

TRANSACTIONS

OF THE

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LONDON, AUGUST 10TH-17TH, 1891.

Patron:—HER MAJESTY THE QUEEN.

President:—H.R.H. THE PRINCE OF WALES, K.G.

VOLUME VI.

SECTION VI.

ARCHITECTURE IN RELATION TO HYGIENE.



EDITED BY C. E. SHELLY, M.A., M.D.,
Assisted by the HONORARY SECRETARIES of the SECTION.

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SECTION VI.

ARCHITECTURE IN RELATION TO HYGIENE.

Tuesday, 11th August, 1891.

The PRESIDENT, SIR ARTHUR BLOMFIELD, in the Chair.

Presidential Address

BY

SIR ARTHUR W. BLOMFIELD, M.A., A.R.A., F.R.I.B.A.

After the inaugural ceremony of yesterday, and the admirable address in which the Prince of Wales gave so cordial a welcome to the visitors of this great International Congress, you will doubtless be anxious to begin the work which lies before us in the next four days with the least possible delay.

I shall not, therefore, detain you with a lengthy address in opening the business of this Section.

Its title, "Architecture in relation to Hygiene," is clear and precise, but it has no doubt occurred to many who have read it that it involves a question to which it is by no means easy to give a clear and precise answer, "What is the relation of architecture to hygiene?"

The difficulty of answering lies in the uncertainty as to the strict limits of the functions and duties of the architect.

One of the greatest of our English authorities on the subject—the late Mr. Fergusson—in the introduction to his well-known handbook, defines architecture to be "The art of ornamental and ornamented construction," and further on, speaking of the architect, he says, "It would be well if, in most instances, he could delegate the mechanical part of his task to the engineer, and so restrict himself entirely to the artistic arrangement and ornamentation of his design."

If this view of architecture and of the legitimate duties of the architect were generally accepted as correct, the relation of architecture to hygiene would be reduced at once to something which is not always easy to trace or grasp, and which has never yet received the full amount of serious and careful attention that it well deserves. In that case most, if not all, of the valuable and interesting papers, which we are about to hear and discuss, would have to be addressed to some other more purely scientific section.

If, on the other hand, we take the more usual definition of architecture as "the art and science of building," its relations to the

science of hygiene at once become too varied and too complex to admit of clear and concise description. A vast field is at once opened out before us, in which it is often extremely hard, sometimes even impossible, to indicate with precision the line of demarcation between the domain of the architect and those of experts in other branches of science. As one out of many illustrations which might be cited of this difficulty, I may mention the wide and interesting subject of paving, which plays so important a part in the health, comfort, and well-being of communities. This large question seems to occupy a kind of neutral ground between the province of the architect and that of the civil engineer.

Many other similar instances might be given, but this one will be sufficient to show that the selection of subjects to be dealt with by this section must always be a matter of considerable difficulty.

Directly scientific considerations are admitted side by side with the purely æsthetic aspect of architecture, it becomes hard to name a subject for discussion at a Congress of Hygiene which would not be as suitable for an engineering, medical, or other scientific section as it is for that of architecture.

For this reason I venture to throw out the suggestion that for some future meeting of this Congress an extremely interesting and instructive paper might be written dealing exclusively with the points of contact between hygiene and the purely æsthetic side of architecture.

This branch of a great subject remains up to the present time practically almost untouched, perhaps partly from the fact that to many minds the attempt to establish any such relationship appears fanciful and unpractical. It is well known that one of the greatest of our English pioneers of sanitary science, the late Sir Edwin Chadwick, viewed the idea of any such connexion with disfavour, and even with anger; he seemed, indeed, to think that art and hygiene were not only unconnected, but even in some respects incompatible.

Notwithstanding this decided opinion of a great and deservedly respected authority, I do not think it would be difficult to show that such a connexion has, at any rate for certain minds and constitutions, a very real existence; neither would it be hard to prove that, although never perhaps closely followed up or fully worked out in all its bearings, the idea of some actual relation between beautiful and artistic surroundings and health, must have been present in the minds of many writers both ancient and modern. Time forbids me to do more than instance a very few examples.

I cannot refrain from giving one of great weight and venerable antiquity which I find in the third book of Plato's "Republic."

"Let our artists," he says, "be those who are gifted to discern "the true nature of beauty and grace; then will our youth dwell in "the land of health, amid fair sights and sounds; and beauty, the "effluence of fair words, will visit the eye and the ear, like a healthful "breeze from a purer region, and insensibly draw the soul, even in "childhood, into harmony with the beauty of reason."

Thus, it would appear, the great philosopher held that the finest productions of art, acting through the eye on the mind, exercise a distinct influence on bodily health; and if, as Emerson tells us, "Out "of Plato come all things that are still written and debated among "men of thought?" we may take this passage as a type of many similar thoughts scattered through the works of numberless authors from his day down to the present time. May not the same idea be traced in the much-quoted line of our own poet Keats, "A thing of beauty is a joy for ever"? But instances will not be found wanting of more direct reference to a real connexion between the beautiful in art, and especially in architecture, and the science of health, or hygiene.

Eight years ago the late E. W. Godwin read before a meeting at the Health Exhibition, then being held in London, an elaborate and masterly paper on "Dress in its relation to Health and Climate." In the course of a parallel which he draws in that paper between dress and architecture, he says: "Science and art must walk hand in hand, if "life is to be worth living. Beauty without health is incomplete. "Health can never be perfect for you so long as your eye is troubled "with ugliness." He goes on to point out that long habit will no doubt accustom most people to any degree of ugliness, so that the mind untrained in Art is seldom perhaps consciously troubled by it. But notwithstanding this apathy, a legitimate source of intellectual enjoyment is lost, and doubtless with it an appreciable element of health in its highest perfection; a loss which it is the business of the architect in some degree to supply by providing beautiful objects to satisfy and delight the eye, and by waging war with everything that is mean, ugly, and squalid.

At present, no doubt, large masses of people are still so habituated to these last characteristics in their every day surroundings that they scarcely feel a wish for anything better, just as they will get accustomed to evil smells, and to a vitiated atmosphere which they breathe quite unconscious of its insidious and deadly effects on their health.

But if education and culture continue to advance as they have done in the last fifty years, and habits of intelligent observation are fostered and encouraged, the eyes of the masses will every day become more sensitive and fastidious; the dreary and monotonous streets and badly designed buildings which a few years ago would have been passed unnoticed, will soon begin to exercise a distinctly depressing and disturbing influence on the mind, which cannot fail to have some ill-effect on the health, comfort, and general well-being of the community.

It is now, I believe, a recognised fact that certain colours, quite apart from the nature of the pigments or dyes which yield them, produce very decided effects, both on the mind and body when in certain conditions.

It is probable that the same is true of certain combinations of colours and even of forms in which the skill and taste of the artist must be paramount, and in which the aid of science, however necessary, can only be looked upon as subsidiary.

Valuable hints and suggestions bearing on this subject may be gathered from a lecture delivered many years ago at the Royal Institution by Cardinal Wiseman, entitled, "Points of contact between Science and Art." Also from an address delivered by Mr. Wyke Bayliss, President of the Royal Society of British Artists, "On Sanitary Reform in relation to the Fine Arts," at the Sanitary Congress held at Hastings in 1889.

As might naturally be expected from such a source, it teems with beautiful and poetical thoughts bearing on the subject. He shows how ruinous are dirt and disorder to the best interests of art, and how all artists must hail every onward step in sanitary reform as not only conducive to bodily health, but to the growth and progress of art. The whole cannot fail to be read with as much pleasure as profit, and anyone who desires to follow out the line of thought I have suggested in tracing a direct connexion between architecture as a fine art and hygiene, will do well to study this address with great care and attention. But the illustrations, arguments and advice made use of are directed more to the influence of sanitary reform on the growth and development of art than on the effect of art on health, a more obscure perhaps, but no less interesting subject, and the one I desire to see dealt with.

I have left until the last all mention of the only writer who, as far as I know, has ever made any serious attempt to deal systematically and in detail with this interesting subject.

Some years ago my friend Dr. B. W. Richardson, who stands in the foremost ranks of sanitary authorities, delivered a lecture upon it, which, I am afraid, is now out of print, and I have been unable to obtain a copy; but he has kindly furnished me with some information about it.

He tells me that the principal points he dwelt on were as follows:—

He began by showing that much prejudice has been excited against some of the best sanitary inventions and labours, because leading sanitarians have failed to consider artistic construction as part of sanitary construction; their whole minds have been absorbed in the useful, and they have permitted all that is ornamental to pass by as if good taste were disconnected from sanitation. He argued that this was a grand mistake; that ugliness was an offence to good health, and that beauty was an aid to the best health.

He showed that when mind and body are enfeebled by bad health, the introduction of disagreeable objects into the sick room or ward is painful and injurious to the occupants; whilst the presence of beautiful flowers, pictures, and designs is curative in its effects; a kind of mental tonic which gives tone also to the body. This thought led him to the consideration of the best forms for hospital wards having regard to the effect on the eye, and through the eye on mental and bodily health, and so with all the details of visible construction and of decoration.

Speaking of the dwelling house he maintained that no part ought to be excluded from the possession of architectural art, because it is the tendency of the human mind to let that which is disagreeable, plain, and ugly go without regard and accumulate dirt and disorder. Hence all

the offices of a house should have as much care bestowed on them as the living rooms to render them bright and cheerful, and to make cleanliness as obvious a necessity in one as the other. In this lecture Dr. Richardson made a great point of the treatment of floors, adverting particularly to the Ancient Roman mosaic floors which were not only beautiful works of art, but easily cleaned, and which by the well-known hypocaust system of warming diffused an equable and agreeable warmth through the room without draughts.

Other points especially dwelt upon were the treatment of roofs, and the introduction of artistic water fountains in different parts of the house.

No one could be found better qualified than Dr. Richardson to speak with authority on both the aesthetic and the scientific aspects of the question "What is the relation of Architecture to Hygiene;" but even when writing in the interests of art he is naturally first of all a man of science, and I should like to see the same subject dealt with by an architect from an artist's point of view.

Professor Fenger (Copenhagen) said that architects on the continent looked in many directions for instruction, but not so often to England as to continental countries; but the conviction is dawning upon them that in one respect England has taken a prominent part among the nations of Europe since the beginning of this century, namely, in sanitary house-building, as well as in the construction of separate wards in hospitals. Now they can scarcely build without being indebted to England for ideas. He concluded by proposing a vote of thanks to the President for his presence in the chair, and for his admirable address.

Mr. Charles Lucas (Paris) fit des remerciements à M. le Président pour son adresse sur la nécessité de l'alliance de la Beauté et de l'Art, le souvenir donné aux regrettés Chadwick et Godwin.

The proposal was carried by acclamation.

On Open Spaces.

Read by the Earl of Meath.

[Prepared by Mrs. BASIL HOLMES, Hon. Sec. to the Metropolitan Public Gardens Association.]

If we could transport ourselves into the England of 200 years ago, or if we were even able to see what our great grandfathers looked upon, how hard it would be to recognise the sites of those places which are now so familiar to us. A great part of the land was common land, or lammis land, heaths, downs, forests, woods, moors, and village greens. But the increase of population, the concentration of the people into towns, the rapid growth of London and the manufacturing centres, these forces conjointly waged war against the open spaces, and gradually swallowed them up. Commons disappeared, fields and lanes became

streets and houses, village greens were encroached upon or thrown into the roadways, graveyards were used as sites for railway stations and public and private buildings of all sorts, and where the dead had peacefully slumbered was heard the noisy engine and the rattling train.

But the history of the desecration and loss of the open spaces round towns is too well known for me to dwell upon it here, and many will also be acquainted with the story of their revival, for it is but a recent one. Acts of Parliament have been passed to protect and regulate commons and greens, to preserve graveyards, to promote the acquisition of open spaces in and around towns, from the largest park to the smallest playground, and to provide for their maintenance. Philanthropic societies have started into existence, whose object it has been to carry out these Acts and stir up the public bodies to do so; and now, on all sides, the public mind is awakening to its need, and the public voice is beginning to ask for its satisfaction. But although something has been done to restore the lost breathing places, much, very much, still remains to be done; and what has been accomplished in the past in a scattered and unsystematic manner, will have to be done in the future, both thoroughly and systematically.

It appears to be a generally recognised and undisputed fact that, to restore enfeebled health or weakened animation, fresh air must be resorted to, *i.e.*, air that is not contaminated by the breath of human beings. We take the fainting person out of a building, we send the consumptive patient to the top of a Swiss pass or to the sea shore, and we carry the sick child from his crowded home in the city and place him in a country village. It is only necessary to glance through those statistics which show the death-rate in the manufacturing and closely inhabited towns as compared to the death-rate in the country or the suburbs, to learn the generally well known lesson that the health of the nation suffers in proportion to the degree that the individuals are crowded. Of course, I am aware that, notwithstanding the increase of population, there is a steady decrease in the death-rate over the United Kingdom, but this is due to improved drainage, warmer clothing, the great advance in medical knowledge, and a hundred other influences which are at work among the people; and, as this is now the case, who can say how robust the nation might have been by this time if the open character of the surroundings of the towns had been preserved.

It is strange to read of the time when the youth of London needed only to go to Moorfields (where Liverpool Street Station now stands) in order to stretch their limbs and sport in the free and open country; when Oxford Street was a country road; and the way to Islington, St. Giles, or Camberwell was through pleasant, flowery fields, by rural lanes and foot-paths. Now, if we live in Islington and wish to see a meadow or a hedge, we must take the train and travel in it for some miles. Certainly there are Hyde Park, Regent's Park, and some 200 smaller recreation grounds in London, besides a few open spaces on its borders, but, invaluable as they are, they cannot supply the place of the open country, nor are they really adequate to meet the wants of the vast mass of people who live round them.

Granted that fresh air and open spaces are needed for the health of the inhabitants of our larger towns, we will briefly consider the two ways of satisfying this need, namely:—1st. A systematic acquisition and preservation of land for public recreation, in connexion with the towns and in relation to their growth. 2nd. Increased facilities for taking people from the towns into the country.

In the towns themselves the governing bodies—the councils—should lay down and should carry out some such rule as the following:—That public recreation grounds should be provided in each parish, in proportion to the number of its inhabitants.

This would mean that there should be a fixed minimum of open space for a certain number of the population. Here and there the minimum would be exceeded, and so much the better for the people, but it should always be reached, either by securing existing open spaces for the public for ever, or by acquiring new ones, and this, if need be, by pulling down houses for the purpose. And for the information of those who are not well acquainted with the question of acquiring open spaces, I would mention that much may be done in the towns by securing and throwing open enclosed and deserted squares, disused graveyards, the remnants of village greens (where such have become merged into the towns), vacant plots of railway land, abandoned wharves, market-places, &c., &c. The Open Spaces Act of 1877, amended in 1881, 1887, and 1890; the Disused Burial Grounds Act of 1884, with its amendments; and other measures, give all the power that is needed to local bodies to carry out these improvements. The Metropolitan Public Gardens Association, which has been at work in London since the close of the year 1882, has laid out, or assisted to lay out, 65 gardens and playgrounds for the use of the public; has given grants of seats for 31 other sites, either streets or open spaces; has granted money towards the formation and upkeep of 23 public gymnasia; has secured the opening of 166 playgrounds belonging to the London School Board (on Saturdays); and the laying out and throwing open of 19 recreation grounds; has planted trees, and given grants for tree-planting in 37 thoroughfares and other sites; has opposed encroachments on 18 disused burial grounds, commons, and open spaces; and has in other ways assisted in the preservation and formation of very many useful recreation grounds. What has been done in London (and it is very little compared to what needs doing) can be done in the other large towns; there is the same opportunity for improving them by bringing green grass, bright flowers, and shady trees into the dingy and monotonous streets.

It may be said that if you increase suburban life you do as much harm as by enlarging a town. But, certainly, if you take the wives and children belonging to a community away from the city and into the suburbs, you are doing them good from an hygienic point of view. The husbands and fathers will have the advantage of spending their nights and their Sundays in purer air, and the disadvantage of, perhaps, journeys in a train twice or more on every week day. But London and the large towns *will* increase, and the only question to be settled is—

Are they to increase from outside inwards, or from inside outwards? These two diagrams will illustrate, in a rough manner, what I mean. The size of the central circles (denoting the towns) is the same. The size of each excrescence, and their number (denoting the suburbs), is the same. The amount of open space enclosed in each dotted circle is also the same, but its distribution is different.

In Fig. 1 the largest mass of new houses is next to the old centre, whereas the smallest group of new houses adjoins the largest plot of open space. In Fig. 2, on the contrary, a larger area of open space is brought close to the old mass of buildings, and the greatest number of new buildings are nearest to the open country. There are, perhaps, advantages in either system; but the advantages in the second, from a healthful point of view, if not from an artistic one, outbalance, in my opinion, those of the first. It may be said, however, that the plans are too fanciful to be of any use; that suburbs always grow in accordance with local need and local possibilities; and that a town built in a pattern, and only allowed to grow in a pattern, would be impossible and undesirable. But I am speaking theoretically, and I wish my theory to be illustrated in a purely systematic way. Fig. 2, if carried out, would involve a cessation of building immediately adjoining the original centre, and this is what is most needed. In other words, a town that has reached a certain size should grow no more, except from centres at a given distance outside. I am not speaking of a plan suitable for time and eternity, or to be carried out by generations far ahead of our own. They will need other and much more far-reaching reforms in building, if the population continues steadily to increase. I am speaking of something that is needed at the present time, and of a plan that might now be adopted in several of the larger towns in England. To take the metropolis as an example:—It is not so likely to hurt London that Wimbledon or Tottenham should grow to great proportions; what does hurt London is, that all the fields of Fulham and Deptford are being covered with houses. It is the increase at the centre that is so detrimental—the gradual annihilation of the remaining open space which is close to, or forms part of, the towns. The increase should be in the suburbs of a town, or, rather in a certain number of them whose centres are beyond a given distance from the city. This need not produce a monotonous sameness. There would soon be characteristic differences in the various suburban districts. There would be the aristocratic suburb, joined to the town by a handsome drive and a rotten row; the commercial suburb, with its service of city trains running every hour, half-hour, or minute, if need be; the artistic suburb, selectly free from the incursions of the railway director, where the linnet and the lily would flourish undisturbed; the domestic suburb, arranged for schools and kindergartens, nurses and perambulators; the cheap suburb, very noisy, and connected with the city by tram-lines and subways; and there might be, but we should hope that there would not be, the cheap and nasty suburb, complete in itself, in its dirt and in its degradation. But each, if not allowed to grow at the city end, but only at the end furthest removed from the town, would share alike in

possessing vast strips of open land for the recreation of the people and their children.

