

SECTION II. ENGINEERING AND ARCHITECTURE.

ADDRESS.

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PRESIDENT OF THE SECTION.

HAVING been appointed delegate by the Royal Institute of British Architects, and by the Birmingham Architectural Association, as well as having been requested to preside over this Section of the Seventeenth Congress of the Sanitary Institute, forces me to the conclusion that it is recognised I have, in the course of my architectural career, done something to advance the cause of sanitary progress.

The honour thus bestowed has however, cast upon me a duty which I fear I can but imperfectly fulfil; and I must crave your indulgence should I fail to rise to the standard of excellence which has so conspicuously marked the addresses of those who in previous years have occupied this Chair.

Sanitation extends over so vast a field of scientific research that it is impossible for an architect or engineer, now-a-days, actively engaged in his profession, to do much more than watch the rapid developments brought about by many indefatigable workers in numerous fields of investigation, and intelligently to take advantage of the knowledge acquired by others, so as to apply it in the works with which he may be entrusted.

Engineers and architects are then the active agents by whom sanitary science is practically applied in permanent works for the benefit of mankind.

The noblest undertakings of modern engineers are those which tend to secure the health and well-being of communities, such as the provision of pure and abundant water supplies, drainage, irrigation, the supply of gas and electric lighting, the construction of railways, canals, bridges, docks, shipping, and other means of transport by which food and clothing are brought to our very doors, often from distant localities of production, and

by which many are enabled to leave the crowded streets of cities and towns, to breathe the purer air of the sea-side and of country places.

The natural tendency of the human race is ever more and more to congregate and form communities; it is then only by united action and expenditure that health can be maintained. Where, however, such is adequately exercised, statistics will show that vast populations may live within a limited area and enjoy as good, if not even better health, than those in thinly inhabited districts where co-operation as regards sanitary matters cannot so readily be brought about.

Now that walled-in cities are no longer a necessity for protection, there is little reason why overcrowding should exist; there is generally open country around allowing, in most cases, of almost indefinite expansion, so that with good roads and easy means of conveyance from one quarter to another, large communities may dwell together, and by united action secure better health and greater comfort for the many, than is the lot of those living in sparsely populated localities.

It is among these large communities that architects find their chief employment. It is expected of them not only that they will provide protection from the elements in the homes of the people, but that such will be healthy, safe and pleasant places of abode; in addition to which they are entrusted with the erection of numerous buildings of public character, such as Schools, Hospitals, Asylums, places of Worship, Assembly Halls, Hotels, Theatres, Shops, Manufactories and Business premises; in one and all of which the amount of care and attention bestowed upon their design and construction, may very materially affect the safety, health, and well-being of a neighbourhood, and of numerous individuals, perhaps for generations.

It is well to impress this fact upon the public mind on occasions such as these Congresses afford, and to insist that the function of architects is not alone to produce artistic designs and decorations, but by a careful application of sanitary science, a knowledge of natural laws, of the nature and properties of building materials, of the earth's surface on which they build, and of the air we all breathe, so to design and construct the edifices they erect that, without being devoid of suitable artistic expression, they may be convenient in arrangement, safe in construction, free from sanitary defects, or such as might cause bodily hurt, mental trouble, or untimely death.

That the public have not always, and do not even now in every case demand this, must be evident. Too often, through ignorance, or on grounds of false economy and favouritism, is

the apprentice or inexperienced hand employed. Consequently as individuals either cannot or will not take care that safe and healthy buildings are erected for their use, the Legislature has stepped in and by various Acts of Parliament, Local By-laws, and numerous officials, endeavoured to safeguard individuals and communities.

The effect of this system is perhaps as good as can be expected, but it appears to me unduly to relieve many of personal responsibility which it would be better they should bear, and, because of the inflexible nature of all regulations, if strictly enforced, hardships in some cases must result, or where there is laxity, evasion is sure to follow; but the greatest evil is the lack of impartiality in administration apparent in some localities, so that instead of inspection and regulation, there is too often dictation and interference at the caprice of authorities or their officials, who may consider they have a right to interpret By-laws as they please, whether or not safety or health is in question; such action is not for the good of the community, individuals are irritated and sanitary progress is retarded.

