not need charitable relief, but the whole family, actually needing the wages of that one worker to keep up its standard, was slipping down and a little nearer the poverty line than they were before. Girls and boys who had hoped to go to high school and college, had to go to work at once. - - And so we find the whole family coming down nearer and nearer to poverty because their resources were cut off; and we have

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<sup>7</sup>. National Fire Protection Association Proceedings, 1913.

that family becoming a social problem". In another case - "The husband has lost the use of both legs. He never can work again. They used to have a nice home. The woman was a good housekeeper. Now the man stays at home. He cannot look after the children. He cannot do the housework. The woman goes to work in another shirtwaist factory. She earns almost as much, of course, as her husband did before he was injured, but how about their home? A good home for children is of great social value to any community. That family has been disorganized and disrupted and we people of the city of New York have lost by fire the value which that home would have been to the children of that family".

Society surely has a right to demand reasonable protection against such economic losses, whether in factory, hotel, or theater.

The second objection, that the value of a life cannot be placed at \$3,000 or any other sum, because life is more precious than any amount of material wealth, appeals strongly at first; but it is not sound. Life is not more precious than any amount of material wealth. If it were, no merchant would ever make a business trip to a neighboring city, because we all know there is a certain hazard in railroad travel. No man would build for himself any but a fireproof dwelling, for we know that many are burned to death in their own homes. Which of us, in his ambition to win the fullest possible life for himself and his dependents, does not daily assume the risk of disablement or death (whether by accident in shop or field, or by overtaxing mind or body in office), which a less strenuous occupation would avoid?

The fact is that "taking chances" to save money or time is wise or foolish according as the saving is greater or less than the probable loss. And in thus balancing gain and loss we must necessarily strike an equation between life and material things.

For the average man life cannot be worth while without a reasonable supply of material things - food and clothing and shelter; without these he cannot be expected to make much intellectual or spiritual progress. And the average man must spend the greater part of his vital energy in obtaining material things for himself and his dependents. When material wealth is destroyed, the life of the individual and the life of the nation is correspondingly impoverished.

We need not attempt any discussion of the spiritual value of life. Spiritually, life may be an asset or a liability. Many a life is a spiritual liability; while a heroic death may be a tremendous spiritual asset.

There is another point of view (already indicated) which shows the absurdity of asserting that millions may well be spent to save a single life. This is absurd for the simple reason that the same millions, transformed into model tenements, pure milk, visiting nurses, tuberculosis sanatoria, and the like, would save not one but thousands of lives. If we were to spend a million wherever a life is to be saved, even the Rockefeller Foundation would soon be bankrupt. We therefore try to spend our money "where it will do the most good" - in other words, we recognize the necessity of getting results proportionate to expenditures.

The purpose of this discussion is simply to establish

clearly that any program of fire protection will overshoot the mark if it seeks to spend more than \$3,000 for the purpose of saving \$3,000, and will also overshoot the mark if it seeks to spend more than (approximately) \$3,000 for the purpose of saving a life. On the other hand, if a life can be saved by spending a fraction of \$3,000, the expenditure is justified. These facts seem self-evident, yet they are often ignored.

The first corollary of this proposition is that the total property loss and expense from fire in the United States (\$500,000,000 annually) is really much more important than the loss of life (about 4,000 lives at \$3,000 each = \$12,000,000 annually). Very large expenditures will be justified if they will decrease the property loss. Considerably smaller expenditures will be justified if they protect life only. Expenditures will be doubly justified if they protect both life and property.

## II. SAFEGUARDS.

With the problem thus before us we may consider the various safeguards against fire. The following list is not a strictly logical classification; it is perhaps not complete, and some of the items overlap, but it at least includes the most important means of fire protection.

### List of Safeguards.

Prevention (elimination of carelessness and neglect - matches, gasoline, rubbish, ashes, explosives, etc.)

- (1) Individual vigilance
- (2) Municipal and state inspection

### Construction

- (3) Protection of furnaces, pipes, lights, wiring, etc.
- (4) Incombustible buildings.
- (5) Dividing fire walls, and enclosure of stairs and elevators
- (6) Protection of wall openings by fireproof windows, doors, or shutters (or blank walls without openings)
- (7) Incombustible roofs
- (8) Open spaces between buildings
- (9) Special restrictions within the fire limits

### Extinguishment

#### Private

- (10) Automatic sprinklers
- (11) Standpipes, chemical extinguishers, pails, etc.

## Public

(12) Fire-fighting department

(13) Water supply, including high-pressure system

## Escape

(14) Exits: stairs, doors, fire escapes

(15) Fire alarm and fire drills

## Distribution of loss

(16) Insurance

Consider the efficiency of these 16 safeguards against the three divisions of the fire hazard; i.e., the property hazard in individual buildings, the conflagration hazard, and the life hazard.

Against property loss in individual buildings the best safeguards are items (1) to (6) because they tend to prevent the occurrence of fire and check its progress; (10) to (12) for extinguishing incipient fires; and (16). Against the spread of fire from an adjoining building the best safeguards are (6) to (10); if the fire gains a foothold (4), (5), (11) and (12) are important; in a general conflagration (13) plays a vital role. Authorities agree, however, that "hose streams never yet stopped a conflagration" which had gained considerable headway in a combustible district. The only effective protection against such a fire is (4), (6), or (10); see these items below. (16) is of course important.

Safety to life is best secured by items (1) to (5), also (10), which prevent or check fire; if these fail, rescue and escape may be offered by (12), (14) and (15).

In general, items (1) to (11) tend to prevent the occurrence of serious fires; while items (13) to (16), and item (12) largely, aim only to limit or mitigate the disastrous results of fires. Hence the former are prima facie preferable to the latter, unless it should prove that their cost is prohibitive.