In the towns themselves there should be every effort made to have beautiful streets, with trees and seats in them, and beds of flowers, instead of neglected and dirty corners, and creepers planted on bare walls. Every disused graveyard and deserted enclosure should become a bright garden, and every plot of unused land be made into a children's playground or an outdoor café.

If the preservation of open spaces were properly taken in hand and systematically carried out, there would not be so much need as there is now for increasing the facilities for taking people from the towns into the country. But still it will always be of great advantage, both to young and old, to see new places and breathe different air; to visit the seaside and the rural country. The railway companies have done much of late years to render this possible to a greater number by issuing cheap "fortnightly" tickets for the seaside, &c., &c., and there is more than one useful society at work giving country holidays to city children, and sending the tired seamstress and overworked clerk to breathe the sea air; besides numberless private people who are doing their best to supply this need by throwing open their own country houses, or paying for the holidays of those who are less blest than they are with this world's goods. This is a question which is not so easily dealt with officially; it is one which, although very important, must be left more or less to be settled by the railway companies and by the people themselves. Something may be done to teach the inhabitants of the towns how best to make use of their holidays, especially the bank-holidays. But, after all, they will please themselves, and some will go to Epping Forest, while others will sit in the nearest tavern and drink, and drink, and drink; and, amongst those who are in Epping Forest, there will be some who feast their eyes on the beautiful trees and tender grass, while others will care for little beyond the ginger-beer and the sticky sweets.

It must always be remembered, in speaking of the open space question, that it is not one which, having been fully dealt with, may now be put aside as settled. On the contrary, the need of providing open spaces increases daily, while the difficulty of finding them does not diminish. It would be a great boon if a new Building Act were passed forcing builders to provide recreation grounds, or to reserve breathing spaces for a fixed number of new houses. So long as the population grows, so long will new public and domestic buildings be erected, and so long will there have to be voluntary action, if there is not State-directed action, to preserve or to provide open spaces for those who increase and multiply in the land. One word more. The work must be done well. It is better to have small recreation grounds, preserving their rural foliage and beauty, than to have large parks, stiff, flat, bare, and uninteresting. We want large and small open spaces, but natural ones; country left in the town so that the townsfolk may not forget the country.



DISCUSSION.

Mr. Rogers Field wished to suggest that all open spaces should be connected by boulevards or park roads. He was not aware that this had been done already in Chicago. He remembered that in his very early days there was an opportunity of making a magnificent boulevard between Regent's Park and Hampstead Heath. The idea had been suggested by the late Professor Cochrane in about 1851, and the plan was published in the *Builder* newspaper. The outbreak of the Crimean War had interfered with the carrying out of the plan. Then, between Primrose Hill and Hampstead Heath there was a fine avenue of trees. This avenue, which was still in existence—Belsize Avenue—could have been obtained at an exceedingly reasonable rate, and plans had been made showing how that avenue could be turned into a magnificent drive from Primrose Hill to Hampstead Heath. Now, however, unfortunately, the whole space was built over, and there was no means of connecting these two open spaces. This was a question to which the greatest attention should be paid. He happened to know the case he had cited intimately, but no doubt there were other cases round London where building was going on, and where the connexion between open spaces should be attended to.

Mr. H. H. Collins said that in this matter, as in so many others, Queen Elizabeth was right when she endeavoured to put a stop to the building of more houses in London. The builders could not be expected to help in the multiplication of open spaces, but the owners of land might be induced to do it because it could be shown to be in their own interests. They could not get the necessary means from the ratepayers, and he would rather depend upon philanthropy than upon State aid. They could not prevent landlords from selling their land, but they could be shown, as had been seen in the very district where Mr. Rogers Field lived at Fitzjohn's avenue, that an apparent sacrifice of land often increased the value of it.

Dr. J. F. J. Sykes (one of the Hon. Secretaries to the Section) said: A great deal of gratitude we owed to the ignorance—or possibly enlightenment—of those people who, by using as burial grounds large open places now in the middle of London, had kept the same from the grasp of the builder. In all probability posterity, if we took to cremation, would have no occasion to bless us from a similar point of view.

Mr. B. Johnson (of the Poplar Board of Works) thought that, in order to prevent land being so built upon that nothing could be seen of the natural beauties of a locality, power should be given to local authorities to prevent more than a certain number of houses being put upon a plot. The necessity of such restraining powers being given was well illustrated in the Isle of Dogs, where men were allowed to go down 8 ft. or 9 ft. underground with the lower floors of houses, and where many families were living literally underground. Until county councils and local authorities had such powers they would never be able to prevent land being covered by houses built like tea-chests, nor to stop jerry building.

Dr. Engel R. L. Gould, of the U.S. Department of Labour, Washington, cited statistics which showed that London held the twentieth position with regard to its open spaces, measured in terms of the number of inhabitants per acre. Vienna had a population of 473 per acre, Paris 495, Brussels 637, while London had 694. The Earl of Meath appeared to be in favour of small instead of large open spaces. He found that London took higher rank when the larger parks were left out of the reckoning. Without

the great parks, London had a population of 909 per acre; but Philadelphia, which had a population of over 1,000,000, and had only 340 per acre on the average, had 17,649 per acre when its greatest park was left out, and Vienna would have 3,300 per acre with one great park left out.

Hygienische Grundsätze für die Erweiterung und den inneren Ausbau der Städte.

VON

J. STÜBBEN, Stadtbaurath in Köln.

A.—ALLGEMEINE AUFGABE.—1. Die Erweiterung einer Stadt darf nicht der freien Privatthätigkeit allein überlassen werden, sondern ist durch amtliche Maassnahmen der Gemeinde und des Staates zu regeln; das gleiche gilt für den Ausbau einer Stadt im Innern. 2. Zu den wichtigsten Obliegenheiten, welche Gemeinde und Staat hierbei zu erfüllen haben, gehört der Schutz des gesunden Wohnens und des gesunden Aufenthalts in der Stadt.

B.—HYGIENISCHE ERFORDERNISSE.—Gesundes Wohnen und gesunder Aufenthalt erfordern: 1. Genügende Breite der Strassen; gesundheitlich zweckmässige Herstellung und Ausstattung der Strassen und freien Plätze. 2. Öffentliche Pflanzungen. 3. Reinhaltung des Untergrundes, des Wassers und der Luft. 4. Wasserversorgungs-, Beleuchtungs- und Verkehrsanlagen. 5. Herstellung zweckmässiger Baugrundstücke in ausreichender Zahl und passender Grösse. 6. Gesundheitlich gute Anordnung und Einrichtung der Gebäude, Arbeitsstätten und Wohnungen.

C.—AMTLICHE MAASSNAHMEN.—Um diese Erfordernisse zu erreichen, sind folgende positiven und negativen Maassnahmen der Gemeinde und des Staates zu ergreifen: a. *Positive Maassnahmen*.—1. Aufstellung eines zweckmässigen Bebauungsplanes für die Stadterweiterung, welcher sich erstreckt auf alle im Anbau begriffenen und zum Anbau in den nächsten 20 Jahren bestimmten Theile der städtischen Umgebung; Aufstellung eines zweckmässigen Bebauungsplanes für die Verbesserung der alten Stadttheile. 2. Aufstellung einheitlicher Entwürfe für Entwässerung, Abfuhr, Schutz gegen Hochwasser, Wasserversorgung, Beleuchtung und Verkehrsanlagen. 3. Ausführung der Strassen, Plätzen, und Pflanzungen, der Siele und öffentlichen Bedürfnisanstalten, des Hochwasserschutzes, der Wasserversorgungs-, Beleuchtungs- und Verkehrs-Einrichtungen *seitens der Gemeinde, insoweit Privatunternehmungen nicht ausreichen*, um einen angemessenen Vorrath an bebauungsfähigen und zur Bebauung bereit gestellten Grundstücken stets zu sichern und dadurch den Ausschreitungen des Baugrund- und Miethwuchers vorzubeugen. 4. Umlegung und Zusammenlegung der nach Lage, Gestalt und Grösse zur Bebauung ungeeigneten

Landparzellen in bebauungsfähige Baugrundstücke. 5. Begünstigung des Anbaues von Wohngebäuden für die unbemittelten Volksklassen. 6. Erlass gesundheitspolizeilicher Bauvorschriften für die zu errichtenden Gebäude, sowohl über die Beziehungen zwischen den Gebäuden, der Strasse und dem Grundstück, (offene Bauweise, Vorgärten Gebäudhöhe, Hofräume) als über die inneren baulichen Einrichtungen (Bauordnung).
b. Negative Maassnahmen.—1. Verbot von Bauten, welche gegen den Bebauungsplan verstossen. 2. Verbot des Anbaues an unfertige Strassen. 3. Verbot, in bestimmten Stadttheilen gewerbliche Anstalten zu errichten, welche durch Ausdünstungen, Rauch oder Lärm die Gesundheit der Bewohner oder die Annehmlichkeit des Wohnens beeinträchtigen. 4. Verbot des Bewohnens gesundheitsschädlicher Räume. 5. Verbot der Ueberfüllung. 6. Niederlegung gesundheitsschädlicher Gebäude und Stadttheile.

D.—GESETZGEBUNG.—Die Gesetzgebung des Staates ist so zu ergänzen, dass sie die Ausführung der angegebenen positiven und negativen Maassnahmen ermöglicht und erleichtert. Es bedarf insbesondere folgender Gesetze: 1. Gesetz über die Feststellung von Baufluchtlinien und Bebauungsplänen. 2. Gesetz über die Enteignung des Strassenlandes, der bebauungsunfähigen Restgrundstücke neben der Strasse, der gesundheitsschädlichen Gebäude und Stadttheile (Zonen-Enteignung). 3. Gesetz über die Umlegung und Zusammenlegung städtischer Landparzellen, welche nach Lage, Gestalt und Grösse zur Bebauung ungeeignet sind. 4. Gesetz über die örtliche Beschränkung der Einrichtung lästiger Gewerbebetriebe. 5. Gesetz über das gesundheitsgemässe Bauen. 6. Gesetz über das gesundheitsgemässe Wohnen.

A. *Allgemeine Aufgabe.*—Jedes Eingreifen der staatlichen oder communalen Obrigkeit in die freie Thätigkeit des Bürgers wird von diesem unter Umständen unangenehm empfunden. Dennoch hat kein Kulturvolk, welche Regierungsform es auch besass, das Eingreifen der obrigkeitlichen Gewalt in die bürgerliche Thätigkeit entbehren können. Und bei unserer heutigen kulturellen Entwicklung ist erst recht die Unterordnung des Einzelnen unter das Allgemeinwohl von nöthen. *Salus publica suprema lex.*

Je mehr wir die Richtigkeit dieses Satzes anerkennen, desto wichtiger ist es auf der anderen Seite, das Eingreifen des Staates und der Gemeinde in denjenigen Dingen zu vermeiden, wo die Privatthätigkeit, ohne Missstände zu erzeugen, ausreicht. Solche Missstände aber sind durch die freie Privatthätigkeit bei der Erweiterung der Städte vielfach entstanden.

Es sind neue Strassen und Stadtviertel geschaffen worden ohne genügende Verkehrsverbindung mit der alten Stadt und mit anderen Stadtvierteln: nachträgliche Strassendurchbrüche für öffentliche Rechnung waren die Folge. Strassen ohne ausreichende Breite und mit ungeeigneten Steigungen mussten nachträglich verändert werden. Ganzen Bezirken fehlte Folge unzweckmässiger Höhenanordnung die Entwässerung; Senkgruben und Schlingfelder verdarben den Untergrund, das Wasser und die Luft; die öffentliche Gesundheit litt Noth. Es ist nicht etwa bloss Mangel an gutem Willen oder an

technischer Befähigung, wodurch die blosse Privatthätigkeit zu solchen Missständen führt, sondern es liegt in höherem Grade daran, dass weder der Einzelne noch eine private Verbindung Einzelner instande oder berufen ist, die Bedürfnisse der Allgemeinheit in bezug auf Verkehr und öffentliche Gesundheit zu überschauen, noch weniger aber die Macht hat, diese Bedürfnisse unter Besiegung der entgegenstehenden Hindernisse zu befriedigen. Dies gilt sowohl für die äussere Erweiterung als für den inneren Ausbau einer in der Entwicklung begriffenen Stadt. Die Regelung und Unterstützung der Privatthätigkeit durch amtliche Maassnahmen der Gemeinde und des Staates ist deshalb unentbehrlich.

Thatsächlich bestehen in allen Kulturstaaten Gesetze, auf Grund deren die Gemeinde und der Staat in die Erweiterung und den Ausbau der Stadt theils positiv theils negativ eingreifen können und eingreifen. In den meisten Staaten aber ist diese Gesetzgebung unvollkommen, oder die Anwendung der Gesetze lässt zu wünschen übrig. Desshalb verlohnt es sich wohl, den Gegenstand auf einem internationalen Kongress zu besprechen.

Unser Kongress beabsichtigt sich zwar nur mit hygienischen und demographischen Fragen zu beschäftigen. Aber eine der wichtigsten Aufgaben, welche beim Städtebau zu erfüllen sind, liegt gerade auf hygienischem Gebiete: es ist der Schutz des gesunden Wohnens und des gesunden Aufenthalts in der Stadt.

Von welcher Bedeutung dieser Schutz ist, das zeigt uns der Vergleich der städtischen Bevölkerungszahl mit der ländlichen und ein Blick auf das rasche Anwachsen der Stadtbevölkerung.

Der Antheil der städtischen Bevölkerung, mit der wir es hier zu thun haben, an der Gesamtbevölkerung betrug in den angegebenen Jahren im Deutschen Reich (1885) 43.7%, in Preussen allein (1890) 39.3%, in Oesterreich ohne Ungarn (1880) 38.4%, in Italien (1881) 59.7%, in Frankreich (1886) 36%, in England ohne Schottland und Irland (1871) 61.7%, in Russland ohne Finland (1885) 12.9%. Die beiden zuletzt genannten Staaten zeigen die grösste und die geringste Entwicklung der Städte. Seit den angegebenen Jahren ist überall, wie vorher, die städtische Bevölkerung rascher angewachsen als die ländliche. Während z. B. die Bevölkerung Deutschlands jährlich um wenig mehr als 1% zunimmt, beträgt die Volksvermehrung der meisten deutschen Städte 2 bis 4%; in kleineren Industriestädten hat man ein noch schnelleres Wachstum beobachtet. Ebenso wächst die Bewohnerzahl der meisten französischen Städte jährlich um 0.5 bis 2%, obwohl die Bevölkerung des ganzen Landes nur um etwa 0.15% jährlich zunimmt. Ausführlichere Zahlen enthält die nachfolgende Tabelle über das jährliche Wachstum einer Reihe von Grossstädten in den angegebenen Zeiträumen:—

JÄHRLICHE VOLKSZUNAHME EUROPÄISCHER GROSSSTÄDTE.

<i>Deutschland.</i>			
Berlin 1880-85	-	3.2 %	Breslau 1880-85 - 1.9 %
„ 1885-90	-	4.0 „	„ 1885-90 - 2.9 „
Hamburg 1880-85	-	2.0 „	München 1880-85 - 2.6 „
			Leipzig 1880-85 - 2.7 „

Köln 1880-85	-	2.2	°/.	Nantes 1881-86	-	0.4	°/.
„ 1885-90	-	3.5	„	St. Etienne 1881-86	-	0.4	„
Dresden 1880-85	-	2.2	„	(Abnahme.)			
Magdeburg 1880-85	-	3.2	„	<i>England.</i>			
„ 1885-90	-	5.4	„	London 1861-71	-	1.5	„
Frankfurt a/M. 1880-85	-	2.4	„	Liverpool 1861-71	-	1.6	„
„ 1885-90	-	3.3	„	Manchester 1861-71	-	0.8	„
Hannover 1880-85	-	2.6	„	Bradford 1861-71	-	3.1	„
„ 1885-90	-	3.3	„	Leeds 1861-71	-	2.2	„
Königsberg 1880-85	-	1.4	„	Sheffield 1861-71	-	2.6	„
„ 1885-90	-	1.4	„	<i>Holland.</i>			
<i>Oesterreich-Ungarn.</i>				Amsterdam 1879-87	-	2.6	„
Wien 1880-90	-	2.0	„	Rotterdam 1879-87	-	3.4	„
Budapest 1880-90	-	3.1	„	Haag 1879-87	-	3.4	„
<i>Frankreich.</i>				<i>Schweiz.</i>			
Paris 1872-76	-	1.8	„	Zürich 1880-88	-	2.3	„
„ 1876-81	-	3.6	„	Basel 1880-88	-	2.1	„
„ 1881-86	-	0.7	„	<i>Dänemark.</i>			
„ 1872-86	-	2.0	„	Kopenhagen 1885-90	-	2.2	„
Lille 1881-86	-	1.4	„	<i>Russland.</i>			
Lyon 1881-86	-	1.2	„	St. Petersburg 1881-88	-	1.2	„
Bordeaux 1881-86	-	1.5	„	(Abnahme.)			
Marseille 1881-86	-	0.8	„				

Nur aus zwei Städten, St. Etienne und St. Petersburg, wird hiernach eine Bevölkerungsabnahme berichtet; in allen anderen übersteigt die Zunahme die Volkszunahme des Landes überhaupt. Aus England fehlen mir leider die Zahlen aus den beiden letzten Jahrzehnten. Man wird annehmen dürfen, dass von den 350 Millionen Einwohnern Europas zur Zeit mindestens 100 Millionen in Städten wohnen.

Kuichling in Rochester (N.Y.) hat durch vergleichende Untersuchung einer grossen Reihe von amerikanischen, deutschen und englischen Städten die nachfolgende mittlere Tabelle für die städtische Bevölkerungszunahme berechnet:—

Tabelle der durchschnittlichen Jahreszunahme der Bevölkerung in Prozenten.

Bevölkerungszahl.	100,000	125,000	150,000	175,000	200,000	225,000	250,000
Amerikanische Städte	4.65	4.30	4.04	3.79	3.55	3.36	3.20
Deutsche Städte	3.57	3.33	3.10	2.87	2.66	2.46	2.26
Englische Städte	3.16	2.99	2.83	2.67	2.52	2.38	2.26
Bevölkerungszahl.	275,000	300,000	325,000	350,000	375,000	400,000	
Amerikanische Städte	-	3.04	2.92	2.80	2.70	—	—
Deutsche Städte	-	2.09	1.93	—	—	—	—
Englische Städte	-	2.13	2.00	1.92	1.84	1.75	1.68

Die amerikanischen Städte wachsen hiernach am schnellsten, und der Prozentsatz der Vermehrung nimmt im Allgemeinen ab mit der Bewohnerzahl. Die Abweichungen von dieser Regel sind indess besonders in Deutschland zahlreich. In den sieben grössten deutschen Städten vermehrte sich die Bevölkerung während eines Jahrhunderts in Berlin um das 8fache, in Hamburg um das 5fache, in Breslau um das 5fache, in München um das 7fache, in Leipzig um das 9fache, in Köln um das 7fache, in Dresden um das 6fache.