Moreover in matters of sanitation there is much yet to be learnt, and there is reason to doubt the wisdom of many regulations which have from time to time been laid down in connection therewith.

There seems to be a law of evolution in sanitation as in many another subject. Consider the degrees of advance in connection with the disposal of faecal matter. Not so very many years ago every house had its privy, little more than a hole in the ground close to the dwelling, where month after month, excrement was allowed to accumulate; the fluid filth saturated the ground and contaminated the water supply drawn therefrom, while the putrifying solids poisoned the air around. Then came the cess-pool, more or less removed from the dwelling, and the water-closet developed; at first simply a pan down which an occasional bucket of water was poured to convey away the solids, then a water pipe with tap was provided for the same purpose; odours became unpleasant, to say the least, so the D trap was invented and following thereon the pan closet—that filthy retainer of faecal matter, still unfortunately to be found in many a house. Public sewers for conveying the objectionable matter to a common outfall were extended. Varieties of valve closets were introduced, and next came the “wash-out” pan, with a flushing cistern which, when acted upon, simply lifts the contents of the pan into the trap below until another flush, perhaps hours after, causes it to move on. Now we have the “wash-down” and “syphonic” pans, which at each flush ought to be thoroughly cleared; but the same bodies who are appointed to regulate

sanitary matters in the interests of the community, if they control the water supply, rarely permit more than a two-gallon flush, which generally proves insufficient for the purpose.

How reluctant some sanitary authorities are that we should be rid of our filth and how they have from time to time retarded the natural order of development, notably by adopting such clumsy devices as the pan collecting system. It is in fact only by painful steps that excreta and other foul matters have been expelled from the near neighbourhood of dwellings. Not long since in many districts a "trap" was required at the foot of every soil pipe, where each discharge was stopped on its way immediately outside the house, there it remained until another discharge came to shift it onward. Even now the "trap" is simply moved on to the boundary of the site often but a short distance from the dwelling. I predict the day will come when all such "interceptors" will be banished together with every other "trap" and impediment outside of buildings, then there will be little if any of that half putrescent matter now so often retained about dwellings, creating sewer gases which find their way into our homes or assail our olfactory nerves as we pass along the streets and highways.

Useful as manholes and inspection chambers may be when judiciously placed, there are some localities where their unreasoning multiplication must in time cause serious nuisance; where their number is excessive they retard the scour of the sewer and often become mere cesspools, filth is deposited around the sides, from which sewer gases are generated. Unfortunately large pipes and the excessive employment of traps, manholes, and inspection chambers are the panacea of inexperience in those who undertake sanitary work.

With every house drain of suitable size well ventilated at its highest point by being carried straight up, its full diameter, clear above all windows, with plenty of street gratings for fresh air inlets to the sewers, ample flush of water, impervious and well laid drains and sewers, all untrapped and free from obstruction; sewer gas, now so well known, might become a thing of the past only to be met with in laboratory experiments.

So soon as a drain from one dwelling joins another, according to law as at present laid down, it becomes a sewer, and from that point the architect, as such, has nothing more to do with it. The sanitary engineer then steps in, it is he who is responsible for the design and construction of the many arteries of pipes and conduits by which sewage is conveyed to the outfalls.

Much as architects may have erred in permitting defective construction in drains, others have sinned more deeply in the

matter of sewers. Apart from their general design, the method of construction, and gradients adopted, actual work has too often been defective in execution, so that, instead of aiding the quick removal of solids by water carriage, they have acted as filters or separators, permitting the fluids to escape and soak into the ground or to run off and to leave the solids to fester and become offensive.