Let us now consider these various safeguards in detail.

(1) Prevention, by individual vigilance. This is without doubt the ultimate ideal which we must constantly strive to approach by educational methods. It is cheap and simple. Together with (2), (3), and (4), it is the basis of Europe's remarkably low loss. It should be preached in every possible way - through bulletins and placards, in the newspapers, by speakers, by "Fire Prevention Days", in schools and colleges. Yet we cannot depend on this alone because we cannot reduce carelessness to the ultimate zero.

(2) Prevention, by municipal and state inspection. This is now almost universally recognized as a valuable and necessary aid and incentive to individual vigilance, as proved by the general enactment of fire marshal laws and the more recent formation, in city fire departments, of separate "fire preventive bureaus". This work can best be done by the city, with a minimum of state supervision to spur on those smaller municipalities which fail to realize the importance of the work. An excellent system of inspection is in use in Chicago, where the fire prevention bureau is made up of men who have served in the regular fire-fighting department and are eligible for promotion to a lieutenancy. The advantage is twofold: first, the inspectors are men of more than

average ability, and have a practical knowledge of fire hazards; and, second, when an inspector is promoted and goes back into some company as a lieutenant, he takes with him a knowledge of conditions in the interior of buildings in his district, which is very useful to him in fighting fires in those buildings.

It is beyond our purpose to analyze in detail the various subjects covered by fire prevention inspections. These subjects include, among others, the handling and storage of explosives and inflammables, such as dynamite and gasoline; proper disposition of rubbish, papers, and waste material, as in factories and basements; maintenance of extinguishing apparatus; maintenance of construction details such as fire doors and electric wiring; maintenance of exits; protection of heating apparatus; and thus shading gradually into more drastic orders for improvements in buildings and equipment, such as enclosure of vertical openings, installation of automatic sprinklers, and other safeguards mentioned later.

In this connection we cannot overlook the present movement toward holding owners or tenants responsible for fire damage caused by their negligence. In a much discussed case, the city of New York collected \$1,500 damages for fire department expense in fighting a fire which was caused by failure to comply with an order of the Fire Prevention Bureau to install automatic sprinklers. This is a valuable precedent and is sound in principle. It is parallel to the 15 per cent penalty provided in the Wisconsin Workmen's Compensation Act where an accident is caused by failure to comply with the law. Fire protectionists will do

well to stop right here, and not endeavor to extend the principle so as to make a man presumptively negligent whenever a fire starts on his premises. This would constitute such a serious liability that it would inevitably be the object of insurance, and then we should be right where we are now, except that we should have to insure against liability to neighbors as well as against personal loss. It is hard to see any advantage in this change. It might be an additional incentive to insurance companies to make more careful inspections; but the present system already furnishes a powerful incentive to such inspection, which nevertheless does not receive due attention from the stock companies.

In this connection also may be mentioned the vigorous prosecution of incendiaries, which has received much attention in recent years. Without questioning the necessity of such prosecutions, we must note that the temptation to arson very often arises from over-insurance, and will be removed as soon as the present defects of our insurance system, which make over-insurance possible, are removed (see below).

Private and public insistence on "good housekeeping" can and will greatly reduce the number of fires; but, as mentioned in the preceding section, such inspections cannot remove the necessity for other safeguards.

(3) Construction: Protection of furnaces, pipes, lights, wiring, etc. The next seven sections, under the general head of "construction", apply mainly to new buildings. Some of these safeguards (e.g., those mentioned in this section) are so obviously necessary and so relatively inexpensive that they are usually required in existing as well as in new buildings. The

extent to which they may reasonably be required must always be determined by balancing the cost against the decrease in hazard.

The necessity of protecting heating and lighting apparatus requires no special argument. Improper protection is a frequent cause of fires, ranking next to those causes grouped under "poor housekeeping". The precise amount of protection necessary is empirical and is specified by laws and ordinances and by Underwriters' rules. Almost any standard, if universally enforced, would have a marked effect on the fire loss.

(4) Construction: Incombustible buildings. First consider Freitag's definition of a fire-resisting building, which includes the features mentioned in this and the following two sections: "By a Fire-resisting building is meant one in which a fire starting within the structure will be confined, through the design and the inherent qualities of the building itself, to that compartment or unit of area within which the fire originates; or, if subjected to attack by fire from without, either through an adjacent fire or wide-spread conflagration, the building must be able not only to protect its own contents from destruction, but serve to protect itself in all essential particulars, and also to protect structures beyond, from the further spread of devastation. Such attacks by fire, whether internal or external, should result in no material damage to the structure either in whole or in part, except to such surface or standing finish as may be easily renewed. - - - Fire-resistance is not an indefinite something which can be added to or taken from a building design at will, as, for instance, a coat of fireproof paint, a supply of fire buckets, or even a standpipe

and hose reels. The question goes deeper than this, for the vital fire-resisting qualities must be inherent in the design."

Comparatively few of our so-called "fireproof" buildings measure up to this standard. Most of them lack the protection of wired glass windows, and many have open stair and elevator shafts; they are far from fireproof; they are merely, wholly or in part, incombustible, which means that a severe fire, either from without or within, burns the contents of the building and destroys its finish, but leaves the skeleton more or less intact. This was the fate of the "fireproof" buildings at Baltimore, San Francisco, and at the recent Edison fire. With proper additional safeguards, such buildings could be made truly fire-resisting; but most of them are not now so made.

Taking incombustible buildings as we find them, we recognize in them, without question, a high degree of merit. Their chief merit is simply this - the building itself adds no fuel to the flames, excepting a small amount of wood trim. A fire of moderate size in such a building is easily put out by the fire-fighters, provided the contents are not especially inflammable. The fire does not burn through floor or ceiling, or run up walls and partitions; it does not spread quite so fast; floors and walls do not fall in; smoke is less, because fuel is less; occupants have a longer time to escape. In some cases, where a building is not exposed to great hazard, either without or within, a higher degree of fire-resistance might not pay.