Man denke sich, dass in einer Stadt von 100,000 Einwohnern es durch hygienische Maassnahmen gelingt, die jährliche Sterblichkeit dauernd um nur 1 auf 1,000 zu vermindern, so bedeutet dies schon die Rettung von 100 Menschenleben. Statistische Nachweisungen, dass die Sterblichkeitsziffer einer Stadt infolge einer Reihe von hygienischer Massregeln um 10 auf 1,000 gesunken ist, sind aber keine Seltenheit. Das beste Kapital jedoch, womit die Welt arbeitet, ist das Menschenleben. Daraus folgt, welche riesige volkswirtschaftliche Wohlthat wir der Menschheit zufügen, wenn wir unsere Städte, in deren Mauern jährlich allein in Europa ein Zuwachs von etwa 2 Millionen Menschen Wohnung und Erwerb sucht, so anlegen, dass von vornherein die Sterblichkeitsziffer als eine möglichst geringe sich ergibt.

B. Hygienische Erfordernisse.—Die hygienischen Erfordernisse, welche zu befriedigen sind, um gesundes Wohnen und gesunden Aufenthalt in einer Stadt zu erzielen, sind mannigfacher Art. Sie beziehen sich auf die Anlage der Strassen, freien Plätze und Pflanzungen; auf die Ausstattung dieser Anlagen mit Ent- und Bewässerungs-, sowie Beleuchtungseinrichtungen; auf die Schaffung bequemer und billiger Verkehrsmittel; auf die Bereitstellung passender Baugrundstücke zur Ansiedelung, sowie auf den Erlass einer hygienisch guten Bauordnung.

Wie breit und wie gerichtet die *Strassen* sein sollen, das ist auf dem letzten hygienischen Kongress zu Wien eingehend berathen worden, wenn auch kaum mit praktisch brauchbaren Ergebnissen. So lange man die Forderung darauf beschränkt, dass das Himmelslicht in alle Wohnräume ausreichend eintreten und zu diesem Zwecke die Strassenbreite wenigstens gleich der 1½fachen Häuserhöhe sein soll, wird sie allmählig vielleicht erfüllbar werden, obwohl zur Zeit die einfache Häuserhöhe als Strassenbreite auch bei Neuanlagen noch keineswegs hat allgemein durchgeführt werden können. Wenn man aber die Forderung der Besonnung der Strassenbreite zu Grunde legt und unter dem 50sten Breitengrad Meridionalstrassen von 47^m, Aequatorialstrassen von 66^m Breite beansprucht, so verlangt man Unmögliches. Man wird in der Regel schon mit der einfachen Gebäudehöhe als Strassenbreite zufrieden sein müssen, daneben aber für eine ähnlich günstige, freie Stellung der Gebäude im Inneren der Blöcke zu sorgen haben. Als beste Strassenrichtung, insofern es sich um die Besonnung der Gebäudefronten handelt, hat *Gruber* entgegen den Ermittlungen von *Vogt* und *Clément* die zu den Himmelsrichtungen diagonalen Linien festgestellt. Dies ist um so mehr zutreffend, als mit den Häuserfronten zugleich auch alle Rück- und Seitenfronten diagonal zu liegen pflegen, während

der verhältnissmässig günstigen Ostwestlage einer Hauptfront die sehr ungünstige Nordlage der einen Seitenfront entspricht.

Bei der Stadterweiterung von Köln, welche ich die Ehre hatte zu entwerfen und auszuführen, hat, weil für die Strassenrichtungen die Lage der neuen Festungsthore zumeist bestimmend war, der hygienische Gesichtspunkt bei der Richtungswahl eine nur geringe Rolle spielen können. Dennoch ist die Diagonale zu den Haupthimmelsrichtungen vorherrschend. Die Breitenbestimmung bedurfte gewisser Uebergänge aus der sehr eng gebauten Altstadt in das neue Bebauungsfeld von 10^m auf 14^m. Letzteres ist die Minimalbreite neustädtischer Strassen; die Breite wächst von 2 zu 2^m bis auf 70^m. Die Bauordnung erlaubt leider, dass die Häuserhöhe die Strassenbreite um 3^m übersteigen darf. Die höchste zulässige Höhe beträgt 20^m.

Dass bei Feststellung des Bebauungsplanes ein angemessener Prozentsatz des Geländes für Strassen, freie Plätze und öffentliche Anlagen in Anspruch zu nehmen ist, versteht sich von selbst. Ein geringster zulässiger Prozentsatz lässt sich aber nicht, wie es oft versucht worden ist, festsetzen. Denn bei offener Villen-Bebauung mit grossen Gärten können beispielsweise 15% Strassenflächen genügen, während bei geschlossenen fünfstöckigen Reihenhäusern, geringen Hofräumen und kleinen Blöcken 45% Strassenflächen zu wenig sein können. Ein Durchschnittsverhältniss ist 35%.

Zur Herstellung der Strassendämme dürfen nur Bodenarten verwendet werden, welche frei von gesundheitsschädlichen Bestandtheilen sind. Vegetabilische und animalische Abfälle sind im Strassenkörper unzulässig. Dasselbe gilt für die etwaige Aufhöhung der Baugrundstücke. Vorhandene Faulstoffe sind zu entfernen, bevor man die Aufhöhung der Strassen, Plätze und Baugrundstücke beginnt. Auf Grund von Erfahrungsbeispielen vermute ich, dass Siechthum und Tod in mehr Fällen die Folge des schlechten Untergrundes sind, als sich nachweisen lässt.

Diejenigen Flächen der Strassen und öffentlichen Plätze, welche dem Verkehr ohne Nachtheil entzogen werden können, sind zu bepflanzen, mit Baumreihen, mit Rasen, Strauchwerk und Landschaftsgärten.

Ausser den Baumreihen auf Strassen, welche nur bei Strassenbreiten von mehr als 20^m lebensfähig sind, den Rasenbeeten und Gartenanlagen auf freien Plätzen und sehr breiten Strassen,* sind zwei Arten *öffentlicher Pflanzungen* eine hygienische Nothwendigkeit, nämlich 1. öffentliche Spielplätze für die Jugend, 2. öffentliche Gärten für die Erholung der Bürgerschaft. Spielplätze (Recreation-places) sind meines Wissens in England am meisten verbreitet: im Jahre 1889 soll London 28, Manchester 11, Birmingham 9, Bradford 7 bepflanzte Plätze dieser Art besessen haben, welche ausschliesslich dem Kinderspiel gewidmet waren. Berlin, Leipzig, Hamburg, Köln sind diesen englischen Beispielen gefolgt.

Einer grösseren öffentlichen Parkanlage, eines "Stadtgartens," sollte keine Stadt von 20,000 Einwohnern entbehren. Je grösser die Stadt,

* Vergl. Stübgen, Städtebau, 5. Abschnitt, Darmstadt bei Bergsträsser, 1890.

um so geräumiger der Stadtgarten, besonders dann, wenn wenig sonstige bepflanzte Spazierwege, wie alte Wallpromenaden u. dergl., zur Verfügung stehen. Bei der Einwohnerzahl von 50,000 oder 60,000 etwa tritt der grösseren Entfernungen wegen die Nothwendigkeit des zweiten Stadtgartens ein. Grossstädte und besonders Millionenstädte bedürfen einer grösseren Zahl von öffentlichen Parkanlagen, um allen Wohnungen den Genuss des Pflanzenlebens in mässiger Entfernung zu ermöglichen. Nimmt man auf 50,000 Einwohner einen Park von 10^{ha} Grösse an, so findet sich bei einer Wohnungsdichtigkeit von 250 Personen pro Hektar das Verhältniss der Parkfläche zur Stadtfläche wie 1:20. Beträgt das Verhältniss der bepflanzten Strassen und freien Plätze zum Weichbilde ebenfalls 1:20, so erhält man als wünschenswerthe Verhältnisszahl, dass wenigstens $\frac{1}{6}$ des bebauten städtischen Weichbildes öffentlich bepflanzt sein möge.

Die englischen und französischen Städte sind, wenn auch nicht alle das angegebene Verhältniss erreichen werden, in dieser Hinsicht den deutschen und italienischen Städten überlegen. In England und Italien überwiegt die Parkanlage, in Frankreich und Deutschland die Strassenbepflanzung. Beides sollte gleichmässig gepflegt werden. In der Stadterweiterung von Köln, welche ein Gelände von 452^{ha} bedeckt, haben wir drei öffentliche Parkanlagen von zusammen 25^{ha}, gärtnerisch geschmückte freie Plätze von 8^{ha}, Gartenanlagen auf der grossen 32 bis 100^m breiten Ringstrasse von 8^{ha}, endlich mit Baumreihen besetzte Strassen von 12^{ha} Flächeninhalt, zusammen also 53^{ha} Pflanzungen, was 11.7% des bebauten Weichbildes beträgt.

Besonders reizvoll und hygienisch vorthellhaft sind diejenigen Parkpflanzungen, welche von den Hausgrundstücken unmittelbar zugänglich sind, wie der Parc Monceau zu Paris oder der Blasewitzer Park bei Dresden, auch diejenigen geschlossenen Squares, welche nach englischer Sitte zwar von Strassen umgeben sind, aber nur von den Umwohnern benutzt werden dürfen.

Zur Reinhaltung des Untergrundes, des Wassers und der Luft bedarf es ferner der geordneten Entwässerung, des Schutzes gegen Hochwasser, der Reinhaltung natürlicher Gewässer, der Beschränkung luftverderbender Gewerbebetriebe. Als beste Stadtentwässerung hat sich die unterirdische Kanalisation nach dem *Schwemmsystem* erwiesen, welche mangels grosser natürlicher Flüsse mit Rieselfeldern oder mechanisch-chemischer Klärung zu verbinden ist. Selbst für Köln wird seitens der Königlichen Staatsregierung eine künstliche Klärung der Kanalwässer, bevor sie in den grossen Rheinstrom münden, verlangt, eine mit gewaltigen Kosten verknüpfte Forderung, welche nach dem Stande der Wissenschaft und Pettenkofer's neuesten Untersuchungen kaum gerechtfertigt erscheint.

Oeffentliche Wasserversorgung und *öffentliche Beleuchtung* sind in unseren eng bewohnten Städten, wo nicht mehr jede Haushaltung einen zuverlässigen Brunnen hat und nicht mehr Jeder auf dunkeler Strasse seine eigene Laterne tragen kann, eine Nothwendigkeit für die Gesundheit, Behaglichkeit und Sicherheit des Wohnens und des Aufenthaltes. In Köln ist der obligatorische Anschluss an die städtische

Wasserleitung für alle Wohngrundstücke eingeführt, welche nicht den Besitz eines Brunnens mit gesundem Grundwasser nachweisen.

Ebenso unentbehrlich ist die Schaffung bequemer und billiger *Verkehrsmittel*, um der gesundheitsschädlichen Wohnungs-Ueberfüllung entgegen zu wirken und auch den entfernten Wohnungen den Broderwerb im Stadtkern oder anderen Stadttheilen zu erleichtern. Diese Frage spielt wohl in allen Grossstädten; fast nirgendwo reichen die örtlichen Verkehrsanlagen aus. Die Stadt Köln plant gegenwärtig ein ganzes Netz von Schmalspurbahnen zur besseren Erschliessung der Umgebung, da die bestehenden Strassenbahnverbindungen mit den Vororten dem Bedürfniss bei weitem nicht entsprechen.

Um der *Wohnungsnoth*, diesem schlimmen Uebel aller moderner Gross- und Mittelstädte, entgegenzutreten, ist es ferner nöthig, die Erweiterung und den Ausbau der Stadt so zu entwerfen und *auszuführen*, dass ein angemessener Vorrath zweckmässiger Baugrundstücke in passender Grösse stets vorhanden sei. Die Blockgrösse kann nicht schematisch festgestellt werden, sondern hat sich nach der zweckmässigen Bauart der zukünftigen Baulichkeiten zu richten: kleine Blöcke für Arbeiterwohnungen, mässige Blöcke für bessere Wohnungen und Geschäftsviertel, grosse Blöcke für Gewerbebetriebe. Für Häuser mit Stockwerkwohnungen (Zinshäuser, apartment-houses, flats) sind Blöcke von bescheidenen Tiefen zu empfehlen, damit nicht das Streben nach thunlichster Ausnutzung des Bodens zur Errichtung grosser Hinter- und Quergebäude führe. Bei Blöcken für offene Bebauung mit Villen, besonders mit Einfamilienhäusern, sind grössere Abmessungen zweckdienlich, um geräumige Gärten zu ermöglichen. In der Kölner Stadterweiterung schwankt hiernach die Blockgrösse zwischen 2,200 und 48,000^{qm} bei 36 bis 130^m Tiefe.

Die gesundheitlich gute Anordnung und Einrichtung der Gebäude, Arbeitsstätten und Wohnungen ist die Aufgabe der Bauherren und Baumeister. Die Erfüllung dieser Aufgabe ist unentbehrlich, damit nicht die öffentliche Fürsorge hinsichtlich der Strassen und Plätze, der Pflanzungen und der Kanalisation, der Wasserversorgung und Beleuchtung, der Verkehrseinrichtungen und der Baugrundstücke in ihrem Erfolge vereitelt werden.

C. a. Amtliche Maassnahmen positiver Art.—Um die erörterten hygienischen Erfordernisse zu erreichen, sind zahlreiche theils positiv, theils negativ wirkende Maassnahmen seitens des Staates und der Gemeinde zu ergreifen und durchzuführen.

Dahin gehört in erster Linie die Aufstellung eines umfassenden, zweckmässigen Bebauungsplanes für die Stadterweiterung, welcher sich erstreckt auf alle im Anbau bereits begriffenen und zum Anbau in den nächsten zwanzig Jahren voraussichtlich bestimmten Theile der städtischen Umgebung, und damit im Zusammenhange die Aufstellung eines zweckmässigen Bebauungsplanes für die Verbesserung der alten Stadttheile. Wenn wir den Bebauungsplan auf eine 20jährige Entwicklungszeit bemessen wollen, so ist das selbstredend nur annähernd zu verstehen. Ein Plan für eine wesentlich kürzere Frist unterliegt der Gefahr, schon nach wenigen Jahren sich als unzureichend zu erweisen, da der Anbau nicht geschlossen, sondern mit Lücken zu

erfolgen pflegt. Ein für eine wesentlich längere Frist bestimmter Erweiterungsplan läuft Gefahr, einer Entwicklung nachtheilig vorzugreifen, deren Vorbedingungen sich noch nicht erkennen lassen. Die räumliche Ausdehnung des Erweiterungsplanes ist ferner abhängig von dem zu erwartenden Bevölkerungszuwachs. Ein Jahreszuwachs von 2‰, 3‰, 4‰ bedingt in 20 Jahren bei gleichbleibender Wohndichtigkeit eine Vergrösserung des bebauten Weichbildes um 48, 80, 119‰. Zur Anstrengung vermindelter Wohndichtigkeit ist eine noch grössere Ausdehnung des Bebauungsfeldes erforderlich. Der Fortschritt der Entwicklung bedingt ein entsprechendes beständiges Fortschreiten der Planfeststellung.

Die gleichzeitige Planfestsetzung für die Verbesserung der alten Stadttheile aus Gründen des Verkehrs oder der öffentlichen Gesundheit wird in den meisten Städten zu wenig systematisch betrieben. Eine bloss gelegentliche Thätigkeit genügt auf diesem Gebiete nicht, sondern die Beseitigung vorhandener Missstände und die Berücksichtigung der Rückwirkung der Neuanlagen auf die Altstadt bedarf einer andauernden, planmässigen Aufmerksamkeit.

Zum Theil mit der Bearbeitung der Bebauungspläne im Zusammenhange, zum Theil selbständig nebenher sind einheitliche Entwürfe für Entwässerung, Abfuhr, Hochwasserschutz, Wasserversorgung und Beleuchtung aufzustellen und beständig, nicht dem Bedürfnisse folgend, sondern demselben voranschreitend, zu erweitern. Die Entwässerungsfähigkeit des Baugeländes ist eine der wichtigsten hygienischen Forderungen; sehr beträchtliche Strassen-Aufhöhungen, bis 5 ja 7^m, sind für diesen Zweck gerechtfertigt. Jedenfalls sollen alle Wohnräume und womöglich auch die Keller dem Einflusse des Hochwassers eines Flusses oder des Grundwassers entzogen werden. Der sichere Anschluss aller Keller an das unterirdische Kanalnetz ist dringend erwünscht.

Die Entwürfe für Verkehrsanlagen und deren Ausführung sollen ebenfalls dem Bedürfnisse nicht nachfolgen, sondern ihm voraussehen. Strassenbahnen, Stadteisenbahnen und Vorortbahnen erleichtern oder ermöglichen erst eine zerstreutere Bebauung, eine gesunde Ausbreitung der städtischen Bevölkerung. Nur im geringen Umfange haben bisher die Gemeinden selbst die Errichtung und den Betrieb von Verkehrsanlagen in die Hand genommen. Täuschen wir uns nicht, so bereitet sich auf diesem Gebiete ein Umschwung im Sinne des stärkeren Eingreifens der communalen Thätigkeit vor. Aber auch auf Privatunternehmungen können die Gemeinden fördernd einwirken durch geeignete Bedingungen bei Gewährung und Verlängerung lukrativer Concessionen, durch Zinsbürgschaften und ähnliche Mittel.

Es genügt nicht, dass die Gemeinde bloss als Polizei- und Aufsichtsbehörde den Privatunternehmungen zuschaut. Besonders die ausgiebige Anlage neuer Strassen mit allen dazu gehörigen Veranstaltungen ist eine hochwichtige Aufgabe der Gemeinde, sowohl um die Gemeindeländereien der Bebauung zu erschliessen, als um die Privatländereien in Anbaugrundstücke umzuwandeln, letzteres insoweit als die Privatthätigkeit nicht ausreicht, um einen angemessenen Vorrath

an bebauungsfähigen und zur Bebauung bereit gestellten Grundstücken stets zu sichern.