I am of course speaking of what has happened in the past—no sanitary authority, architect, or engineer would now think of permitting such defects to occur. Yet, unfortunately, all are not agreed as to the necessity for preventing the formation of sewer gases, or even in accord as to the best methods of doing so, and, strange to say, although some of the “ills to which flesh is heir” have undoubtedly been traced to the action of sewer gas, there are many keen observers who point to the general good health of sewer men and failing to detect the deadly bacilli in its most concentrated essence, infer that after all, sewer gas is but a harmless though somewhat unpleasant guest. Others go less far, and while pronouncing it harmless within the sewers or playing about the streets, will yet condemn it as a burglar and murderer should it enter a dwelling. Notwithstanding this divergence of opinion, and although sewer gas may not on every count have been found guilty, it is undoubtedly more prudent to regard it as a suspect, to permit it no entry to our dwellings and to banish it from the streets and public ways. At the same time care must be taken not to imprison it within the sewers, for then it becomes more virulent and should it find a loop-hole for escape, it may work untold ill.

In other sections during this Congress much will doubtless be heard of sewage disposal, a subject of the greatest interest to sanitarians. A new era with regard to that question may be upon us, if what is now known as the “septic tank” fulfils the promise of its so-far rapid advance in public estimation.

Facility of disposal implies greater possibility of rapid removal from the neighbourhood of dwellings; and if what is claimed for the septic tank proves to be true, a dual arrangement of sewers and storm-water drains will be unnecessary. The periodic falls of rain can then, by means of collecting tanks or reservoirs, be utilised as a constant means for flushing and cleansing drains and sewers; because it is held that, whatever the volume of the effluent, it may with safety be turned at once into the natural water-courses.

Sanitation has to deal with many subjects quite as interesting, if not so savoury, as sewers and drains. Every building we occupy, the houses in which we reside, the water or the fluids we drink, the food we eat, the air we breathe, the clothes we

wear, the work we do, the recreation we take, all exercise their influence for good or ill upon health.

Because some diseases are marked in their characteristics, and frequently become fatal within comparatively short time, their causes are zealously traced, and safeguards are devised. Yet how many continually suffer ill-health, are deprived of full vitality and capacity for useful employment and enjoyment in life, resulting, in the majority of cases I do not doubt, from neglect of sanitary laws. But because the immediate effects are not made apparent, the causes are more or less ignored, investigation is imperfect, knowledge is indefinite, and popular prejudice is often at fault.

Careful and constant observation of cause and effect, together with frequent exchange of the views and ideas of observers and thinkers, may in time elucidate much that is now obscure regarding what is requisite for the health, strength and consequent happiness of mankind "Prevention is better than cure."

Probably the greatest obstacles to the advance of sanitary science are popular prejudice, and the unreasoning adoption of materials, means and methods which may be good under certain circumstances or conditions, but the cause of evils when wrongly applied or employed.

In this connection is the question of the proper use of certain building materials. In most books on building construction will be found advocated, without qualification as a rule, the employment of hard and impervious materials. Popular prejudice catches at the idea that hard materials must be the best and strongest, and those that are impervious must secure dry buildings, consequently the hardest of stone, the most highly pressed bricks and tiles are demanded. In the daily press there is frequent advocacy for the employment of glazed materials for the entire exterior as well as the interiors of buildings, and in a few cases the suggestion has been followed; yet I find there are many observant architects who persist in what they consider better methods of construction, they seek for materials of permeable structure, having surface texture and variegated tones, with which they build in such a manner that, while securing adequate strength, there is no waste of good material. I venture to believe they are rightly aiming at a scientific method of construction, the best suited to secure health and comfort for the occupants.

To go into all the reasons of the why and wherefore would be out of place in an address such as this but broadly regarded, the difference is on a par with clothing oneself now-a-days in a suit of steel plate armour, instead of in good woollen material; the plate armour was of some value doubtless in the days of

hand to hand combat, but even then only employed for the purpose of protection, as a daily garb it would be ridiculous in appearance as well as injurious to health and comfort; whereas a suit of woollen material is serviceable and greatly to be preferred, from this comparison I must leave you to draw your own inferences.

Ventilation is another subject of primary importance from a sanitary point of view; how glibly most people will talk about it, and yet how little is it understood by the general public. Popular prejudice and ignorance too often frustrate the best endeavours of those who have studied the subject and apply the knowledge they have acquired.