In a conflagration, the incombustible building comes

through with a salvage of roughly one-half on the building, and nothing on the contents. It checks, though it does not stop, the sweep of the conflagration. In Patterson, N. J., and again at Baltimore, so-called "fireproof" buildings with unprotected windows were themselves gutted, but checked the conflagration sufficiently to save other incombustible buildings beyond.

(5) Construction: Fire Stops. One of the cardinal principles of "mill" or "slow-burning" construction is the introduction of fire-stops or blockades at strategic points to check the spread of fire. This is obviously quite a different matter from making the building incombustible. Either feature may exist without the other; in such cases, the mill building with proper fire-stops is often safer than the incombustible building without fire-stops. A truly fire-resisting building must of course possess both these features, as designers are gradually coming to realize.

Fire stops include (1) fireproof walls or partitions separating different rooms or divisions of a building, or dividing large areas; (2) fireproof enclosure of stairway and elevator shafts; (3) where common wood stud partitions are used, fireproof filling between the studding at each floor level. Their purpose is to prevent the rapid spread of fire (1) horizontally throughout a large area; (2) vertically from floor to floor; (3) up the inside of partitions. In addition to the obvious advantages of such checks, the first two are of especial importance in safeguarding life. (See under "Exits" below.)

(6) Construction: Protection of Wall Openings. The best protection against fire from outside is obviously an unpierced fireproof enclosing wall. Since, however, we require light and air, enclosing walls must usually be pierced with windows. These windows, then, must be made as nearly as possible equivalent to the wall itself, if it is desired to protect against a fire next door. This is equally true, whether the floors of our building are of wood, or of concrete or tile. The complete destruction of the contents and the interior finish of incombustible buildings with unprotected windows, when exposed to conflagration, is a matter of common knowledge. On the other hand, witness the shining example of the Naumkeag Cotton Company's storehouse No. 1, at Salem, whose windows, doubly protected by wired glass and automatic shutters, withstood the full force of a conflagration which the hose streams of all eastern Massachusetts could not stop. It is of no importance, in this connection, that the building happened to be of reinforced concrete; the temperature in the building never rose high enough to scorch a yard of cotton, or to open a single sprinkler head; had the floors been of wood, the result would have been the same. It was the window protection that saved the day. In the San Francisco fire a large mill-constructed warehouse, with wired-glass windows, went practically uninjured.

Protected windows are also valuable in case of a hot fire within the building. Such a fire often bursts through outside windows at the point of origin, and enters the windows of the stories above. If a large amount of combustible material is at hand, this hazard may be serious, as in the Triangle Waist

Company fire, which spread so rapidly from floor to floor through outside windows, that the occupants of the upper floors had no time to escape.

Details of window protection design are beyond our scope. Fire-resisting shutters give the best protection if they are closed. Wired glass is now most commonly used, but it radiates heat and melts in an extremely hot fire. A combination of wired glass windows and automatic inside shutters is almost impregnable, but is not practicable for large windows.

(7) Construction: Incombustible Roofs. Incombustible roofs on combustible buildings are mainly effective against fire from without. In every conflagration shingle roofs, hundreds of yards distant, catch fire from flying brands. Cities therefore commonly prohibit new shingle roofs in the congested district, and in some cases this requirement has been extended to the entire city. The latter requirement is being vigorously advocated by fire protectionists and seems likely to become widespread, especially in view of the decreasing cost and increasing variety of incombustible roofings.

(8) Construction: Open Spaces between Buildings. Open spaces, like protected windows, discourage the spread of fire from one building to another, and also permit the approach of firemen. This applies especially to small frame buildings such as residences. This safeguard has the advantage of being in line with sanitary requirements for light and air, and can thus be reasonably required by municipalities, partly on the ground of fire protection and partly on the ground of health.

(9) Construction: Fire Limits. Fire limit ordinances

simply require in congested districts, certain safeguards which are desirable for all buildings, but which (balancing cost against gain) are not believed to be reasonable if applied to outlying districts. Such special requirements must naturally relate to safeguards which have a marked effect on the conflagration hazard, as it is only this hazard which is greater in congested districts than elsewhere.

(10) Extinguishment: Private - Automatic Sprinklers.

This form of protection is receiving a great deal of publicity both from parties interested in its sale, and from public officials and others who (like the writer) honestly believe that in many cases sprinklers furnish the best protection for both life and property because they operate at the critical moment - the start - when "all fires are the same size", and because they operate automatically. Such early extinguishment is next best to prevention. Sprinklers, however, like prevention, sometimes fail, though they are said to operate properly in over 95 per cent of all cases; they do not entirely obviate the necessity for other protection.

It is said that in all the sprinklered buildings insured by the New England mutuals, only twelve lives have ever been lost by fire, and nearly all of these twelve were either firemen or persons who voluntarily re-entered a burning building. This remarkable record cannot be entirely credited to the sprinkler systems. The owner who installs sprinklers is usually a man of prudence and foresight who gives more than average attention to other safeguards, such as chemical extinguishers, ample exits, and fire drills. The buildings

insured by the mutual companies are built from approved plans and have proper horizontal and vertical fire stops. The inspection service of these companies insures proper maintenance of safeguards, and largely eliminates carelessness. All these items have done their share in preventing loss of life in these buildings. The remarkable safety enjoyed by these millions of employes is not a testimonial to sprinklers alone, but it is a striking example of the high degree of safety to life, as well as property, which may be secured by a reasonable adherence to elementary principles of fire protection.