Denn gegen die der Städte-Erweiterung, d. h. der Vermehrung der Wohnungen, so sehr nachtheilige Preistreiberei der Grundstücke giebt es kein wirksames Mittel als die *Vermehrung des Angebotes*. Die Vermehrung der Wohnungen ist aber Vorbedingung für alle Maassregeln zur Milderung der Wohnungsnoth, zur Beseitigung der Wohnungs-Ueberfüllung, zur Verbesserung oder Schliessung oder Vernichtung gesundheitlich schlechter Wohnungen. Als beispielsweise die Stadt Köln vor einigen Jahren in der Lage war, eine Fülle fertiger Baugrundstücke zu mässigen Preisen an den Markt zu bringen, war eine unwiderstehliche Einwirkung auf die engen, schlechten Wohnungen der Altstadt zu beobachten, welche in grosser Zahl theils verbessert, theils niedergelegt und durch bessere Wohnungen ersetzt wurden, zum Vortheil nicht bloss der Miether, sondern auch sehr vieler Eigenthümer.

Zur Bereitstellung vieler neuer Baugrundstücke genügt aber nicht die Anlage der Strassen und ihres Zubehörs an Pflanzungen, Verkehrseinrichtungen und unterirdischen Werken. Es muss hinzutreten die freiwillige oder zwangsweise vorzunehmende *Umlegung und Zusammenlegung* der nach Lage, Gestalt und Grösse zur Bebauung ungeeigneten Landparzellen in Baugrundstücke, welche den festgestellten und ausgeführten Strassenzügen entsprechen. Aus manchen Gründen ist es bekanntlich nicht möglich und nicht zweckmässig, das städtische Strassennetz nach den zufälligen Begrenzungen der vorhandenen Landparzellen zu richten. Die Strassen schneiden die Grundstücksgrenzen meist unter spitzen Winkeln, manche Grundstücke kommen gar nicht an eine Strasse zu liegen, von andern bleiben nur unförmliche Reste zu beiden Seiten der Strasse übrig. Die Landparzellen sind oft sehr schmal und von grosser Länge, so dass sie weder in der Längenrichtung noch in der Breitenrichtung zur Bebauung sich eignen. Der seitherigen Parzellirung aus landwirthschaftlichen Rücksichten, der seitherigen Zerlegung des Besitzes durch Kauf und Erbtheilung liegen die Rücksichten auf die nunnmehrige Bestimmung zur städtischen Bebauung nicht zu Grunde, weil die Linien des städtischen Strassennetzes nicht vorherzusehen waren, auch der Einfluss des Einzelnen sich auf sein Eigenthum beschränkt. Die Umlegung des Besitzes nach Maassgabe der neuen Anbaustrassen erfordert aber naturgemäss die Mitwirkung mehrerer Eigenthümer, gewöhnlich sogar aller Eigenthümer eines von Strassen umgrenzten Blocks. Ein einziger Eigenthümer kann oft die Regelung des ganzen Blocks verhindern, sei es aus Eigensinn, sei es aus berechnetem Eigennutz. Die Kölner Stadterweiterung ist leider reich an solchen Beispielen menschlichen Uebelwollens, und ganze Blockgruppen können heute noch nicht der Bebauung erschlossen werden, weil einzelne Besitzer der Grenzregelung dauernd widerstreiten. Zuweilen gelingt es, alle Betheiligten nach längeren Verhandlungen auf einen Umlegungsplan zu vereinigen: der Vorwärtstrebende muss dabei dem Zurückhaltenden Opfer bringen. Oft aber ist jede Mühe umsonst; und wenn schliesslich das Verkehrsbedürfniss die Ausführung des

Strassenbaues gebieterisch verlangt, so werden die missgestalteten, schiefen, ineinander geschachtelten, einander schädigenden Grundstücke alsdann ohne vorherige Regelung bebaut, zum grossen wirtschaftlichen Nachtheil der zeitigen Eigenthümer, aber zum noch grösseren, dauernden, wirtschaftlichen und gesundheitlichen Nachtheil der zukünftigen Bewohner-Generationen.

Daraus folgt die Nothwendigkeit des gesetzlichen Eingreifens behufs Umlegung und Zusammenlegung städtischer Baugrundstücke, falls die freiwilligen Bemühungen nicht zum Ziele führen. In einzelnen Staaten, z. B. im Grossherzogthum Hessen, giebt es ein solches Gesetz; in den meisten Ländern bildet das Fehlen desselben eine grosse Erschwerniss des Städtebaues, auch in hygienischer Beziehung.

Der Schwerpunkt der Wohnungsfrage liegt in der Verbesserung der alten und in der Beschaffung zahlreicher neuer Wohnungen für die unbemittelten Volksklassen. *Der Neubau von Wohngebäuden letzterer Art ist daher seitens des Staates und seitens der Gemeinde zu begünstigen.* Selbst Wohnhäuser für Unbemittelte zu errichten, ist nicht die Aufgabe der Gemeinde oder des Staates; von dieser Bethätigung des Sozialismus sind wir hoffentlich noch recht weit entfernt. Das ist Sache der Gewerbetreibenden, der Kapitalisten, der Arbeitgeber, gemeinnütziger Vereine und genossenschaftlicher Unternehmungen. Aber Staat und Gemeinde können diese private Thätigkeit wirksam unterstützen durch die Anlage von Strassen und Bereitstellung von Baugründen in der vorbesprochenen Weise, durch zweckdienliche Eintheilung des Strassenplanes, durch öffentliche Pflanzungen, durch Ermässigung oder Erlass von Immobiliensteuern und Strassenbau-Abgaben, durch billige Lieferung des Wassers u. s. w. Nur an wenigen Orten hat bisher eine derartige fördernde Mitwirkung der öffentlichen Gewalten zur Lösung der Wohnungsfrage, welche vielleicht als die bedeutsamste aller hygienischen Tagesfragen bezeichnet werden darf, in systematischer Weise stattgefunden. Zwar entspricht der Mehrbedarf an Wohnungen nicht immer der Zunahme der Bevölkerung; bei steigendem Wohlstand überwiegt der Wohnungsbedarf, in Zeiten schlechten Geschäftsganges bleibt der Wohnungsbedarf zurück, weil Viele sich einschränken. Aber im Allgemeinen ist der Bedarf besonders an kleinen Wohnungen stets ein grosser, und es ist eine Thatsache, dass die Spekulation aus sich diesen Bedarf an kleinen Wohnungen nicht zu erfüllen pflegt.

Gesundheitspolizeiliche Bauvorschriften für alle zu errichtenden Gebäude sind gegenüber dem Bestreben des Grundbesitzers, die Rente seines Grundstücks durch möglichst dichte und möglichst hohe Bebauung zu steigern, unentbehrlich. Zur Regelung der Beziehungen zwischen den Gebäuden, der Strasse und dem Grundstück bedarf es der Vorschriften über die Abstände der Gebäude von einander und von der Strasse, sowie über die Höhe der Gebäude an den Strassen und an den Höfen und über die Grösse der letzteren.

Was die Gebäudeabstände betrifft, so ist die gesundheitlich beste Anordnung des Wohnhauses offenbar die Freistellung ringsum. Zu erreichen ist das nur durch die sogenannte *offene Bauweise*, auch Villenbau oder Cottagesystem benannt. Allgemein ist eine solche

Bauweise aber undurchführbar. Sowohl im Inneren der Städte als auch in äusseren Geschäftsstrassen ist der geschlossene Reihentypus aus wirtschaftlichen und gewerblichen Gründen notwendig; die offene Bauweise muss daher auf bestimmte Stadttheile beschränkt werden, wo sie aber streng durchgeführt werden sollte. Sie ist eine hygienische Wohlthat nicht bloss für die Bewohner des einzelnen Hauses, sondern mehr noch wegen der freien Durchfluthung der Strassen und Blöcke von Luft und Licht für das ganze Stadtviertel und dessen Umgebung und alle dort Wohnenden und Verkehrenden.

An manchen Strassen, wo die pflichtmässige offene Bauweise nicht erreichbar ist, führt die gesetzliche Anordnung von *Vorgärten* zwischen der Strasse und den Häusern wenigstens einen Theil der vorerwähnten hygienischen Vorzüge herbei.

Die Höhe der Gebäude in Bezug auf die Strassenbreite habe ich bereits erwähnt. Schwieriger und, da die meisten Wohnräume einer Stadt nicht an den Strassen, sondern an den Höfen zu liegen pflegen, noch wichtiger ist die Beschränkung der Gebäudehöhe an den Höfen. Der "Entwurf reichsgesetzlicher Vorschriften zum Schutze des gesunden Wohnens," aufgestellt im Jahre 1889 vom Deutschen Verein für öffentliche Gesundheitspflege, lässt an den Höfen eine Gebäudehöhe zu, welche das Anderthalbfache des mittleren Abstandes von der gegenüberliegenden Begrenzung des unbebauten Raumes beträgt. Einen hygienischen Grund, an den Höfen ein ungünstigeres Verhältniss zwischen Höhe und unbebauter Breite zuzulassen, als an der Strasse, giebt es nicht. Der Entwurf des deutschen Vereins trägt also schon, dem Zwang der Umstände folgend, der herrschenden engen Bauweise, welche nicht mit einem Schlage beseitigt werden kann, gebührend Rechnung. Der auf dem internationalen Kongress in Wien von Trélat gemachte Vorschlag, die oberen Stockwerke der hohen Gebäude zu enteignen und niederzulegen, würde zwar das Uebel beseitigen; aber kein Staat und keine Gemeinde vermag die Geldmittel aufzubringen, welche zur Ausführung einer solchen Enteignung erforderlich sein würden. Die in vielen Bauordnungen enthaltenen Bestimmungen, dass ein aliquoter Theil des Grundstücks, etwa $\frac{1}{3}$ oder $\frac{1}{4}$, unbebaut bleiben müsse, fällt nicht mit dem hygienischen Interesse zusammen, da für letzteres das günstige Verhältniss der Hofräume zur Gebäudehöhe, nicht das Verhältniss der Hofräume zur Grundstücksgrösse massgebend ist. Die von einigen Schriftstellern empfohlene Festsetzung rückwärtiger Baufluchtlinien, welche die Gebäudetiefen beschränken, also das Innere des Blocks von der Bebauung frei halten sollen, halte ich nur in Ausnahmefällen für durchführbar.

Bezüglich der inneren Gebäude-Einrichtungen sind Vorschriften erforderlich über die geringste Höhe der Wohnräume (2·5 oder 3^m), über die geringste Lichtfläche der Fenster ($\frac{1}{10}$ oder $\frac{1}{12}$ der Zimmerfläche), grösste Zahl der über einander liegenden Wohngeschosse (4 oder 5) über hochwasserfreie und grundwasserfreie Lage der Wohnräume, über den Schutz gegen aufsteigende Feuchtigkeit, über die Beschaffenheit von Wohnräumen im Kellergeschoss, über Zahl und Beschaffenheit der Aborte, der Entwässerungs- und Leuchtgas-Leitungen. Ich muss mich hier damit begnügen, auf den oben erwähnten "Entwurf

reichsgesetzlicher Vorschriften," sowie auf die Schriften über Hausentwässerung von W. P. Gerhard in New-York hinzuweisen.

b. Amtliche Maassnahmen negativer Art.—Gesetzliche oder polizeiliche Verbote auf dem Gebiete der Wohnungsfrage sind erst dann zulässig und können auch erst dann wirksam sein, wenn durch die vorgeschriebenen positiven Maassnahmen die Entstehung gesunder und zweckmässiger Wohnungen in ausreichender Zahl herbeigeführt oder gesichert ist.

Die ersten beiden Verbote betreffen alsdann die Herstellung von Bauten, welche gegen den veröffentlichten Stadtbauplan verstossen, sowie solcher Bauten, welche an unfertige Strassen errichtet werden sollen, d. h. an Strassen, in welchen für den Fahr- und Gelverkehr, für Wasserzuführung und Wasserabführung und für die Beleuchtung noch nicht ausreichend oder noch gar nicht gesorgt ist. Das erstere Verbot besteht in allen Kulturstaaten mit wenigen Ausnahmen, das zweite Verbot dagegen ist noch keineswegs allgemein verbreitet. In Preussen ist den Gemeinden das Recht verliehen, das Bauen an unfertige Strassen durch Ortsstatut zu verbieten. Aber über eine bloss finanzbürokratische Handhabung dieses Verbotes, dem doch die systematische Fertigstellung einer ausreichenden Zahl von Strassen für den Anbau gegenüberstehen müsste, haben sich leider im Allgemeinen die preussischen Städte nicht erhoben. Das Verbot wird nämlich in der Regel nur ausgesprochen, wenn der Baulustige den für seinen Fall von der Gemeinde geforderten Beitrag zu den Herstellungskosten der Strasse zu zahlen ablehnt. Im Uebrigen pflegt man das Bauen auch an unfertigen Strassen fast regelmässig zu gestatten, für die Fertigstellung der Strassen aber nicht dem Baubedürfnisse wie es sein müsste voraufgehend, sondern nur dem Baubedürfnisse sehr langsam folgend, Sorge zu tragen. Diese den Bau von Wohnungen mehr erschwerende als fördernde Gemeindepolitik ist hygienisch durchaus nicht zu billigen.

Ein drittes Verbot bezweckt, die Freihaltung gewisser Stadtviertel, namentlich solcher, welche für offene Bauweise bestimmt, welche wegen gärtnerischer Anlagen oder sonstiger öffentlicher Pflanzungen besonders für ruhiges Wohnen aufgesucht werden, welche Kranken- oder Genesungsanstalten enthalten, von lästigen Gewerbebetrieben. Ausdünstungen, Rauch und Lärm können die Gesundheit und Annehmlichkeit des Wohnens erfahrungsgemäss ernstlich gefährden und manche hygienischen Maassregeln unwirksam machen. Ein örtlich beschränkendes Verbot derartiger gewerblicher Anstalten ist deshalb gerechtfertigt, namentlich, wenn für gute gewerbliche Vorbedingungen in anderen Stadttheilen seitens der Behörden gesorgt wird.

Das Verbot des Wohnens gesundheitsgefährlicher Räume, sowie das Verbot der Wohnungs-Ueberfüllung und die Niederlegung derjenigen gesundheitsgefährlichen Gebäude und Gebäudegruppen, welche nur durch völligen Neubau zu saniren sind, dies sind hygienische Nothwendigkeiten, da die schlechten und überfüllten Wohnungen nicht allein für die Bewohner unmittelbar, sondern durch Ansteckung und Entsittlichung auch für die Allgemeinheit verderblich werden. Der Neubau gesunder Wohnungen und *die Verbesserung schlechter*, aber noch gebrauchsfähiger Wohngebäude muss natürlich mit diesen Verboten

Hand in Hand gehen. Ob die schädliche Ueberfüllung schon vorhanden ist, wenn eine Familie weniger als 20^{qm} Wohnraum pro Kopf besitzt, oder ob das Vorhandensein eines Schlafrumes von 10^{qm} pro Kopf genügt, das lässt sich schwerlich auf blossen wissenschaftlichen Wege feststellen. Man wird mit dem wirtschaftlich Erreichbaren sich begnügen und eine *allmähliche* Gesundung der durch örtliche Enquêtes festzustellenden Wohnungsverhältnisse anstreben müssen.

D. Gesetzgebung. — Die geschilderten positiven und negativen Maassregeln der Gemeinde und des Staats sind nur ausführbar auf Grund einer entsprechenden Gesetzgebung. Sechs Gesetze sind es hauptsächlich, welche sich nach den bisherigen Erfahrungen und nach den Berathungen der hygienischen Vereine als notwendig erwiesen haben.

Zunächst ein Gesetz über die Feststellung von Baufluchtlinien und Bebauungsplänen. Das preussische und mehr noch das hessische Gesetz über diesen Gegenstand entsprechen ziemlich, wenn auch nicht vollkommen, den gesundheitlichen Anforderungen. In manchen Staaten ist dieser Zweig der Gesetzgebung noch wenig ausgebildet, in anderen herrscht noch Unklarheit und Willkür.

Das Enteignungsgesetz ist gleichfalls in den meisten Staaten noch unvollkommen. So kann man z. B. in Preussen zwar das zukünftige Strassenland enteignen, nicht aber die bebauungsunfähigen Restgrundstücke neben der Strasse (welche in der Hand eigennütziger Besitzer den Anbau behindern oder verschlechtern) und ebensowenig solche Gebäude und Gebäudegruppen, deren Beseitigung im Interesse der öffentlichen Gesundheit gefördert werden muss. Frankreich und England sind auf diesem Gebiete erfreulich vorgeschritten, wenngleich sowohl die bezügliche französische Gesetzgebung als die englischen Torrens- und Cross-Acts der weiteren Entwicklung und namentlich der wirksameren Handhabung bedürfen.

Ebenso notwendig ist ein Gesetz über die oben besprochene, baufähige Umlegung und Zusammenlegung unbebauter städtischer Grundstücke, sowie ein Gesetz, welches die Ausschliessung lästiger Fabrikanlagen aus reinen Wohnvierteln ermöglicht.

Von entscheidender Wichtigkeit aber sind hygienisch durchdachte Gesetze über das Bauen und über das Wohnen. Baugesetze besitzen wohl alle Kulturstaaen; aber nöthig ist deren Durchsicht vom Standpunkte der öffentlichen Gesundheitspflege und die allgemeine Festsetzung der als Mindestforderung zu beobachtenden hygienischen Vorschriften, deren Durchbildung und Verschärfung nach örtlichem Bedürfniss und wirtschaftlicher Erreichbarkeit die Pflicht der einzelnen Gemeinden ist.

Eine hygienische *Wohnungs-Gesetzgebung* steht gegenwärtig in Deutschland, in Oesterreich, in England, in Frankreich, in Italien auf der Tagesordnung. Die Frage wird nicht verschwinden, bis sie gelöst ist. Sie ist ein wichtiger Zweig der allgemeinen sozialen Frage. Allgemeine gesetzliche Vorschriften über die Vermietung und die Benutzung der Wohnungen, gegen die Ueberfüllung und Verwahrlosung derselben, sind überall als ein Bedürfniss der Gegenwart erkannt.

Es würde zu weit führen, hier des Näheren auf diesen wichtigen Gegenstand einzugehen. Der Zweck dieses Vortrags ist erfüllt, wenn es mir gelungen ist, die *allgemeine Aufgabe*, welche uns bei der Erweiterung und dem inneren Ausbau der Städte gestellt ist, die *hygienischen Erfordernisse*, welche Vorbedingung sind für das gesunde Wohnen und den gesunden Aufenthalt in unseren Städten, sowie die *amtlichen Maassnahmen* positiver und negativer Art, welche zur Befriedigung jener Erfordernisse geeignet sind, annähernd darzulegen und schliesslich die Hauptpunkte anzugeben, über welche die *hygienische Gesetzgebung* im städtischen Bau- und Wohnungswesen sich zu erstrecken hat. Every man may do his duty!