Is it always remembered that regulations respecting the width of streets, the height of buildings, the prevention of overcrowding, the proper construction of sewers and drains, the cleansing of thoroughfares, and particularly of courts and alleys (which, by the way, ought not to be allowed to exist if every individual had a proper regard for his own, and his neighbours health and well being); the quick removal of refuse animal and vegetable matter, from within and around dwellings, an ample water-supply for domestic and cleansing purposes, the provision of electric lighting; and many another duty laid upon district authorities, have one and all a direct bearing upon the maintenance of the atmospheric air we breathe in a state of suitable purity, without which efficient ventilation is impracticable?

Fortunately in this country it is possible in most dwelling houses to employ natural means for securing an adequate change of air on almost every day in the year. Yet there is much that an architect may do, by care and forethought, in planning, in the employment of suitable materials, and in devising means so that such necessary change of air within may be brought about in a manner to secure comfort to the occupants. It must however, be remembered that without due care and intelligent attention on the part of the occupants, efficient ventilation cannot be maintained.

In many buildings erected for public use the case is often different. Natural means cannot always be relied on for securing efficient ventilation, because mere change of air is far from being all that is implied by the term. In addition there must be suitable temperature and humidity of the atmosphere, as well as freedom from draughts. To meet these requirements mechanical means must be resorted to.

I venture to point with some degree of pride to one of the largest installations ever laid down, viz., that at the general Hospital in this city, a building erected from my designs. To Mr. William Key I give all credit for devising the engineering

requirements for heating and ventilating that building; but I have no hesitation in saying, and feel sure he agrees with me, that success in such an undertaking is best secured when the architect, having made himself thoroughly acquainted with the requirements by which good ventilation can be obtained, works hand in hand with the ventilating and heating engineer, and designs the building on lines best suited to the methods to be adopted.

Frequent failures there have been in applying mechanical means for securing ventilation in large buildings. It is well to face that fact, and to realise the vast amount of prejudice resulting therefrom. My investigations convince me that such failures result from three primary causes:—

1. Too low an estimate of the volume of air required.
2. Want of efficient mechanical appliances.
3. Want of constant and intelligent management.

With regard to the first, even recent writers upon the subject of ventilation give a change of air three times per hour as a suitable requirement, and many professed ventilating engineers base their estimates on such inadequate provision. One firm had a laudatory article in a sanitary journal (?), recently published, of a newly introduced appliance, by which it is claimed that change of air within an apartment can actually be brought about *once* in every hour.

So long as architects and the public shut their eyes to the ascertained fact that a change of air from seven to ten times per hour is essential for health and comfort, failure must inevitably result.

The perfection to which mechanical contrivances can now be brought, and the ease with which electricity may be employed for motive power, make it practical to secure an adequate change of air within a building, however complicated may be its plan and arrangements.

The internal capacity of the General Hospital, Birmingham, equals two million cubic feet, and provision is made for propelling a total of twenty million cubic feet of cleansed and tempered air throughout the buildings every hour continuously, night and day.

The experience I have gained in this and other buildings, similarly ventilated on the plenum system, enable me to assert without hesitation that, with an adequate expenditure upon a properly equipped installation and careful management, there is no reason why efficient ventilation and warming should not be secured in every public building, with absolute freedom from harmful draughts.

The provision of dwellings for the working classes has for

many years occupied the attention of sanitarians; because, permanently good health cannot be secured in defective dwellings, and unless the health of the largest class is maintained, it constitutes a source of danger to the rest of the community. There are many reasons why homes for the labouring classes are often defective, but there is one reason which more than any other tends in that direction—it is the system of creating excessively high ground-rents.

There is a limit to the amount of rent which it is possible for working men to pay, consequently if the ground landlord is grasping in his demands there is little capital left to be expended on the buildings and therefore, they are scamped. I am no Socialist in the ordinarily accepted sense of the term, but I realise most strongly that the excessive value put upon land for building purposes—particularly that required for the houses of the working population—is a leading cause of bad building, the result of which is impaired health in the community from which the landowner, as well as members of his family may perchance suffer more severely than they would from a slightly reduced income following upon less exorbitant demands for ground rent.