Sprinkler systems receive a large credit on insurance rates, so that where heavy insurance is carried on the contents of a building, as well as on the building itself, it is often a simple problem in arithmetic to compute that the saving in premiums will more than pay interest and depreciation on the sprinkler cost. Where a building has no valuable inanimate contents, but a large human occupancy of great economic value so situated that a fire might be disastrous, government may reasonably require the same sprinkler protection as the owner would voluntarily provide for a valuable stock. Again, it is agreed by fire fighters that basement fires are hardest to fight, and that such a fire is apt to spread to neighboring buildings before it can be controlled. For protection against conflagrations, and for the safety of firemen, the city may therefore reasonably require basement sprinklers in the congested district.

(11) Extinguishment: Private - Standpipes, Chemical Extinguishers, etc. These various implements of private fire-

fighting have often proved very valuable. It is essential, however, that (1) the type of apparatus chosen be suitable to the occupancy and hazards; (2) the apparatus be kept in good condition; (3) someone understand how to operate it; (4) the public fire department be summoned immediately. If these precautions are not observed, the equipment may do more harm than good.

(12) Extinguishment: Public - Fire-fighting Department.

With structural conditions as they are, the highly-developed American type of fire department is absolutely necessary. It is at present practically our only safeguard against conflagration, - though experts truly declare that no fire department ever stopped a conflagration. The paradox is only apparent; fire departments cannot stop a conflagration under way; but they can and do extinguish millions of fires which would otherwise become conflagrations; and they also save many lives.

When private and public prevention inspections receive proper attention, when new buildings are intelligently - not expensively - planned, when old buildings receive such protection, by sprinklers and otherwise, as is economically reasonable, - then some reduction in the enormous cost of our fire departments may be expected.

(13) Extinguishment: Public - Water Supply. This is simply one important element in fire fighting, especially important in conflagrations. It is mentioned here because in large cities the special high-pressure systems and other special equipment required for fire service only, form a considerable part of the financial burden imposed by past neglect of rational fire

protection.

(14) Escape: Exits. As fires will doubtless continue to occur, for some time at least, and as our people are so thoroughly imbued with the fear of fire that they kill and injure one another in panic at an alarm, true or false, - it remains necessary to provide sufficient means of egress. The provision of exits sufficient for emergency is purely a matter of safety to life; but the form in which such exits are provided may vitally affect the property hazard. The various forms of exits will first be considered.

In accordance with principles already discussed, those forms of exits are obviously best which protect property as well as life; or which at least do not endanger property. Those forms are also best which add to, not subtract from, the convenience of the building for ordinary use. Finally, only those forms are efficient which are always ready for immediate use, and which will actually be used by the occupants, and which, when used, will lead to safety.

Various forms of exits are

Horizontal exit (i.e., a door through a fire wall, or an outside balcony or bridge leading to another building or division.)

Exterior enclosed stair (cut off from the building, and reached by outside balconies.)

Interior enclosed stair (fireproof enclosure with fire doors.)

Interior stair, not enclosed.

Elevator.

Outside stair, not enclosed.

Outside fire escape, stairway type.

Outside ladder.

Special forms of fire escape, as chutes, poles, ropes, etc.

The horizontal exit to another building or division best fulfills the desired conditions. It saves life by providing an area of refuge from which the occupants may descend to the street at leisure. It protects property, because the fire wall prevents the spread of fire. Being in constant use, it is always available in emergency. In some industries, of course, where unobstructed floor space is desired, a dividing wall may be inconvenient.

We must not, however, infer that "a horizontal exit is a panacea for all ills. There must be adequate facilities for moving persons downward as soon as they have passed through a horizontal exit, both because fire may spread to floors below them, and because of panic possibilities. In a building with a division wall but with unprotected floor openings, a single fire door, not closed or failing to close automatically, could jeopardize life almost as seriously as if no horizontal exit existed."<sup>8</sup>

The exterior enclosed stairway "offers the safest medium for moving people downward in a building, but it is only an enclosed stair with a definite capacity if the time factor enters. In a fire-resistive building with floors effectively cut off, a single stair tower, with well-drilled persons using it, can accommodate a large number of people, but if persons pour into it from several floors at a time, its capacity is much

reduced as regards any one floor."<sup>9</sup> The chief disadvantage of this form of stairway is from the standpoint of everyday use. In an inclement climate there is not much "safety to life" in compelling persons to cross an outside balcony whenever they wish to pass from one floor to another. More lives may be lost by pneumonia than saved from fire. If, on the other hand, such a stairway is provided in addition to the service stairs, it occupies valuable space which would otherwise be rentable.

As a compromise, the "outside" balconies may be enclosed with thin glass opening automatically. This arrangement might send a small amount of smoke into the stair tower, but the gain in serviceability would be great. Fire protection experts are, however, loath to recognize any such concession which impairs the complete detachment of the stair tower.

An interior enclosed stairway is so obviously better, for the safety of both life and property, than an unenclosed stair, that such enclosures are commonly provided, and should be universally required, in all buildings where fire protection receives any consideration. Almost every fire which gets beyond the room of its origin, proves anew that open stair and elevator shafts are simply flues through which fire spreads throughout the building in a remarkably few minutes. In office buildings, hotels, etc., where the occupancy is light and an artistic design important, architects have been slowest to give up the open stair with its ornamental possibilities; but most of them have now learned the lesson of the many bad fires in buildings

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8. Report of Committee on Safety to Life, N.F.P.A., 1914.

9. Ibid.

of this class, both combustible and incombustible, and have designed enclosures of wired glass in metal frames, which are pleasing in appearance and at the same time sufficiently fire-resistive for light occupancies.