DISCUSSION.

Mr. John Slater said that so large a subject could not be disposed of in fifteen minutes. There was matter sufficient for the whole sitting, and even for an adjourned discussion. The great difficulty in London was its enormous size. The distances in continental cities were as nothing to those in London. Nearly all the continental cities, too, had been fortified, and the disused fortifications could be best utilised now by turning them into boulevards and open spaces. Herr Stübgen had rendered good service by advocating a regulation to restrict the height of buildings in narrow thoroughfares. Even we in London moved far too slowly in this respect. Herr Stübgen was entitled to our warmest thanks for coming here to tell us what was being done abroad for the extension and internal improvement of towns.

Mr. Rogers Field said that byelaws for the regulation of buildings and drainage had been of the greatest utility, but he very much questioned whether the regulations relating to houses were scientific. In the little town of Uppingham he had seen a good deal of the working of such regulations from the beginning, and he found quite as much indirect advantage from them in the education of the public mind on sanitary questions as of direct advantage. It was often urged that byelaws might be serviceable for new buildings, but how about the old ones? The answer suggested by his experience was, that if once the principle were adopted by the people generally, it would be applied by them to old buildings as well as to new. If people saw it was to their advantage they would make the regulations apply to both.

Mr. Thomas Blashill, Superintending Architect to the London County Council, regretted the tendency to consider the question as too large a one to be effectively dealt with. It was considered by many people not possible to make an old town perfectly habitable. The question had been taken up by faddists and inexperienced persons, which accounted for their failure to find the solution. If approached in a scientific spirit, and backed by sufficient funds, there was no reason to despair of a practical solution of the problem being found.

Herr Ludwig Techner (Budapest) sagte, — die Gesetze und Regeln die uns Herr Stübgen empfiehlt und die er selbst in Köln so glänzend zur Geltung gebracht hat, sind wohl die richtigen, doch lassen sich diese nicht so leicht überall gleichmässig anwenden, und [zwar sind wohl Klima, Gewohnheiten und bestehende Verhältnisse von grossem Einfluss auf die Möglichkeit der Durchführung. So können diese in Stadttheilen,

welche oft auch historische Bedeutung haben, schwer durchgeführt werden, und sind hierzu meistens gewisse Vorwahrungsregeln erforderlich, die sehr häufig den Widerstand der Bevölkerung herausfordern und mit ungewöhnlichen finanziellen Opfern verbunden sind. Die schädliche Ueberspeculation mit Bau-Gründen und Hinauftreibung der Reichen kann wohl durch grösseres Angebot ermässigt werden, doch ist dies mit dem Nachtheil verbunden, das Strassen und Strassen-Einrichtungen für grosse Complexe im Voraus hergestellt, auch erhalten werden müssen, bevor die Verbannung erfolgt, und dies vertheuert die empfohlene Methode. Wo möglich sind solche Umänderungen und Erweiterungen populär zu machen, und Eingriffe privatrechtlicher Natur nicht zu forciren, wo diese nicht unbedingt nothwendig sind. Bei Anlagen von Baumpflanzungen ist wohl auch das Klima massgebend, Rasenflächen im südlichen Klima nur mit grossen Kosten schön zu erhalten. Wo also Verhältnisse und Umstände es erlauben, sind die empfohlenen Regeln anzupfehlen und werden gewiss zu sehr günstigen Resultaten führen.

Hygiène des Groupes d'Habitations à Bon Marché.

PAR

M. CHARLES LUCAS, Architecte à Paris, &c.

Les efforts tentés actuellement pour réunir, aux abords d'une grande exploitation ou dans certains quartiers d'une ville industrielle, des habitations de divers genres, telles que des maisons à étages comprenant quelquefois des chambres garnies ou non mais toujours plusieurs logements par étages, et des petites maisons, isolées ou groupées, mais affectées chacune à une ou deux familles au plus, entraînent, outre l'étude générale des données de l'hygiène propres à chacun de ces modes d'habitation, une étude particulière des données de l'hygiène spéciales à l'ensemble de ces habitations et à leur groupement.

Cette hygiène, à la fois publique et privée, morale même, qui, de plus, ne doit pas être étrangère à toute préoccupation d'assurer un certain charme pittoresque à l'ensemble des habitations à créer non plus qu'à toute économie réalisable par suite du groupement de ces habitations, se rapporte à la fois aux deux grandes divisions :—I. *Création et agrandissement des Villes*; et II. *Construction*, en même temps qu'à divers alinéas du programme de la Section VI.; car, pour ces groupes d'habitations à bon marché, il y aura à se préoccuper, à une échelle restreinte, il est vrai, des espaces libres à réserver (A) et des rues intérieures (B); toutes les conditions d'une bonne construction devront y être soigneusement recherchées; de plus, ces groupes participeront à la fois des habitations particulières (C) et des habitations communes (D); enfin, si, comme il est désirable de le voir réaliser, des locaux industriels (E) et quelques bâtiments publics (F), locaux et bâtiments réservés à l'usage seul des habitants des groupes ainsi créés, viennent

faire de ces ensembles d'habitations à bon marché comme un quartier dans une ville, aucune des préoccupations qui ont si judicieusement inspiré les auteurs du programme de la section VI. (Architecture appliquée à l'hygiène) ne devra rester étrangère à cette étude.

C'est donc une vue d'ensemble des nombreux points que soulève l'hygiène du groupement des divers genres d'habitations à bon marché que l'auteur se propose d'exposer, vue d'ensemble dont il s'efforcera de préciser les données multiples par des exemples pris sur des types existants.

DISCUSSION.

Mr. Wm. White said the question of rent must always depend on the value of land, and whatever could be done to get land at a lower price should be within the question.

Mr. H. H. Statham referred to a point not hitherto touched upon, the spacing between blocks of dwellings. The building of high blocks in order to make the most of the value of the ground, unless the buildings were spaced proportionally farther apart, was just as much overcrowding as cramming people together in lower buildings in narrow streets. Moreover, the high buildings, unless far enough apart, shut out the sunlight from each other. Light was most important, and in some collections of blocks in London this consideration has been flagrantly neglected.

The Control of the Construction of Dwelling-houses.

BY

THOMAS BLASHILL, F.R.I.B.A., Superintending Architect to the London County Council.

The right and the duty of the public authority to make and to enforce regulations for the construction of habitable buildings, with proper regard to their healthy occupation, have been recognised in this country by many special Acts of Parliament affecting the metropolis and our larger towns, and also by the Public Health Act, which is applicable wherever the density of a population renders such regulations necessary. The laws of other countries generally recognise the same right and duty.

The chief structural conditions of a habitable building which are recognised as being necessary for its healthy occupation are these :—

1. It must stand upon a site the subsoil of which is naturally dry, or is properly drained and free from impurity; and effective means must be taken to prevent the admission of air from the soil into the building.

2. The building materials—particularly the bricks, the mortar, and the plaster of the walls—must be of good quality, so that neither moisture nor impure air can be admitted through them into the building, and means must be taken to prevent the moisture from the ground rising up the walls.
3. All parts of the building, and not merely those parts which are actually inhabited, must be properly ventilated and lighted, the habitable rooms being of sufficient size and particularly of sufficient height.
4. Provision must be made for the removal of refuse, whether solid or liquid, from the building, and from its near neighbourhood, before this refuse begins to pollute the air.

In order to show how these matters may be dealt with by law, I will, in the first place, give the regulations which are now in force in London and applicable to each of these necessary structural conditions.

The Metropolitan Buildings Act and the Metropolis Local Management Act were passed in 1855, and have been since amended by several Acts, some of which give to the London County Council a limited power of making byelaws. So far as these Acts and byelaws relate to buildings, they are chiefly intended to provide for the sound construction of walls and the prevention of fires. The regulations that relate to health as affected by construction are few and not very efficient for their purpose.

As regards the sites of buildings, the byelaws made under the Amendment Act of 1878 require that they shall be cleared of any material impregnated or mixed with faecal, animal, or vegetable matter, dust, or slop, or other refuse with which they have been filled up or covered, and the holes thus formed must be filled up with "hard brick or dry rubbish." The Amendment Act of 1890 empowers the council to make byelaws regulating the mode in which any excavation made within 3 feet of a building shall be filled up. The object is to clear the site from impurity, but when I say that the existing byelaws were found insufficient to prevent the erection of houses upon a disused cemetery filled up by interments, some idea may be formed of the difficulties that beset the makers of regulations for sanitary purposes. Under the Public Health Act, 1875, certain byelaws have been framed by the Local Government Board applicable to the cases of urban and rural sanitary authorities, and these are now generally adopted outside the metropolis, with or without modifications sanctioned by that Board. The new byelaws of the city of Manchester, approved in 1890, probably give their best and most modern form. They require, in addition to the removal of any impure material from the site, the removal of any such matter as may have been deposited upon the site, but they are silent as to the filling up of any holes left by the excavation.

The Metropolitan Regulations make no provision for the drainage of a site that is naturally damp. The Model Byelaws provide that the subsoil shall be drained with earthenware field pipes, which shall be trapped and ventilated at their junction with the foul drain of the house. In a district where much of the subsoil had been excavated for the

removal of clay and gravel a byelaw was approved prohibiting the erection of a building until a layer of sound and suitable material sufficient to elevate the site to an adequate height had been deposited thereon. It seems generally desirable to treat a site that is naturally damp or soaked in moisture in this way, for an ordinary field drain is not permanently efficient, and there is no security that the trap will always prevent the passage of foul air into a porous subsoil.

The Metropolitan Byelaws require that, unless a site is gravel, sand, or natural virgin soil, it shall be covered with a layer of good concrete 6 inches thick, and smoothed on the upper surface. This concrete, which is usually made with lime, is of very little practical utility, and the exception of certain kinds of site is very unfortunate. The Model Byelaws admit of no exceptions, and require the site to be covered with asphalt or with a 6-inch layer of good cement concrete rammed solid. The object being to prevent the admission of ground air into the house, this cement concrete should be either asphalted or grouted on the surface with cement properly smoothed, as even the best concrete will allow the passage of moisture and of air. The Metropolitan Byelaws are silent as to ventilation under the wooden floors of the lowest story, but the Manchester Byelaws provide for a ventilated space beneath the floor timbers. I have, however, long been convinced that there ought to be no wooden floors of the ordinary construction in the lowest story of a house, and no space, ventilated or unventilated. The air-inlets are invariably stopped up to prevent cold and draughts, and, at the best, the space must be a means of introducing stagnant or ground air into the house. If brick or stone paving would be too cold, floor-boards 1½ inch thick, Burnettized or Ryanized, may be nailed to narrow fillets embedded in the concrete about 3 feet apart, or they may be nailed to a layer of coke breeze and cement, concrete, or the ordinary wood flooring blocks may be used. Thus the cost of excavation and of floor timbers may be saved, and a solid impervious floor obtained.

Burnt bricks and bad mortar permit the passage of moisture through walls. Mortar and plaster mixed with putrid or earthy matter increase this mischief and pollute the air. The Metropolitan Buildings Acts and Byelaws demand good, hard, sound, well-burnt bricks, and mortar composed of fresh burnt lime or cement and clean sharp sand or grit "without earthy matter." This last item is very important, for earthy matter can be easily detected by the eye and separated by analysis. The London Council General Powers Act, 1890, gives power to the Council to regulate the composition of plaster, which hitherto could be made chiefly of foul road scrapings or garden mould. The materials demanded will be generally similar to those required for mortar.

The provision of a damp course near the base of a wall is most important. The Metropolitan Byelaws demand that it shall be of "asphalte or other material impervious to moisture" placed one foot above the level of the ground in external walls, and six inches below the lowest floor in internal and party walls. Thus in external walls there is no provision against the passage of damp at the level of the ground or below that level. The Manchester Byelaws require a damp course of sheet lead of four pounds to the inch, asphalt half an inch thick, or

slates laid in cement, or of other material impervious to moisture beneath the lowest timbers and at the level of the surface of the ground. If the lowest floor is to be below the surface of the ground the external wall must be double, having a cavity of two inches between the outer and inner portions and extending from the base of the wall to the surface of the ground, with one damp course at the base of the wall and another at the top of the cavity. The Model Byelaws suggest that the cavity should extend to six inches above the surface of the ground, and even that is hardly enough to provide against the splashing of rain. The least that should be demanded is an outer covering or rendering of the wall with asphalt or some effectual material carried down from the damp course which is above the ground to a damp course that is below the floor. But it would not be very unreasonable to demand that the whole of the lowest part of the wall, up to a height of twelve inches above the ground, should be built of hard bricks bedded in cement mortar, as is very usual in good work. There does not appear to be any legal authority at present for demanding a dry area, or even an external coating for the protection of the lower part of a wall, these matters not forming part of the wall.

The supply of light and fresh air to habitable rooms, and the provision of sufficient air-space may be secured by requiring that the rooms be made of adequate size, and particularly of sufficient height—and that they have suitable windows overlooking open spaces. The Metropolitan Buildings Act, 1855, provides that unless all the rooms in a dwelling-house can be lighted and ventilated from a street or alley adjoining, it shall have in the rear or on the side an open space exclusively belonging to it, measuring 100 square or superficial feet. But it has been legally decided that the light and ventilation need not come directly from the outside, and if they are admitted through another room no open space need be provided. If the open space is provided there is no power to secure that any room shall be lighted or ventilated from it. The Amendment Act of 1882 requires that every new dwelling-house erected upon a site not previously occupied in whole or in part by a building shall have directly attached thereto, and in the rear thereof, and extending throughout its entire width, an open space of not less than 150 square feet. If the frontage exceeds 15 feet in length, the space must measure 200 square feet, a frontage over 20 feet must have an open space of 300 square feet, and a frontage over 30 feet must have a space of 450 square feet. But it is permitted to cover the whole of this space with buildings not higher than the ceiling of the ground floor storey of the main structure. In many cases this is very inadequate. The Model Byelaws fix the size of the open space at a minimum of 150 square feet but increase the area in proportion to the height and length of the house. In any case the distance from the rear of the house across the open space must be not less than 10 feet, but if the house is 15 feet in height the distance must be 15 feet—if the height is 25 feet the distance must be 20 feet—and for 35 feet or more of height the distance must be 25 feet, and these widths must be carried all along the rear of the building. These byelaws also enforce open spaces in front of dwelling-houses, and a similar result is obtained by the Metropolitan Regulations

which fix the widths of streets and the heights of buildings. These Model Byelaws also demand that every room shall have a window measuring one tenth of the area of the floor, and one half of it must open so that the opening extends to the top. This window must overlook an open space. And if a room has no fireplace it must have a ventilating opening or shaft of 100 square inches in area. The Berlin Regulations of 1887 provide that lobbies, vestibules, and corridors that have no windows must have tubes or pipes for ventilation. It is difficult to fix by law the size of a habitable room. The Metropolitan Building Act requires that every habitable room shall be 7 feet high in every part, except rooms in the topmost story, which must be 7 feet high over one half of their area. If in a basement, they must have (in accordance with the Metropolis Local Management Act) 1 foot of their height above the adjoining footway with an open area 3 feet wide along the front.

But the building regulations adopted by the London County Council for artisans' dwellings that are built upon the land which it has to devote to that purpose, indicate the views of that body as to the proper sizes of dwelling-rooms for the lowest class of the population that inhabits separate tenements. The assumption is that the average population will be two persons per room, and the standard height of rooms is to be 9 feet. A one-roomed dwelling is not to be of a less area than 144 square feet; in a two-roomed dwelling the additional room is to measure at least 96 feet square; and in a three-roomed dwelling the third room is also to be of this size. Basement rooms are not to be sunk more than 3 feet below the adjoining pavement, and waterclosets are not to be immediately accessible from dwelling-rooms. These closets are, in those dwellings, generally so arranged with regard to the scullery that a current of air will pass to the other rooms through the scullery and not through the closet. The Model Byelaws provide that the closet shall adjoin an external wall, and shall have a window measuring 2 feet by 1 foot, also a ventilating air-brick or air-shaft; but no regulations can secure these contrivances from being stopped up by the occupiers. It is, I think, a source of evil to assume that a watercloset must be a foul place, and to trust to remedial precautions which, in practice, will never be taken. A closet should, by its construction, be rendered so free from impure air that nothing beyond a window should be necessary to keep it sweet.

The last item I have to notice is the structural measures necessary for the removal of refuse from the house. The modern practice being to take all the liquid refuse of town houses into a public sewer, no question of cesspool construction can arise where sewers exist, and a cesspool cannot in any case be constructed in or near to a house. Questions of house drainage will be dealt with in another department of this Congress, and we have only to notice the structural means of getting liquid refuse into the drain. There are in the metropolis no very precise regulations for that purpose, but byelaws are now under consideration. The Model Byelaws require that the soil-pipe from a closet or slop sink shall be fixed outside a house, and shall be thoroughly ventilated. The waste-pipe from a bath, lavatory, or ordinary sink

must discharge outside the building over a channel leading to a trapped gully 18 inches distant. But there is no provision for a trap under the sink, which is necessary, and there is no satisfactory provision for the trap which forms part of the closet apparatus.

An earth-closet must be lighted and ventilated, as in the case of a water-closet, but I think no earth-closet should be permitted within a building, though with proper arrangements it may be placed close to a building. Privies and ash-pits, where they are permitted, must be placed 6 feet from a building, and 100 feet from any source of water supply. The Model Byelaws give detailed regulations as to these matters. Ashpits (or dustbins) for "dust, ashes, rubbish, and dry refuse," must be built of brickwork, and may contain 6 cubic feet, or such less amount as may be equal to the accumulation of one week. This is a great source of evil, for the kitchen refuse has to be mixed with it. In the city, which forms rather over a square mile of the metropolis, this refuse is collected daily, and no accumulation beyond one or two days ought to be permitted. I think that kitchen refuse should not be mixed with the ordinary dry refuse, such as dust, ashes, and hard-core; the mixture spoils both articles, producing a putrid mass that is unmanageable, and of little value.

I have now given the details of those structural regulations which in this country have been generally considered necessary for ensuring the healthy condition of a house, together with a few observations thereon. Had time permitted I should have been glad to compare our regulations with those in force in the chief continental countries, some of which are very elaborate, but I hope that these will be adequately brought out during this Congress.