In this connection it is proper to consider the degree of fire-resistance which should be required of such enclosures. In a large incombustible building, designed to withstand a severe fire either from without or from within, an 8-inch brick or 6-inch reinforced concrete enclosure is appropriate; but in a 3- or 4-story building of ordinary construction (i.e., joisted floors) so heavy an enclosure is a waste of money. Any enclosure which will hold back fire for an hour, or even for half an hour, will not only permit all the occupants to escape, but will ordinarily permit the fire to be extinguished before it has done much damage. Therefore not only a 2-inch solid plaster partition on metal lath and metal studs, but even a wood stud partition covered with metal lath and plaster, or with asbestos board, should be recognized in low grade buildings, both by building laws and by insurance raters. Chief Hammitt of the New York Fire Prevention Bureau states that a wood stud partition covered on each side with two thicknesses of  $\frac{1}{4}$ -inch asbestos board, will pass a one-hour fire test, though it may not pass the water test.

Fire protectionists must recognize that the great majority of two, three, and four-story buildings constructed in this country for many years to come, will be combustible; and that it is generally useless, and often discredits the whole

movement, to advocate high-grade protection for these low-grade buildings. We must devise safeguards corresponding in cost and efficiency to the building itself, or we shall generally get no safeguards at all. This implies no lowering of ultimate standards.

Open stairways have already been alluded to as flues, not means of egress. In new buildings of more than two or three stories (with few exceptions) open stairs should never be permitted. In existing buildings the question is not so easily decided, because it is usually difficult, without structural changes, to provide a sufficiently substantial enclosure to be recognized by underwriters; and without the incentive of lower premiums, it is then more difficult to justify the cost of a fireproof enclosure on the ground of safety to life alone. The Wisconsin rule (based on safety to life) gives to an open stairway one-half the value of an enclosed stairway of the same width, on the expectation that, with two open stairs remote from each other, in case of a fire near one stair, the other would be available for escape for several minutes. With open stairs, an outside fire escape must always be provided as an additional safeguard.

Elevators cannot be relied upon for egress unless there is certainty that a capable operator will be always on duty and that the power will not be interrupted by fire. In any case, elevator shafts should be enclosed to prevent the spread of fire and smoke.

Outside stairs, not enclosed are valuable on certain

classes of buildings, if covered by a roof to keep off snow. Such a stair is better than a fire escape because the occupants are accustomed to use it. On apartment houses particularly, an outside stair serves as a rear service stair and a fire escape combined. On high buildings (i.e., over three stories) the stair should have high protecting rails, and adjacent windows should be protected the same as for fire escapes.

Fire escapes have been and are the cause of much controversy - recognized by law-makers, past and present, as a valuable and necessary safeguard; condemned by experts as a pitiful delusion.

Ladders, and stairways much steeper than 45 degrees, may at once be dismissed as valueless, except where used by only a small number of active men. Moreover, any of the following defects may render a fire escape useless: <sup>flimsy</sup> construction, inaccessibility from public parts of the building, lack of protection against fire in lower stories, lack of extension to street level, use on high buildings where height causes panic, poor condition, snow and ice, other obstructions. Fire escapes are also open to the following general objections, as compared with other exits: they furnish no protection to property; they add nothing to the convenience of the building for daily use; and, being never used except in emergency, when emergency and panic come the occupants often forget, if they ever knew, their existence.

It is nevertheless true that a stairway fire escape, if properly designed, located, constructed, and protected, is a valuable safeguard, and in many cases the most economical safeguard.

Without going too much into technical detail, the following may be mentioned as necessary features of a fire escape specification: placed against blank wall, if possible; adjacent openings protected by fire doors or wired glass windows; accessible from public passageways, by doors rather than by windows; no cast iron (except counterweights, etc.) and no wood; designed for 100 pounds per square foot, at low working stress (to allow for rust); proper width; bars of platforms and treads to be of proper section, close enough not to catch heels, not so close as to catch rain and snow; brackets of proper stiffness, with tension members bolted through wall, and proper connections so as not to overstrain a weak wall; stairs not steeper than 45 degrees; treads and risers of proper width and height; lateral bracing for long runs; stiff, smooth, continuous railing; balanced stair of proper design (no cable counterweights); extension to roof; painted occasionally; not used for storage or otherwise obstructed; removal of heavy snowfalls; height limited to 60 feet above ground, with possible extension to 90 feet in special cases, if high latticed railing is provided.

This detailed description is given in order to show that it is perfectly feasible to build a fire escape (in fact, they are being so built in Wisconsin and elsewhere) which will furnish safe egress for a limited number of persons, subject to the single objection that the occupants are not accustomed to them by daily use.

This objection can hardly be considered vital in low buildings where there is no great hazard, where only one stairway is needed for routine use, and where a fire escape can be provided

much more cheaply than <sup>an</sup> additional stairway. There are of course difficulties of maintenance; but these are not peculiar to fire escapes. A stairway not needed for daily use is often found to be locked or used for storage.

Some special types of fire escape, like the "down and out" spiral chute, have considerable merit. Individual rope fire escapes, etc., have undoubtedly saved lives, but are a makeshift which should not be necessary in a building properly safeguarded.

Turning now to the number and width of exits, we find in building codes great confusion of thought and fondness for rule of thumb methods. Mr. Rudolph Miller<sup>10</sup>'s brief on this subject, before the New York factory investigating committee in 1911, contains the first, or one of the first, statements of rational governing principles. These principles are simply the following: (1) the number and location of exits must be such that, in case of obstruction at any point, an alternate exit will be available; (2) number and location of exits must be such that every point in the building will be less than a specified distance from an exit; (3) total width of exits must be proportionate to the number of occupants. The present New York factory law, the Wisconsin state building code, the standards of the National Fire Protection Association, and other authorities, are in general accord with these principles, though their detailed application varies, especially with respect to the proper relation between total width and number of occupants. For theaters and assembly halls this relation is simple, and ranges from the N.F.P.A. standard of 60 inches per 100 persons, down to some legal standards

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10. Supt. of Buildings Borough of Manhattan, New York.

as low as 30 inches per 100 persons. In factory and mercantile buildings, where persons from various floors use the same stairs, the problem is more complicated. Mr. H. E. Porter insists that the stairs from any floor to the floor below should be large enough to accommodate the entire occupancy (i.e., number of persons accommodated) on that floor - that is, the entire occupancy of the building is to be accommodated on the stairs at one time. This standard is very drastic; its effect, and probably its purpose, is to compel dividing fire-walls in any building having a large occupancy; for, with such a fire-wall, Mr. Porter would permit the stairs on either side to be reduced to a minimum. The latter seems to the writer a mistake. (see under "horizontal exits" above.) Even with a fire-wall, stair widths should not be reduced more than 50 per cent, because a fire-door may be blocked open or may fail to operate; even if it closes, smoke will ooze significantly through the joints; and panic-stricken people, acutely conscious of the fiery furnace on the other side of the wall, will not at once relax into the delightful calm pictured by Mr. Porter.

The New York factory law adopts the above standard, with the modification that stair widths may be decreased one-third if a sprinkler system is provided. Mr. Porter objects to such modification on the ground that sprinklers sometimes fail. On the theory of reasonable protection - results proportionate to expenditures - this objection cannot be sustained. Neither sprinklers, nor stairs, nor fire-walls, nor any other safeguard, furnish perfect protection. Three or five per cent of sprinkler failures undoubtedly compares favorably with the per cent of stairs and fire-doors put out of commission by goods piled in

front, or doors locked, or other misuse or disuse. Surely a sprinklered building with two stairs is, on the average, safer than an unsprinklered building with three stairs.

In the same way it seems reasonable to relax the above exit standard in the case of fire-resisting buildings - not because fire-resisting construction is a means of egress, but because in such buildings there is less chance of a serious fire and therefore less chance that emergency exits will have to be used.

One other important modification may well be made. The New York standard, as already stated, requires sufficient stairway width to accommodate all the occupants of the building at one time. This is probably necessary in a high building, but is it necessary in a low building? In a two-story building it is surely not necessary that the last person on the second floor be able to enter a stairway before the first person has reached the ground. This standard would require about twice as many stairways as are required for a theater balcony (where the hazard is generally quite as great) according to the high standard of the N.F.P.A. Therefore the required exit width per 100 persons should be on a sliding scale, increasing with the height of the building.

Summary of Exit Requirements. Every building should have at least two exits, and in large buildings the number should be increased so that there will be no dead-end corridors and no part of the building more than a certain distance from <sup>an</sup> exit. The total width of exits should be proportionate to the number

of occupants, the proportion varying with height, type of construction, and sprinkler protection. At least half the exits should be stairways, which should be enclosed if the building is higher than two or three stories; the other half may be horizontal exits or (under proper limitations) stairway fire escapes. In large buildings such requirements will lead to the use of a bisecting fire-wall as a means of reducing the number of stairways required.

(15) Escape: Fire Alarm and Fire Drills. We have long recognized the value of these safeguards in our schools, and we are coming to realize their value in factories and other places of assemblage. In New Jersey, Labor Commissioner Bryant has introduced factory fire drills quite extensively, and they have proven their worth in several serious fires where hundreds of girls have marched without confusion down the fire escapes and stairways. One advantage of a fire drill is that it calls attention to any lack of exits; as Mr. Proter remarks, it is impossible to have a successful fire drill in a building with insufficient exits. In theaters and department stores a fire drill of employes is exceedingly valuable.

(16) Distribution of Loss: Insurance. It is trite to say that fire insurance, while it does not create or replace wealth, is and always will be economically necessary for the protection of the individual owner. But fire insurance wrongly administered may be an economic curse. When agents are eager to write policies at or above the actual value of the property insured - when the careless man can buy insurance as cheaply as

the careful man - when inspections are infrequent and superficial - when adjusters pay claims above the true loss and without inquiry into the fire's cause - then insurance makes men indifferent, and worse than indifferent, to the danger of fire. On the other hand, rational rating is the strongest possible incentive to correct construction and equipment; rigid inspections, backed up with the threat of cancellation, may be more effective than state or municipal orders; coinsurance gives the insured a direct financial interest in fire-prevention. The incentive of lower rates applies not only to individuals but also to cities, whose basis rate depends on the efficiency of the fire department, the water supply, and the building laws.

In fire insurance as at present carried on, all these features, bad and good, may be noticed. The former are generally caused by the ignorant greed of local agents, who often have no knowledge of the principles of fire protection; the latter are due to the foresight of the large companies and of the National Board of Fire Underwriters, which have spent a great deal of time and money on fire prevention work of every sort. The companies' sincerity in this work has sometimes been questioned, but really it is a perfectly simple business proposition. If the fire-prevention campaign brings a consistent reduction in the fire loss, rates also must undoubtedly be lowered, either voluntarily, or by the competition of mutuals, or by governmental regulation; but the decrease in rates will lag at least five years behind the decrease in losses; and the insurance companies will be gainers. This of course does not mean at all that the public will not also be gainers, even during the first five

years, by reason of the decrease in the indirect losses not covered by insurance.

Various methods have been proposed for making insurance more effective for fire prevention. One method is state insurance. Another is state regulation of rates. Another is the licensing of agents, with the hope of eliminating the evils which have been mentioned as largely due to the local agent's ignorance or disregard of fire protection principles. It is beyond our scope to discuss these remedies in detail, but it is certain that some way must be found to bring fire insurance into more complete harmony with fire protection.