The structural conditions of a healthy house do not appear to be numerous, but they are exceedingly difficult to define so that they can be clearly understood and enforced by law. It ought not to be possible to build a house in which the conditions necessary to healthy occupation are violated. Indeed, this can be prevented where the Model Byelaws are in operation, which forbid the occupation of a house until it has been certified to be fit for human occupation. But if this care is necessary in a new house, its necessity can hardly be disputed in the case of old houses, where the conditions are notoriously unsatisfactory. It has been proposed to bring these houses gradually under inspection by fixing a period after which the public authority will be authorised to inspect and order the amendment of defects. This is a matter which, both as to regulations and as to inspection, will demand the greatest care and caution. If it is established, it should apply to all houses without distinction of size or of the class of their occupiers, so that the whole population, the interest of which, as regards health, is common and cannot be divided, should be protected by public law from evils over which individuals can have but little control. And amongst the many sources of sickness and premature death, we should be freed from those which spring from the faulty construction of the house.

DISCUSSION.

Professor Aitchison, A.R.A., said, with regard to the sanitariously-constructed dwelling-houses, they were probably used by mechanics or persons who might be looked upon as the aristocracy of labour. But probably half the population of London did not earn more than about 10s. a week, and all these regulations, providing for sand, well-burnt bricks, mortar, best burnt lime, asphalt, and all sorts of things, were absolutely impossible, as these people could not pay the rent for such dwellings. But something must be done to render the habitation of the poor possible. He did not see what could be done unless the wages were to be raised, but that was a question of population, and at present people were willing to work at the lowest wage to avoid starvation. For the houses of the largest class of persons in large towns there was much difficulty in meeting most of these requirements, for the speculative builder knew perfectly well that his houses were useless unless they could be let at a certain price. The consequence was that every kind of bad material and bad workmanship was put into requisition; and every attempt was made to outwit those who were appointed to see to the carrying out of the regulations.

Mr. Coard S. Pain (Liverpool,) said they were all fully acquainted with the fact that it was a greater difficulty to enforce byelaws, however excellent in themselves they might be, than to make them. All of them who had had anything to do with the superintendence of buildings must know how utterly impossible it was to get the byelaws carried out if the builder was short of money or otherwise unable to do his duty. He thought that the official of the local authority should be jointly appointed by the Local Government Board and the rural or urban sanitary authority. They all knew that the general public was utterly indifferent to what was going on. The local authorities were, to a large extent, composed of people directly interested in not carrying out the regulations. One might be as smart as possible, but he would back the jerry builder against the smartest. Unless one actually sat upon the job, it was impossible to compete with him; he would cheat them under their very noses, and the local authorities backed him up for many reasons. One member might be the owner of a great property; another element in the local authority was usually the speculating builder; and it was most difficult for the official, however honest he might be, to fight against these influences. That difficulty should be removed, and he thought the adoption of the suggestion he had made would remove it, the more so as another difficulty in getting the byelaws carried out was the frequent inefficiency or ignorance of the official. He was referring to small communities of from 2,000 to 6,000 inhabitants, just large enough to demand the services of a sanitary official. A carpenter, possessed of no particular knowledge, was appointed as surveyor, and he had come across a surveyor recently who was not even acquainted with the byelaws. The law could not make a man honest, but it could insure the appointment of a competent man.

Dr. G. B. Longstaff, Member of the London County Council, felt some hesitation in rising in the presence of so many experts of whom he expected to seek information rather than to afford them any. It was important that architects should give information to individuals like himself as to what were really the essential points in building legislation to aim at. He would recommend them to throw aside all minor matters,

but to fight for those of great importance. Thus he would like to have the general opinion of architects upon Mr. Blashill's proposal to construct the ground floor with concrete and wood, a suggestion which he thought was quite a new one. If wood was used at all, it should be placed on concrete direct. The advantages were clear enough, but he wanted to know whether such a floor was practicable and durable, and whether a nuisance would not arise from the decay of the wood? It would be impossible to compel the people in London to live on concrete or stone or any similar material. They should have an impervious floor, but covered with wood or other non-conducting material. The greatest difficulty was the great respect which Englishmen always showed, and rightly showed, for vested interests, but the question arose whether the consideration of these vested interests had not gone too far. The Act of Parliament of 1855 gave many powers to the governing body of London to carry out provisions in all buildings which were not erected previously, but a long time had elapsed since then. People had learnt something, and the question was whether it was not time to strike out the existing clauses exempting all houses erected prior to 1855. They should also insist upon suitable open spaces, whether the sites had been occupied previously to 1855 or not. It should not be allowable to pull down an ancient street and build a new one of the same width, or to build a new house on the site of an old one covering the same or a larger area up to an indefinite height. Guides on these points would be of very great value. It was common knowledge, he supposed, that the Government had promised to bring in a Bill for the Consolidation of the Metropolitan Buildings Acts, and that a Committee of the County Council would probably be employed for many months to come in considering the details to be proposed to the Government.

Mr. Edward Bond, Chairman of the East-End Dwellings Company, said that in the model byelaws as sketched out by Mr. Blashill, he found little to object to, and nearly all the regulations he had suggested were such as an honest person doing his duty might very well submit to carry out. But there was the difficulty that a great number of people who went in for building speculation did not very much care what sort of houses they put up as long as they could erect them at the least possible cost. It was a matter of extreme difficulty to secure that byelaws, however excellent in themselves, should be positively enforced and carried out by those whose duty it was to see them carried out. At the present moment, however, they did not discuss the difficulties to be overcome, but what the ideas were as to framing our byelaws. There was nothing unreasonable in the suggestion implied by Mr. Pain in the opening of this discussion, but he could not agree with all that had been said about houses erected previous to 1855, and some of the suggested difficulties did not exist. He should be sorry to think, with Professor Aitchison, that only 10s. a week was earned by the average London working man. He would like to know where he had obtained that figure, seeing that, from his own observation, it must be very far from the exact truth. He did not think that the conclusion arrived at by Mr. Charles Booth in his book on London life was very wrong, according to which there was a large number of people earning from 15s. to 18s. a week. It was very difficult to settle the question how such people, who could only afford to pay 2s. 6d. to 3s. a week for rent, rates, and taxes, could best be lodged. The company with whom he was connected had made some attempts in that direction, and had found they had rooms for people of that class which would be found to satisfy Mr. Blashill's suggested byelaws, varying from

3s. 6d. to 2s. 6d. and 2s. a week. They had been able to pay their shareholders a dividend of 4 per cent., which was now likely to reach as much as 5 per cent. They did not confine themselves to buildings of that class, but catered also for people who could afford to pay considerably higher rents. He ought to mention that most of the sites upon which their houses were built, and which had been cleared by the Metropolitan Board of Works or by the County Council under the Artisans' Dwellings Act, they had acquired at a rate very much below the strict market value. When he spoke, therefore, of having to a certain extent solved the problem, it should be taken into account that they had paid less for their land than it would have cost in the open market. Otherwise he doubted whether they would have been able to provide rooms which the people could have inhabited, and also to pay a good remuneration to those who had entrusted them with their money.

The Rev. Harry Jones said he was in favour of pulling down any bad house, whatever inconvenience it might cost to anyone. A bad man would sometimes make a bad house, but a bad house would inevitably make a bad man.

Mr. H. H. Statham said he could not agree with the conclusions of his friend, Professor Aitchison, which he thought were entirely false humanity, and illogical. If byelaws were to be relaxed because properly-built houses were beyond the means of the poorer class, in two or three generations we might reach the point where they could only afford straw huts, and the authorities would be called on to permit those in the byelaws. The enforcement of good building tended to keep up a healthful standard of life, and was a benefit to the community.

Mr. Edwin T. Hall wished to urge the necessity of excluding ground-air and sewer-gas. There was a lamentable want of power to do this in the Building Acts governing the metropolis. There was no regulation whatever having for its object the exclusion of ground-air as such. "Sewer-gas" was guarded against, but it must be remembered that ground-air was almost as deleterious. They would remember that experiments had been made showing that air went through walls of houses at the rate of 16 cubic feet per hour at 30 deg. difference of temperature, and at a difference of 5 deg. the rate was 17 cubic feet. When they remembered that ground-air was charged with carbonic acid gas and gases from organic matters, they would see how deadly this was to the persons inhabiting such rooms. The floor should be protected by asphalt, of which he had been an advocate for many years. There should be no space under the floor, that being a reservoir for stagnant air. They could get no syphon action to ventilate it, the ground being in most cases level on each side. In upstairs rooms it was also important, though not necessary, to have a solid concrete floor. With regard to virgin soil, that seemed to him to be anything except absolute refuse. They might take the grass off a field and build on that, which would be virgin soil, whilst it should be law that the lowest room in a house should be built on an impervious material. Nor was the Act adequate in other respects. It provided for one watercloset in a house, but, having put that one closet in, which complied with the Act, fifty others might be put in that did not. Dr. Longstaff had referred to the necessity of having windows to more than one side of the house, and the difficulty about that had also been pointed out. He thought that, for such cases, dispensing power should be given to some one by the County Council. They should provide regulations for the ninety-nine cases that formed the rule, and not for the one

forming the exception. The difficulty he had long felt of enforcing all penalties for breaches of byelaws should be met by placing the duty of the prosecution upon the police.

Mr. W. N. Elliott, of Plymouth, considered the erection of dwellings under sanitary conditions to be the first consideration, as all enjoyment of life depended upon it, and he thoroughly approved of the means suggested for the purpose in the paper. In Plymouth, concrete beneath the floors of houses was compulsory, except the site was on a solid rock. Sanitary inspectors had to contend with the difficulty arising from the fact that insanitary buildings were often the property of members of the local authority, and great influence was brought to bear upon the officials of the borough, interfering with the exercise of their duty in a conscientious manner. If these inspectors were independent men, and were paid from an independent source, the results would be more satisfactory. Then if the expense of erecting healthy dwellings for the poor was really so great that their inhabitants could not pay the rent, he did not see why State aid should not be granted. Some of the speakers had confined their remarks to London, but in an International Congress they had to deal with all towns.

Dr. Sykes called attention to the fact that the title of the paper was the "Control of the Construction of *Buildings*," not *dwellings* only. He laid stress upon this point because he wished to mention something that bore materially on that question. Buildings were inhabited or uninhabited. Uninhabited buildings affected the health of the population only by external influences, while inhabited buildings affected it externally and internally. Those who were acquainted with English legislation would last year have seen an Act,—the Public Health Amendment Act,—in which there was a clause introducing a totally new feature into the building legislation. The clause was to the effect that any building that had not been erected for the purpose of a dwelling should not be used as a dwelling until permission had been obtained for its being so used from the surveyor or architect of the district. A building might be erected which was not intended to be dwelt in, and yet be used as a dwelling-house, whilst, *vice versa*, a dwelling-house might be converted to other uses. It was through this conversion that the whole difficulty in building legislation arose, and he hoped that the County Council would adopt measures for preventing a stable-loft,—he was going to say a kennel,—being used as a dwelling without being rendered fit for habitation. He spoke from personal experience as a medical officer of health.

Mr. E. T. Brydges, Town Clerk of Cheltenham, wished to point out with reference to the remarks made by Dr. Sykes about the Public Health Amendment Act, that that Act was an adoptive Act, which had the serious defect that one could not adopt sections of it, and, for that reason, local authorities had, in many cases, not been able to avail themselves of it. He agreed that byelaws should apply to all houses irrespective of date of erection, and that any unhealthy house should be pulled down.

Mr. H. H. Collins desired to protest against over-legislation. That the Building Act required some remodelling, one could admit. But as it had been 36 years in operation without having given rise to serious complaints, notwithstanding the serious alteration of circumstances, he thought that spoke well for the Act and for those who had framed it.

On Furnishing Steam from Central Districts for Heating and Power in Towns and Cities.

BY

S. M. BURROUGHS.

As water, gas, and electricity have been found most convenient and economical when supplied to the general public from central sources, the idea was suggested, and has been found practicable in its working, of supplying steam from mains laid under the streets from which it can be conveyed either for heating purposes or for power. The first practical experiment in this direction was made by Mr. Holly, of Lockport, New York, the inventor of the Holly system of large pumping engines. The system is very simple. It consists of boilers in central stations supplied with smokeless furnaces adapted to the consumption of coal-dust, which would otherwise be wasted. The steam is conducted through the streets in large mains composed of wrought iron lap-welded pipes. Contraction and expansion are duly provided for by means of service variators which have secured unblockable joints. The pipes are covered with non-conducting substances which prevent the radiation of heat. This can be secured by covering the pipes with magnesia or asbestos, and enclosing them in logs of wood with holes bored to suit. The steam can be supplied at a high pressure, say at 80 pounds, and can then also be used for driving engines, pumping water, &c., &c. By means of reducing valves the pressure can be reduced to 3 pounds on the square inch; and by the use of steam meters, the quantity of steam taken by each customer can be measured. The New York Steam Company now furnish steam for 600 engines from one station. They also supply heat for the city Post Office, the Western Union Telegraph building, and for many other buildings. Their profits are rather more than 33½ per cent., and their customers find this method of heating more economical and desirable than any other. Heat is supplied by this system the same as water or gas; it is on tap, and can be had at any time, day or night, by simply turning a valve. While there have been killed in New York in one year, by horse-cars 64, by waggons 55, by gas 23, by electric current 5, not a single case of death has occurred through the use of steam by this system. Mr. F. H. Prentiss, the chief engineer and general manager, gives the following affidavit:—"I am chief engineer and general manager of the New York Steam Company, and have been in the employ of said company and familiar with its affairs for seven years. There has never been an explosion of a steam-pipe of this company in the streets of New York; there has never been a paving stone lifted, to my knowledge, except by a crow-bar, in the usual way. All talk of explosions in this connexion is supreme nonsense. The sudden generation of force necessary to produce an explosion, which can and does take place in a steam boiler, cannot occur in the street pipes. I state, as an engineer and expert in steam matters, that such a thing is

"physically impossible, as there is no fire under the pipes in the streets. They are as safe and free from explosion as Croton Water pipes."

There is abundant evidence, not only in New York city but in other places where this system has been employed, to prove that it has given general satisfaction, and to indicate that there is a future of great usefulness before it. It can be utilised with great advantage by electric lighting companies, because they can employ their waste steam for the purpose. The Edison Electric Company of Kansas City paid the cost of the investment from the first year's income. The system is especially useful for college buildings, asylums, &c. The mains should be laid down from 4 to 6 feet underground. No man-holes are necessary; the variators should be placed about 50 or 100 feet apart, and should be enclosed with brick. The pipes enter buildings through a cellar or basement, and connect with radiators wherever required. The condensed steam is usually conducted into the basement, where it passes through coils exposed to a current of fresh air from the outside; this abstracts from the steam the remaining heat and then passes upward into the rooms where required for heat and ventilation. The water is of course also pure, and can be used for general household purposes; or, if not required, can be passed into the sewer. If steam is required for heating water, it can be easily carried into a little gravel at the bottom of a basin or tub. The steam can also be used conveniently in drying rooms for drying clothes; it can also be used for forcing water upstairs to tanks by means of steam pressure; also for green-houses and conservatories; and likewise for cooking. It is a great protection against fire, because, if steam is turned into any room where there is a fire it speedily extinguishes it. The risk of fire is greatly reduced by the employment of such a system. The loss of heat, when the main pipes are well covered, is considered to be not more than 5 per cent. The system has been found economical, and has been adopted in competition with good coal at 2½ dollars per ton. A few of the advantages are, briefly; *First*, convenience; *Second*, absence of fireplaces and stoves, and of the risks attendant upon them; *Third*, uniformity of temperature is easily secured; *Fourth*, absence of dust, smoke, and noxious gases which come from coal, gas, or petroleum; *Five*, economy; *Six*, absence of danger from explosions, economy of labour over the use of separate boilers; utility over supplying the steam for power.

In 1891 the Holly system was in use in 29 towns in the United States; also for heating power in different buildings in these towns. The adoption of such a system would, I should think be particularly desirable in London, and might be the means of abolishing the smoke and fog nuisance. It has been found that the value of land along streets where the steam mains are laid has been considerably increased thereby. If therefore, the supply of steam should be taken in hand by municipal authorities, a considerable amount of the cost could justly be defrayed by taxing the increased values imparted to adjacent land by the laying down of steam-mains.

DISCUSSION.

Mr. R. A. Robinson said he was glad that Mr. Burroughs had brought the idea of this improvement to London. He saw no reason why the plan could not be carried out, to judge by the evidence adduced by the lecturer. He would like to know, however, how far steam could be carried. Another point was that our streets were already filled up with underground pipes, and he had some hesitation in advocating the insertion of more pipes than were absolutely necessary. He would like, however, to see the system tried, as it would be of great importance to London.

Mr. John Atha (Leeds) pointed out that, through conducting steam in pipes underground for long distances, part of the steam would be condensed into water, and thus in a short time interfere with the proper working of the system.

Mr. Burroughs, replying to various queries, said that the size of the pipes depended upon the demand. The main would have to be large, perhaps 8 in. or 9 in., but much smaller pipes would convey the steam into the houses. He had not heard of the subsidence of the soil causing any serious difficulty, but they were in the same position as with water and gas. So far the scheme had been carried out with great satisfaction in the United States, and it has also been found that it tends to an improvement in the sanitary condition of the towns. As to the collection of condensed water, there were traps provided into which such water would fall.

Wednesday, 12th August 1891.

The President, Sir ARTHUR BLOMFIELD, in the Chair.

Sur la Constitution Hygiénique des Murs d'Habitation.

PAR

M. le Prof. EMILE TRÉLAT, Directeur de l'Ecole Spéciale d'Architecture,
Député de la Seine.

Les murs des habitations modernes sont toujours exclusivement établis en conséquence de deux idées fondamentales:—1°. Une idée technique qui porte à rechercher des matériaux capables de durer dans le temps, de résister aux charges mécaniques auxquelles ils seront soumis dans la construction et de fournir à la perspective de l'édifice des ressources plastiques en rapport avec l'expression architecturale désirée; 2°. Une idée économique qui porte à rechercher des matériaux faciles à travailler et peu coûteux à obtenir.

Il faut ajouter que dans les villes qui s'étendent sans cesse et absorbent de plus en plus les populations des campagnes, l'espace manque au constructeur, ce qui lui commande de réduire la place occupée par les *pleins* de ses édifices. Les murs doivent donc y être aussi minces que possible. Ils sont aujourd'hui d'autant plus minces

que les villes sont plus peuplées et l'habitation plus dense. Comme d'ailleurs, les constructions à la campagne prennent de plus en plus modèle sur celles des cités, on peut dire d'une manière générale que la tendance actuelle du constructeur est de réduire l'épaisseur des murs.

Je voudrais fixer l'attention de la Section sur les conséquences de la routine que je viens de décrire et montrer qu'il y a nécessité de faire intervenir dans le problème des considérations absolument négligées aujourd'hui.

Pour cela il faut envisager le mur de maison, non plus seulement comme un organe de la construction, mais comme un facteur du bien-être et de la salubrité intérieure. C'est, en effet, entre les murs qui enclosent nos logements que doivent être aménagés le confort et la sécurité de l'habitation. À ce point de vue les murs sont, d'abord, pour l'habitant des parois de protection contre les intempéries : pluies, vents, écarts et excès de températures atmosphériques. Ils sont, en second lieu, des intermédiaires qui doivent favoriser autant que possible la reconstitution de la salubrité intérieure sans cesse compromise par le fonctionnement de la vie pendant que les locaux sont habités.

On infère facilement de ces conditions de service des murs la nécessité de définir leurs capacités :—1°. Au point de vue de la protection qu'ils fourniront à l'intérieur contre les *variations* atmosphériques ; 2°. Au point de vue de leur influence sur l'état atmosphérique intérieur.

I.—Capacités des murs au point de vue de la protection qu'ils doivent assurer à l'intérieur contre les variations atmosphériques.

Les variations atmosphériques sont *mécaniques, hygrométriques, ou thermiques*.

Les variations *mécaniques* sont dues aux mouvements de l'atmosphère qui est calme ou venteuse ou tempétueuse. Les murs, comme on les construit couramment, sont toujours des protecteurs suffisant à ces sortes de désordres. Il n'y a pas à s'en occuper ici.

Les variations *hygrométriques* sont tributaires des saisons, des climats et des sites. L'atmosphère est alternativement sèche ou humide, et ces alternatives sont plus ou moins souvent répétées selon les localités. Un intérieur sain ne supporte pas ces changements d'états. L'atmosphère doit y être convenablement chargée d'eau : ni trop sèche, ni trop humide. Les variations extérieures ne doivent pas sensiblement l'influencer. On voit intervenir ici non seulement une question d'épaisseur de parois, mais une question de constitution matérielle de ces parois. En laissant de côté l'épaisseur qui est généralement suffisante dans la pratique courante, on constate, que certains matériaux de construction donnent très facilement passage à l'eau, tandis que d'autres l'interceptent complètement. Les grès, notamment ceux de formation tertiaire, comme les *grès de Fontainebleau*, sont dans le premier cas. Un morceau de grès de Fontainebleau, d'une épaisseur très notable (50 ou 60 centimètres) en contact avec l'eau sur une de ses faces, laisse voyager le liquide dans ses profondeurs et atteindre après

quelques heures la face opposée. Au contraire, du granite ou du calcaire placés dans les mêmes conditions ne se laisseront pas sensiblement pénétrer par l'eau. On peut dire qu'au *point de vue hygrométrique* la conservation d'une atmosphère intérieure saine demande des parois composées de *matériaux imperméables à l'eau*. Les variations *thermiques* extérieures dépendent encore des climats, des saisons et des sites, qui gardent les nuages au ciel ou qui les en éloignent. Les surfaces du sol et de ses reliefs sont influencées par l'état thermique de l'atmosphère ; et, quand celui-ci persiste, les échauffements ou les refroidissements de ces surfaces pénètrent dans les profondeurs.

Une paroi d'habitation est un protecteur effectif contre les changements de température quand elle arrête dans son corps, sans le laisser traverser, les variations thermiques auxquelles est soumise sa face extérieure ; en d'autres termes, quand elle est pourvue d'une suffisante capacité d'isolement. Le type d'une semblable paroi pourrait se définir ainsi :—Elle serait composée d'une matière assez isolante et elle serait assez épaisse pour que les écarts de température extérieure n'eussent jamais le temps d'atteindre les profondeurs de l'ouvrage jusqu'à gagner la face intérieure. Les échauffements et les refroidissements du mur s'opéreraient ainsi sans modifier l'état thermique de la surface intérieure qui enveloppe les habitants et agit constamment sur eux par rayonnement. Une semblable paroi dans nos latitudes, entre le 42° et le 52°, degré, devrait avoir 2^m et plus d'épaisseur. On trouvait de pareilles conditions dans les vieilles constructions de l'antiquité et du moyen-âge. Il était alors facile d'entretenir dans l'habitation une régularité de température sensiblement constante. La surface intérieure des murs ne subissait que de légers écarts de chaleur auxquels on remédiait sans peine, à l'aide de simples foyers de cheminées. Nous sommes aujourd'hui très éloignés de conditions aussi favorables avec l'épaisseur réduite de nos murs. La face intérieure s'en refroidit considérablement l'hiver et s'échauffe de même l'été, en sorte qu'elle rayonne offensivement sur nos corps du froid ou du chaud. Pour remédier à cet inconvénient les appareils les plus divers sont employés au chauffage pendant la saison froide et nous en tirons peu de satisfaction en général ; tandis que nous sommes dépourvus de palliatifs pendant la saison chaude.

C'est contre ce double mal qu'il faudrait réagir en donnant plus d'épaisseur à nos murs d'habitations. À Paris et dans la France du Nord les constructeurs donnent aux murs de façade une épaisseur de 0.50° quand on les construit en pierres calcaires, et de 0.35° quand on les construit en briques. La brique (argile cuite) possède une propriété d'isolement sensiblement double de celle du calcaire, si bien que le mur de briques de 0^m.35 est plus protecteur contre les changements de température que le mur de calcaire de 0^m.50°. Ces épaisseurs sont, toutefois, insuffisantes l'une et l'autre. On peut, il est vrai, augmenter singulièrement le pouvoir isolant du mur en l'habillant à l'intérieur d'une doublure en bois ou en étoffe. Le bois est quinze fois plus isolant que le calcaire et sept fois plus isolant que la brique. La laine est vingt-trois fois plus isolante que le calcaire et onze fois plus isolante que la brique. On pourrait donc doubler la capacité d'isolement des murs que nous construisons avec un revêtement intérieur *en bois* de 0.07°, d'épaisseur pour les murs de

calcaire, de 0.^m05 pour les murs de briques; avec un revêtement intérieur en étoffe de laine de 0.^m5 pour les murs de calcaire, de 0 025 pour les murs de briques. Sans prétendre à d'aussi beaux résultats, on voit le parti qu'on peut tirer des matériaux fortement isolants, pour améliorer les murs de face de nos maisons. Quoique ces doublures isolantes soient des remèdes coûteux et restés jusqu'à présent des applications de luxe, c'est à elles qu'il faut recourir si l'on veut remédier à l'insuffisance de protection que nos murs nous fournissent contre les variations thermiques de l'atmosphère. *Tous nos murs de façade devraient être lambrissés en bois.* On obtiendrait ainsi, sur les parois exposées aux intempéries une garantie très efficace qui rendrait beaucoup moins pénible l'habitation d'été, et beaucoup plus facile l'entretien pendant l'hiver de la température des enveloppes rayonnantes des salles.

Je place ici une observation que je ne saurais omettre, puisque je parle à Londres et que mes auditeurs sont, en majorité, des Anglais. La capitale de d'Angleterre n'est plus aujourd'hui ce qu'elle était il y a une trentaine d'années encore, une ville à petites maisons basses, à laquelle s'appliquerait sans réserve tout ce qui vient d'être dit. Après s'être étendue en surface jusqu'à occuper 32,000 hectares, la ville de Londres semble aujourd'hui se ramasser sur elle-même, en même temps qu'elle perce les vieux quartiers et se fait des voies nouvelles. Et comme tout se fait vigoureusement et quelquefois excessivement dans ce grand pays, on y voit s'élever des maisons à une hauteur extraordinaire. On en rencontre qui ont jusqu'à 13 et 14 étages, ce qui porte leurs murs à 35 ou 40 mètres de hauteur. Dans ces conditions la stabilité a exigé l'épaississement des murs; et, sans qu'ils le fassent exprès, on voit ainsi les architectes anglais construire des maisons dont les logements sont mieux protégés que ceux des anciennes constructions contre les changements de température. Cette observation n'enlève rien à la netteté du principe de salubrité qui commande à l'habitation d'être close par des murs permettant de maintenir aisément en température sensiblement constante les surfaces intérieures des parois.

II. Capacités des murs au point de vue de leur influence sur l'état atmosphérique intérieur.

Toutes les émanations du corps sont délétères. Quand nous vivons en plein air nous échappons à leur influence, soit par ce que nous ne séjournons pas au voisinage des dépôts excrémentiels que nous créons; soit parce que nos déplacements nous éloignent des lieux de l'atmosphère viciés par nos expirations ou nos transpirations; soit, enfin, lorsque nous restons stationnaires, parce que les mouvements de l'atmosphère ou les simples courants verticaux entretenus autour de nous par notre chaleur corporelle déplacent et remplacent les gaz expirés par nos poulmons. Mais aussitôt que nous nous enfermions dans nos habitations nous perdons ces bienfaits. L'atmosphère limitée qui nous entoure s'infecte dangereusement si nous ne la renouvelons pas. Malgré les intempéries ce renouvellement s'opère partiellement par les fissures de nos fenêtres et de nos portes, par les vasistas et surtout par les cheminées que nous prenons soin de ménager dans chaque pièce habitée.

Mais tout cela ne suffit pas à maintenir nos corps dans un milieu de salubrité comparable à celui que nous trouvons dehors. Aussi nous efforçons-nous judicieusement, d'ouvrir nos fenêtres aussitôt que le temps le permet, ou que le voisinage bruyant et poussiéreux des voies urbaines nous y autorise. Mais dans les longues saisons d'inclémence atmosphérique nous n'ouvrons pas nos fenêtres, nous fermons nos vasistas et notre atmosphère intérieure reste misérable, souvent sensiblement infectée et toujours insensiblement malsaine. Dans maintes circonstances l'infection reste pour ainsi dire collée aux murs. Cela arrive toujours dans un milieu constamment occupé pendant longtemps lorsque les murs ne sont pas poreux, c'est à dire perméables à l'air. Au contraire, si les murs sont perméables à l'air, l'infection de surface murale ne se produit pas. Cette perméabilité est une condition de salubrité très précieuse. Il faut la rechercher toujours.

Nous connaissons des matériaux qui se laissent très facilement pénétrer par l'air à travers des épaisseurs très considérables. Ainsi se montre le calcaire tendre dont le type peut être pris dans le calcaire grossier du bassin du Paris, qu'on nomme *Vergelé*. Un mur de Vergelé de 1.^m00 d'épaisseur, et plus, laisse passer une notable quantité d'air ou de gaz quelconque. Si on considère une salle habitée, close par un pareil mur, voici ce qui se passe; l'air extérieur y voyage de dehors en dedans, tandis que l'air intérieur y voyage de dedans en dehors. Ce dernier charrie avec lui les fumiers* humides et gazeux résultant de la vie enfermée. La rencontre de ces deux courants, réducteur et réductible, produit l'oxydation des fumiers et ruine leur action nocive. Il se fait là une véritable épuration tout à fait comparable à celle qu'on obtient sur un champ poreux et perméable arrosé par des eaux d'égout courant en rigoles. On sait avec quelle perfection et quelle rapidité toutes les oxydations salutaires s'opèrent en ce merveilleux laboratoire de salubrité. Les calcaires poreux sont des matériaux très précieux pour la constitution hygiénique des parois d'habitations. Quoique leur porosité les rende facilement pénétrables à l'air, ils laissent difficilement passage à l'eau; et, sous ce rapport, ils gardent l'avantage des matériaux qui ne laissent pas entrer les eaux atmosphériques dans l'habitation. Aussi doit-on, au point de vue hygiénique, les préférer à tous autres matériaux, aux matériaux perméables comme le grès qui ont l'inconvénient de se laisser pénétrer par l'eau, et qui, alors ne permettent plus à l'air de passer, et aux matériaux comme le granite qui, imperméables à l'eau, ne laissent jamais passer d'air.

Je dois conclure, à la suite de cette communication, par ces trois indications :—

- 1°. Les murs extérieurs de nos habitations sont aujourd'hui pourvus de capacités isolantes trop faibles pour que nous puissions régulièrement entretenir dans nos logements la température normale de salubrité.
- 2°. Il y a lieu d'accroître ces capacités soit en augmentant l'épaisseur des murs, soit, à défaut de cette augmentation, en

* Mot très juste et très pittoresque du Dr. Rochard.

révêtissant la face intérieure des murs d'une doublure faite en matériaux très isolants, tels que le bois ou les étoffes.

3°. Au point de vue de la pureté atmosphérique intérieure, les meilleures parois sont les murs composés de matériaux perméables à l'air et imperméables à l'eau. Le type de ces matériaux est le calcaire tendre.

DISCUSSION.

Professor T. v. Gruber (Vienna) will nicht den geistreichen Darstellungen des Vorredners widersprechen, macht aber darauf aufmerksam, dass ein sehr grosser Theil der Wände durch die Fenster eingenommen wird, die hier in England wie in Frankreich nicht nur in höchst anerkennenswerther Weise sehr gross, sondern auch stets einfach gemacht sind. Die Wärmetransmission durch das Glas ist aber bedeutend grösser als die durch das Mauerwerk; so lange also nach climatischen Verhältnissen einfache Fenster genügen, erscheint eine Verstärkung der Mauern-Ende nicht nöthig; vortheilhaft ist es aber gewiss, und besonders unter climatischen Verhältnissen, welche die Verdoppelung der Fenster verlangen, in die Mauern "Lichtschichten" als schlechte Wärmeleiter einzuschalten. Wir dürfen nie übersehen, dass wir die Anforderungen der Hygienie nicht zu hoch ansehen, wenn wir den grössten Bedürfnissen der Gegenwart, der Schaffung von entsprechenden Wohnungen für die arme Bevölkerung, Rechnung tragen wollen. Was die Permeabilität der Wände betrifft, ist wohl zu unterscheiden in welcher Weise die Ventilations-Einrichtungen durchgeführt sind. Wo für die Vorwärmung der Beleuchtung und für entsprechende Abzugsschote vorgesorgt ist, und die richtige Ausnützung dieser Einrichtungen erwartet werden darf, ist es gewiss am besten die Aussenwand der Mauer permeable, die Innerwand aber impermeable zu gestalten. Wo aber die richtige Verwerthung der Ventilations-Einrichtungen nicht zu erwarten ist, muss man leider noch heute vielfach diese bedauerliche Thatsache constatiren, dort wird die Permeabilität der Innenwände und Mauern das Richtige sein.

Dr. Spottiswoode Cameron (Leeds) thought that there was a danger, in excluding damp, of excluding another precious element, the oxygenating influence of fresh air, which largely took place through the permeability of walls. In many houses the means of ventilation were almost *nil*, but a certain amount of the deleterious gases got out through the walls. Was there not a danger, if we made the walls too impervious, that we might be doing as much harm as good?

Mr. Ralph Nevill, F.S.A., did not agree with Mr. Seddon in his observations on a previous paper in favour of solid walls rather than hollow walls. To make the walls impervious by increasing their thickness was useless, so long as in other parts of a room there was only a single pane of glass between the inmates and the open air. He was of opinion that windows should always be constructed in such a way that there should be an air space always between two sheets of glass forming the windows.

Mr. H. H. Statham said he was disposed to agree with the last speaker, that it was of no use to increase the thickness of walls while we had glass windows occupying so large an area of wall space. In

England we were not accustomed to double sheets of glass, with an $\frac{1}{2}$ in. air space between.

Mr. H. H. Collins said that Pettenkofer gave instances of houses for the working classes built of iron slag, which was supposed to be impermeable. But such houses were found to be extremely uninhabitable, because, at certain seasons, water would be found running down the interior walls. The speaker agreed with Mr. Neville with regard to hollow walls, and, he would add, hollow windows.

Mr. W. P. Buchan (Glasgow) said he doubted whether the double window with $\frac{1}{2}$ in. or 1 in. interspace would prove as effective as some of them anticipated. He knew a church in Glasgow where the windows were double and of large size, in which the cold was bitterly complained of. He was of opinion that experiments should be made in the period of winter to ascertain the proper interval between two sheets of glass in order to prevent the escape of heat. Half an inch appeared to him too little. The most effective interval was probably between $\frac{1}{2}$ in. and $1\frac{1}{2}$ ins., or, perhaps, 2 ins. It would be a great advantage to have the matter settled by careful experiment.

M. Trélat, in replying on the discussion, said he had guessed, rather than understood, the drift of the arguments. The speakers appeared to be of opinion that the loss of heat by windows would be so great as to neutralise the advantage of thickened walls. It was a question of degree, of calculation, of volume. The larger the windows the thicker should be the walls. The fundamental idea was that the surrounding mass should be so ample and sufficient that the heating of a wall should not depend upon the withdrawal from the inmates of any portion of their animal heat. He hoped that his remarks would not be misunderstood by his ancient colleague and general secretary at Vienna, the Chevalier Von Gruber.

Sur l'Emploie des Fondations sur Pilotis pour les Habitations.

PAR

le Dr. P. J. H. CUYPERS,
Architecte des Musées Nationaux, Amsterdam.

I. Les constructions datant du moyen-âge dans les villes construites dans un terrain marécageux, comme Amsterdam et Rotterdam, sont toutes bâties sur pilotis. De ces temps on augmentait la résistance du sol tourbeux en enfonçant grand nombre de pilotis long de quatre mètres environ, tout côté à côté. Toute cette masse de bois était enfoncée jusqu'au dessous du niveau de l'eau; sa surface était beaucoup plus étendue que la largeur des fondations en maçonnerie. L'élasticité des couches tourbeuses comprimées par les bois de sapin, agissant dans un même sens que la force de l'eau dans lequel ces bois sont enfoncés, constituaient la résistance pour la fondation des constructions.

À mesure que les moyens mécaniques, servant à forcer les bois de sapin à entrer dans le sol, se sont développés, on a augmenté la longueur des bois, pour atteindre plus de résistance. Dans beaucoup d'endroits on est parvenu à un système (reposant) basé sur un principe plus sur :

restreindre le nombre des pilotis, augmenter leur force en choisissant des bois de plus forte dimension, les enfoncer en terre jusque dans les couches très résistantes de sable pur, ou mêlé d'argile. Dans ces conditions il est possible de calculer la force résistante de chaque arbre qu'on vient d'enfoncer, puisque le poids du marteau, la vitesse avec laquelle il frappe la tête de l'arbre (pilotis) et le poids de l'arbre sont connus; et après chaque coup l'on mesure l'avancement en terre. Dans certains cas la résistance d'un arbre peut être évaluée à dix-huit mille kilogrammes. Dans certains endroits la couche originelle de sable déposé par la mer ou les fleuves, est si profonde que les plus forts arbres (de vingt mètres par exemple), n'atteignent point ces couches résistantes.

II. Le niveau de l'eau qui enpreigne le sol, est dans tous les terrains tourbeux (généralement des polders drainés par les moulins à vent ou pompes à vapeur) assez constant de hauteur. On a retrouvé des fondations en pilotis d'anciens monuments ou des ramparts des villes après plus de deux ou trois cents ans, qui étaient restées tout à fait intactes quant à leur résistance. Le bois s'était noirci, et était aussi dur que le métal.