In all these matters the "factory mutual" companies are one of our greatest assets. They are unquestioned leaders in inspection and in insistence on proper construction and equipment; their yearly dividends preach the gospel of fire prevention as no other agency can; and their low net rates are a check on the rates of the stock companies.

### III. PROGRESS.

#### 1. Through Self-Interest.

The campaign of education which is being carried on with increasing vigor will unquestionably bring increasing results by appealing to the selfish interests of the property owner. Working side by side in the campaign we find the National Fire Protection Association and affiliated state and local bodies, insurance companies, architects, manufacturers of fire-resisting materials and extinguishing equipment, governmental officials, and writers in the popular periodicals and the press. As a result, most architects and many owners now understand thoroughly that better construction and equipment mean lower insurance rates. An increasing number are also realizing that these safeguards also protect against the indirect losses not covered by insurance - the loss of rent and profits, the temporary and often permanent loss of customers, and the disturbance to the working organization.

If this appeal to self-interest can be made to cover the entire field, then the method of education is undoubtedly the most efficient method, and it is only necessary to strengthen the forces engaged in this campaign.

The fact is, however, that the appeal to self-interest is in general effective against only part of the fire loss - the loss in individual buildings. It is not very effective against the conflagration hazard or against the life hazard. With dwelling-house insurance as cheap, and fire departments as efficient as they now are, self-interest will not lead the individual owner to specify an incombustible roof-covering for his

new house, even though from the standpoint of the entire city such protection would be a profitable investment. Self-interest may lead the far-sighted theater or hotel owner to adopt every modern precaution for the safety of his patrons, as a form of advertising; but the vast majority of such owners will not be moved by this appeal. As a very approximate numerical basis we may say that the fire loss in individual buildings forms about 70 per cent of the total loss, and the conflagration loss and loss of life (in other than private residences) together form about 30 per cent. This 30 per cent is a matter of public welfare and it will not be eliminated by private self-interest alone.

## 2. Through Legislation.

The 30 per cent just referred to is not, of course, a separate problem. If we could reduce the losses in individual buildings to zero, or to one-tenth of their present magnitude, we should thereby reduce the conflagration losses and the loss of life in the same or greater proportion. Legislation will therefore be most effective when it works along the same general lines with self-interest. Assume, for example, a factory in which fireproof stair enclosures would cost \$800. The owner finds that such enclosures will give him a reduction in insurance premiums sufficient to justify an expenditure of about \$700 but no more. The owner therefore tells his architect to omit the enclosures. The law then steps in and requires that for the protection of employes and adjoining buildings the stairs must be enclosed. This legal requirement costs the owner only \$100 net; it simply supplies the necessary additional incentive to

adopt a safeguard which self-interest has already seriously considered - which in fact self-interest would have adopted, had the owner fully considered the indirect losses which a serious fire might bring. Suppose, on the other hand, the law said nothing about stair enclosures but required an outside fire escape costing about \$300. Self-interest would rightly look on this expenditure as a pure loss; the fire escape would be built grudgingly and in the cheapest possible manner, and it would actually cost the owner more than the \$800 stair enclosures.

This example simply illustrates that legislation should protect the public against conflagration and against loss of life by means which will at the same time protect the individual property owner. In addition to being economically sound, this also happens to be expedient because such laws are much more easily enforced. Thus enclosed stairs are better than fire escapes; automatic sprinklers are better than a high-pressure water system; fire prevention inspections are better than additional steamers. The former is in each case prevention; the latter is cure, and generally a very imperfect cure at that. Under present conditions the curative safeguards are an undoubted necessity; but vigorous attention to the preventive safeguards for ten or twenty years will greatly reduce that necessity and will (if the experience of Europe and of the factory mutuals amounts to anything) bring about a decided reduction in the fire loss, which the curative safeguards have, at best, only held stationary.

Such legislation will fall into two classes: first, periodical inspections to correct dangerous practices and insure

proper maintenance of safeguards; and second, building regulations. Dangerous practices cause most fires; improper construction causes the remainder and also permits or aids all fires, however caused, to spread rapidly and become serious. A third object of legislation has already been sufficiently discussed - namely, the regulation of insurance agents.

Fire Prevention Inspections have passed the experimental stage. The experience of New York, Chicago, Philadelphia, and other large cities, and of the many states which have fire marshal departments, has proved this. It is only a question of time when every city will make such inspections. The system has already been discussed; it consists simply in sending out a few experienced firemen to secure the correction of conditions which they know to be dangerous.

Building Regulations, though perhaps not more important than the inspections just mentioned, are at least much more complicated. Building codes have too often been written either hastily, or by incompetent persons. (A code may be written "hastily", even though its formulation is spread over a period of years.) An examination of codes now in existence will dispel the illusion that a group of busy architects, builders, etc., whose minds are fully occupied with their own work, can come together for a few hours every week or every month and hope to turn out a finished product. Codes thus written will be found a patchwork of excerpts, more or less altered, from other codes, without rational order or coherence. Let me be not misunderstood; the judgment of such a committee of experts, on vital

points, is absolutely necessary; but it is not enough. The code, if it is to be any more than patchwork, must also have the careful, continuous attention of one or two men who are competent to gather and analyze evidence, to distinguish between essentials and non-essentials, and to elicit on essentials the real judgment of the expert committee. It may not be too much to ask also a working familiarity with English grammar.

There has been much talk of a "national" or "basic" building code and several national organizations have had committees working on such codes. (Note, in passing, the quaint spectacle - different groups of men, each writing a "basic" code, and each quite oblivious of the others!) It is questionable whether any uniform code is necessary or desirable. Of one such proposed code, the first installment, recently issued, contains a mass of technical definitions which may be needed to circumvent the trained legal mind of the New York jerrybuilder, but which would confuse, rather than enlighten, the village carpenter or fire-chief - and incidentally cost the village board a staggering amount to publish. A building code must reflect the needs and the temper of the community; and in different communities these factors will always be far from uniform.

There is, however, one particular in which building codes might well be uniform - the method of attack. Experts should, after full discussion, be able to agree whether the width of exits should be based on the number of occupants or on the size of the building; with this determined, the exact ratio will have to be left to the conscience of the community, at

least until current theories have been tested by experience. Some approach to this sort of uniformity may be hoped for as a result of the present agitation for a basic code. (Compare Lawrence Veiller's excellent "Model Housing Law" which, as to form and scope, uses the accumulated experience of New York and other cities, yet leaves the content capable of modification in deference to local conditions.)

In its requirements for specific safeguards (which we have already considered in detail) the building code should, of course, conform to rational, modern practice; should always seek a careful balance between public gain and private cost; and should as far as possible incline toward the preventive safeguards which protect the private owner as well as the public.

We are already beginning to write building codes along these rational lines.

State Building Codes are now receiving considerable attention all over the country. The arguments against a "basic" code, mentioned above, are often cited as proof that there is no place for a state code. This is true if we have in mind a state code as detailed as the city code of Chicago or Cleveland. On the other hand, we cannot overlook the fact that most cities of ten, twenty, and even forty thousand people have absolutely no building codes, because they generally do not recognize the importance of such regulation, and also because they shrink from the really formidable task of drafting a code which will be satisfactory.

It would seem, then, that there is a legitimate place

for a state code that is simple, brief, and fundamental, leaving to city councils the adoption of more detailed or more drastic ordinances if they desire. By "simple" is meant a code which every builder or fire chief can understand; by "brief" is meant a code not more than one-fourth as long as that of Chicago - preferably shorter. (Such brevity can only be attained by the most merciless pruning; but the enforcing official will wish that his code were even shorter, when he starts to work in a small town where any building regulation at all is a radical innovation.) By "fundamental" is meant that the code should strive to specify results only, and not encroach on the architect's or engineer's province of working out the most economical methods.

It is also desirable that the state code be enforced by local officials as far as possible, under the general direction of the state. This is not only more economical, and more in harmony with the principle of home rule, but it has the advantage of arousing greater local interest in the subject. If the small city does not have enough building to keep a separate inspector busy, let the fire chief or city engineer be building inspector *ex officio*, or let building, plumbing, and electrical inspectors be rolled into one. If this man-of-all-work has trouble in understanding any of the few technical requirements included in the state code, let the state department diplomatically lend assistance. This state department must be prepared to do a great deal of missionary work in the different communities; in fact, it should depend more on educational methods than on arbitrary authority.

It is very important for the government official to avoid all appearance of arbitrary authority in his dealings with the public or with officers of smaller units. The modern inspector gets results not so much by ferreting out specific violations as by convincing the owner that carefulness and safety make for efficiency and economy; that the law is meant to help, not to hurt him. An owner thus convinced will discover and remedy more defects than the inspector can find.

No mention is here made of building code requirements on sanitation and structural design. Such requirements, of course, form an important part of the city code, and a less important part of the state code, because in the smaller cities the actual existing hazards are mostly fire hazards.

Discretionary Power. Another disputed point in connection with administration is the amount of discretionary power given to the enforcing official. A building code contains so many details, and covers such a wide range, that special cases are sure to arise where some relaxation of standards is absolutely necessary. If the statute does not authorize any such relaxation, it will be permitted anyway, and in the worst possible manner - namely, by the tacit consent of the subordinate inspector. This is inevitable because, if the matter is brought to the attention of the chief, he can legally do nothing else but refuse the concession. The subordinate soon finds this out and thereafter uses his "judgment", which is not always the best. Even though the inspector is perfectly honest, no one gives him credit for it. How much better, then, to give reasonable discretionary power to the chief inspector or com-

missioner, or to an expert advisory committee! There is much in favor of the Wisconsin plan (partially followed in New York state) of a very general statute, under which a state commission is empowered to adopt and enforce detailed regulations. The commission can then grant an occasional exception to its rules where necessary; it can correct any defects which appear; it can adopt its code to new or changing conditions. Such a commission will generally be found quite as responsive to an intelligent public opinion as the legislature itself, because the commission is always in session, it has definite responsibility for a few specific functions, its proceedings are public, and it is subject to court review if it oversteps its authority. The same considerations, and the fact that it cannot accomplish much without the support of public opinion, will deter the commission from making frequent or erratic changes in its code.

## CONCLUSION.

The most efficient sort of fire protection, both for the private owner and for the public, is prevention - applying that term not only to the origin of fire but also to the conditions which permit its spread. Fire prevention legislation should require (1) inspections to correct dangerous practices, and (2) proper building construction. Such legislation must rest on a sound economic basis and must not require any greater expenditure than will be justified by the increased safety to life and property. We cannot require all buildings to be "fireproof", but we can require, for each grade of construction, such fire-stops and other safeguards as experience has proved to be efficient and necessary. In the case of any preventive safeguard, we may add together the benefits to the individual owner, to adjoining buildings, and to the occupants, and this total benefit will justify a greater expenditure than would be justified either by public safety alone or by the owner's self-interest alone. In addition to the preventive safeguards, public safety requires sufficient means of egress; but even here it is possible to choose types of exits which will protect property as well as life - namely, the enclosed stairway, and the horizontal exit through a dividing wall.

Such requirements should be embodied in city and state building codes, which should be rational, coherent and in line with modern practice. The state code should not be modeled

after existing city codes, but should be simple, brief, and fundamental, so as to be readily understood and enforced by local officials. The city should then be encouraged to adopt, according to its needs, more detailed or more drastic ordinances.

Approved W. S. Kiene

W. O. Withey

John G. D. Mack