Dans les "polders" qui existent déjà plusieurs siècles, les terrains se sont retrécis, et on a dû abaisser le niveau constant de l'eau. Des suites très funestes se sont déclarées dans les monuments datant de plusieurs siècles. Les fondations ne résistaient plus, et des crévasses se montraient de tout côtés. L'examen des pilotis démontrait que le bois avait été à sec, et était donc pourri en peu de temps. On a pu y remédier dans quelques cas, en coupant les bouts des pilotis pourris et en introduisant par morceaux, de la maçonnerie entre les vieux murs et la fondation en bois d'autant plus profonde.

III. On pose les pilotis en moyenne à une distance de 0.50 m. mesurée sur les centres. En coupant et égalisant les têtes des arbres enfoncés on ménage un tenon qui entre dans les traverses (holl.= *hespen*), destinées à supporter le plancher en bois (épaisseur de 0.08 à 0.12 M, en sapin ou en chêne là où le poids de la construction sera très grande). Les différentes planches sont posées à une distance de 1 à 2 centimètre pour leur permettre de se dilater sous l'influence de l'eau, sans exercer une pression dangereuse sur les moyens d'assemblages surtout des planches extérieures.

IV. Les ingénieurs du "Waterstaat" (Ponts et chaussées, etc.), et de chemins de fer de l'état ont quelquesfois coulés des blocs immenses de béton en ciment, comme moyen de relier les têtes des pilotis, et en même temps comme fondations pour les maçonneries. Les pilotis avancent dans ce cas sur un mètre en hauteur dans la masse de béton, qui a deux mètres de hauteur; comme ces fondations sont exposées à une très grande pression par la structure superposée (des piles de ponts en fer, etc.), il faut pouvoir compter absolument sur la cohésion du bloc de béton, afin qu'il n'y pas de danger qu'il se rompe, en plusieurs pièces; un écroulement de l'œuvre entière en pourrait être la suite funeste.

Aussi en vue de quelques désastres qui se sont produits dans des constructions exécutées d'après ce système dans des terrains marécageux

et très peu résistants, les architectes n'ont pas imité ce système qui n'est efficace, que dans des terrains sablonneux et argileux, formés par les couches des grands fleuves; dans ces conditions on peut éviter avec le pilotis des constructions pneumatiques bien plus coûteuses.

Quoique le béton pourrait fournir une bonne fondation pour les caves, qui serait imperméable à l'eau du sol, on ne l'emploie pas dans ce but, craignant les fissures, dans les terrains marécageux; les fondations entièrement construites en bois sont absolument nécessaires dans ces circonstances, pour porter la maçonnerie.

V. Depuis deux siècles la coutume d'habiter les caves, de les destiner pour les comptoirs et bureaux des commerçants, pour des ateliers de peintres et verriers, de menuisiers, etc., s'était extrêmement répandue dans nos grandes villes, à cause du prix élevé des terrains et des fondations. Un grand nombre de la classe ouvrière vivaient dans des caves en grande partie sous-sol. Et comme les fondations n'avaient pas été exécutées avec assez de soin l'eau pénétrait pendant l'automne et l'hiver, souvent au dessus du pavé. Chaque soir et chaque matin ces habitants pompaient devant leur entrée cet eau, pour l'éloigner par les égouts, pour un certain temps du moins. Car chaque jour elle revenait de nouveau.

Depuis vingt ans les autorités communales, ont défendu d'habiter les sous-sols, et ceux qui les habitaient dans ce temps, devraient les quitter dans un espace de temps déterminé.

Quoique à présent les cas soient rares que les sous-terrains soient encore habités par des familles entières, pourtant on dispose généralement la cuisine et quelques autres pièces, qui sont habitées pendant le jour dans les sous-terrains. En tout cas il est d'une grande importance pour la salubrité des habitations, que les caves soient absolument sèches. L'humidité des planchers et des murs ne ferait pas seulement pourrir les bois, les meubles et les tapisseries, etc., dans ces sous-terrains, mais dans un pays aussi fierreux, que le nôtre, les habitants sentiraient bientôt les suites funestes d'une demeure, où cette humidité se répandrait par tous les étages.

Les conditions suivantes s'imposent à la structure de nos caves, sur une fondation en pilotis.

1°. Comme le bois ne résiste pas à la décomposition, au dessus du niveau de l'eau, les murs en maçonnerie sont posés au dessous du niveau de l'eau le plus bas, qui se présente. Pendant l'exécution des maçonneries on tient le puits, dans lequel on travaille à sec par de pompes de différentes capacités.

2°. Pourque garantir le plancher de la cave, ou du souterrain, on peut le monter au dessus du niveau de l'eau dans le sol. Afin de garantir les murs d'agir comme conducteurs de l'humidité, une partie comprise entre deux plans horizontaux: l'un en dessous du plancher intérieur, l'autre en dessus du sol environnant, est exécuté en chaud hydraulique, au ciment, ou à la chaud mélangée de parties égales de ciment de tuffeau (pierre de tuffe provenant des bords du Rhin, écrasée en poussière).

Les évaporations du sol sont écartées par des courants d'air introduits au dessous du plancher, passant sur une couche de sable couvrant le sol originaire.

3°. Dans le cas ordinaire, voulant économiser sur la hauteur de la construction, on est bien obligé de descendre le plancher du sous-terrain en dessous du niveau de l'eau. Il faut que le pavement, aussi bien que les murs, jusqu'en dessus du terrain environnant, soit parfaitement imperméable. Comme on ne construit en général, que des murs d'une dimension très faible, il faut gagner en qualité des briques et du mortier, ce qu'on perd de force par les faibles épaisseurs des murs environnants.

Trois à quatre couches de briques très bien cuites et dures, sans les moindres crévasses, posées dans un mortier de chaux et ciment, suffisent à résister à la pression de l'eau, qui ne vient d'une hauteur trop grande. Le dallage en marbre blanc ou en dalles de grès cérame est posé en dessus. De même les murs qui auront 0.34 m. à 0.45 m. d'épaisseur (tout suffisants pour porter trois étages), ne résistent pas à la pénétration de l'eau par les joints horizontaux des assises. Il est donc nécessaire de les couvrir à l'intérieur avec les mêmes couches de briques très dures, posées à plat (dans la plan vertical) jusqu'à la hauteur du niveau du terrain environnant. On prend bien soin de poser les briques en couches successives de manière que les joints soient toujours couverts par les couches supérieures.

Mais comment supporter les dallages dans un terrain aussi marécageux ?

(α.) Quand le bâtiment possède dans sa fondation plusieurs murs parallèles peu distancés, la construction de voûtes cylindriques est facile et préférable. Le peu de hauteur nécessaire pour la voûte ne causera pas de difficulté dans le niveau du sous-terrain. Sur toute la superficie de la voûte on coule du béton, où l'on remplit les profondeurs en maçonnerie afin d'égaliser la surface dans un plan horizontal, sur lequel trois ou quatre couches de briques avec le dallage forment un ensemble bien résistant à l'eau et les évaporations humides du sol. La surface extérieure des murs est couverte d'asphalte coulant, afin de prémunir les murs dans toute leur épaisseur contre la pression de l'eau.

(β.) Supposons que le sous-terrain ne possède que des pièces assez large, les fondations des murs restent bien espacées, de plus de 3 mètres. En ce cas les voûtes cylindriques exigent une hauteur considérable sous le pavé. On préfère donc de continuer le plancher en bois sur toute la surface du bâtiment, afin de se passer des voûtes, et de pouvoir continuer la maçonnerie hydraulique des fondations, non seulement sous les murs, mais sous la surface entière de l'habitation. Tout ce bloc est exécuté dans les meilleurs matériaux, les briques les plus dures, etc.

Sous les couches de briques, sur le plancher en bois, une couche d'asphalte toute unie, garantit d'avantage contre l'action de l'eau, surtout à cette profondeur où l'eau veut remonter avec force dans la maçonnerie.

Les différentes couches de briques sont parfois remplacées par un béton au ciment, couvert d'une couche de ciment en mortier (moitié sable) d'une épaisseur de 3 centimètres au moins. Cette couche de ciment doit être continuée contre les murs jusqu'à la hauteur du terrain.

Les caves ainsi construites sont parfaitement saines ; les influences de l'humidité du terrain, entièrement empreigné d'eau bourbeuse ne s'y font pas sentir du tout. Ces caves préservent toute la demeure de l'humidité dans les voisinages où le soir et la nuit des vapeurs désagréables puissent s'évaporer du sol.

4°. Si le cas présente qu'une habitation, construite il y a longtemps, ne possède pas de caves convenables ; et que les fondations ne sont pas assez larges pour y installer encore la construction décrite plus haut ; on exécute tout la cave dans une enveloppe de bois, de la forme d'un grand bac, posé à l'hauteur voulue, pendant qu'on tient l'eau pour ce temps à un niveau plus bas. Même sans fondations ces caves avec un grand massif de maçonnerie ne s'enfoncent pas dans le terrain marécageux, parceque le volume de l'eau remplacée est plus grand que le poids de toute la cave, comme elle a intérieurement un grand vide. Ces sortes de "caves flottantes" montent et baissent avec le niveau de l'eau entre les murs de la maison, et sont retenues par celles-ci dans leur direction.

VI.—Plusieurs habitations dans les villes de la Hollande sont situées sur les bords de l'eau, sans quai intermédiaire. La salubrité de ces maisons ne diffère en aucune sorte des autres maisons des mêmes villes, pourvu que les fondations soient exécutées avec soin : car au fond, toutes les maisons de ces mêmes villes ont leurs fondations également sous la surface de l'eau, sans que les habitants en ressentent aucune suite désagréable ou malsaine.

Dans le bois de sapin et de chêne, sur dans les longs arbres de sapins, nous avons donc trouvé de matériaux d'une très grande valeur pour la construction dans tous les mauvais terrains. Le bois, qui dans la nature a comparativement si peu de résistance, ne pourrait être remplacé dans ces conditions par aucune autre espèce de matériaux.

Si la Hollande ne possède en général que peu de terrain solide à bâtir, puisque les provinces du Nord sont formées par un alluvium marécageux, elle a trouvé dans le bois de sapin, qui fournit des arbres d'une longueur assez considérable et de dimensions assez fortes, le moyen d'aller trouver le sol naturel à des profondeurs qui diffèrent de 4 à 28 mètres.

Une partie de la gare centrale à Amsterdam, notamment les piles extérieures de la charpente de la couverture sur les voies, a exigé des pilotis de 28 mètres de long sur une épaisseur de 38 à 40 centimètres à une mètre du tronc. La construction des fondations en maçonnerie de ce bâtiment, qui à 318 mètres de long sur 31 mètres de largeur a été établie sur un pilotis continu sur toute l'étendue du bâtiment. Les arbres sont enfoncés sur 50 centimètres d'axe en axe et assemblés par des madriers en chêne de 20 sur 30 centimètres et croisés par des longrines également en chêne de mêmes dimensions.

The Sanitation of Theatres.

BY

LENNOX BROWNE, F.R.C.S., Ed.

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When the committee of this section did me the honour to permit me to embody in a paper the information I possessed of the condition of our theatres, I felt it was desirable, notwithstanding the long and extensive experience of them that I had, that a careful and detailed examination of the principal buildings should be effected in order that any statements I might find it my duty to make, should be founded on exact and precise information.

Through the courtesy of the lessees and managers, I have been able, in conjunction with my friend Mr. Ernest Turner, F.R.I.B.A., to inspect no less than 20 of our London theatres, besides a number in the provinces. I had, indeed, made application to 22 metropolitan lessees, but in two instances, instead of the ready assent accorded me by the majority, I was met by peremptory refusal, on the ground that the lessees could not permit their theatres to be inspected, except, to quote the exact words of the secretary of one, "by the authorised authorities."

As to one of these theatres, its pent-up situation, its age—over 30 years—and its manifold sanitary imperfections in the front part of the house, may be taken as sufficient reasons for the objections to inspection of the back; but with regard to the other, I had hoped to be able to describe it as a theatre which, being one of the most recently erected, might be accepted as a type of what a small comedy theatre should be, in the same way as one is able to point to another as a type of all that is best suited for the home of grand opera, and to a third as an almost ideal theatre for the requirements of light comic opera. However, during a visit to the front, when I occupied a seat in the stalls, on the prompt side, a strong whiff of carbolic acid which assailed my nostrils each time the door to that portion of the auditorium opened, indicated that the condition of the urinal in the adjacent lobby was far from perfect; and I further learned that another similar convenience opens directly into the pit; so one may assume that however well the building is constructed with an eye to the beautiful, and with all modern improvements for scenic display, the sanitary arrangements have not been equally successful in conception, or, it may be, in execution.

Of the 20 theatres which I did visit, it may be said at the outset that in many the arrangements, from a sanitary point of view, are the reverse of satisfactory; indeed, there is hardly one in which some fault may not be detected. But I am bound to testify that the defects are for the most part due to structural causes for which, when existing as part of an original plan, I am sure every member of this section will agree, that there is no excuse, although the blame should rest rather with the architect than with the proprietor. On the other hand, I have

the greatest pleasure in bearing witness that the managers have, with hardly an exception, endeavoured to overcome the difficulties of the situation by care and supervision. If they have not always been successful, it has been far less often from want of zeal on their part than from the ignorance and neglect characteristic of members of the lower branches of the theatrical profession, and especially of the working staff, who represent, for the most part, a low type of the artizan class. Against the results, however, of bad workmanship in the sanitary fittings, no amount of supervision of the employés is of much avail, and unfortunately in theatres, as in our own houses, instances of slipshod and faulty work are by no means exceptional.

In the front of the house, among the audience, it is found that from the careless way in which sanitary appliances are used, they are not unfrequently getting out of order, or giving cause for complaint. With a large section of the public, and not by any means those occupying the cheaper seats, it would seem necessary to supply automatic flushers, or a staff of attendants specially to wait on them.

Most of our investigations were made on Sundays, for two reasons—1. Because it was the only day on which we could give the time necessary, and was the one least likely to interfere with the working of the theatre. 2. Because on that day, better than on a week day, one could gauge with a certain degree of accuracy, the care that was bestowed on the household arrangements generally; for as a straw may show which way the wind blows, so such small matters as leaving the slops unemptied till the Monday may be taken as a criterion of the ordinary practice in regard to sanitary matters.

Another indication of no small value of the sort of sanitary care that is taken at a theatre is afforded by the arrangements for the removal of dust and rubbish accumulation. At several, all dust is removed daily; at others, not only in small or in provincial theatres but in some of the largest London houses, heaps of refuse may be found, not at one, but in many corners.

I have not thought it necessary to make analyses of the air in these buildings, as I had at first intended, partly because this matter has been very carefully gone into by Angus-Smith and others, but chiefly because, given the cubic space, the number of occupants and of gas lights, and the amount, or rather, too often, the want of, ventilation, deductions can be drawn sufficiently convincing as to the state of the air, without calling in the aid of the analytical chemist.

Much has been written on the duty of theatre proprietors to afford protection from the risk of fire or of alarms of fire; but the London County Council, in its elaborate requirements in this direction, seems to have almost ignored the far more important subject of the health, not only of the actors and actresses, but also of the general public. I say "more important" advisedly, as there is ample evidence to show that the time when fires are most liable to occur in theatres, is not when the house is full, but within two or three hours after the audience and company have left the building; whereas if the sanitary arrangements are faulty, the danger is a constant one; and this danger to health,

while affecting the audience, must much more affect those employed behind the scenes, because they are compelled to be in the theatre for much longer periods, both for acting and rehearsals, and are there all the week round. Moreover, it is behind the scenes that insanitary conditions are to be found in their most objectionable form; and although from time to time more or less fitful interest has been excited by the rumour of a death or of a severe illness taken by some member of a London or a country company, any systematic sanitary investigation of that portion of the building in which the actor is specially engaged has not only been completely neglected, but its necessity has been practically overlooked. It is to this department, therefore, that I have made inquiry; and since my professional work for the last quarter of a century has brought me so directly into relation with members of the theatrical profession in all its branches, I can speak of the effect on their health with no uncertainty. Nor is this merely a question of affections of the throat, although they are bad enough and important enough to those with whom a sound throat is a *sine quâ non* of their vocation, for we find that the general health of the actor suffers to a very marked extent when he is compelled to breathe constantly the vitiated air of hot, crowded, un-ventilated, and ill-situated dressing-rooms; the lowered state of vitality predisposes him in a marked degree to bronchitis, pneumonia, phthisis, and diseases of the respiratory and circulatory organs generally, to dyspepsia, to so-called acute rheumatism—if rheumatism, and especially acute rheumatism, be not in itself a form of blood-poisoning—and to typhoid fever, deaths from which last are by no means uncommon among actors, especially in the case of members of touring companies. It is well known, also, that a craving for stimulants is set up by insanitary conditions of the respired air and surroundings of a man's work. Indeed alcohol is often asserted—it has never been proved—to be an antidote to the poison of an unsavoury atmosphere or occupation, and the statement is frequently made as an excuse for indulgence.

But it must not be supposed that because I deal with those mysterious parts of a theatre behind the curtain, that it is the employés who are the only sufferers from insanitary conditions in those situations. It must indeed have been in the experience of many that when the curtain has risen, or a scene has been changed, and especially when the stage has been opened up, a rush of air of charnel-like odour has blown into the house; while the occurrence of theatre headache, theatre diarrhœa, and even theatre sore-throat, is well recognised as the not infrequent morrow's payment for an evening's amusement. Moreover, anyone with the least knowledge of theatres must be aware that there are certain theatres throughout the kingdom which are hardly more or less than veritable death-traps.

Whenever I have conversed with a member of the theatrical profession on the subject I have always been told of one or other particular provincial theatre which was especially condemned. Not a few buildings have been particularised by more than one informant, and one or two are *always* mentioned as prominently insanitary. It is, however, almost impossible for the actor to attack this mischief because he belongs to a

profession in which supply is in excess of demand, and it is even difficult for a manager. In one case with which I am acquainted, the London manager of a company, a member of which died from typhoid fever taken in a provincial theatre, was advised by his lawyer not to insist on legal proceedings as it would greatly prejudice his having a date given him should he again desire to visit that town, and this prejudice might probably be shared by the managers of other provincial theatres who were conscious of similar sanitary shortcomings and dangers to health.*

In this connexion I may mention a case which happened in my own experience, and which throws a peculiar light on the legal view taken of our efforts to prevent disease. A young lady, who had on several occasions been under my care for attacks of sore throat of an undoubted sewer-gas type, while filling an engagement in a London theatre was directed by her manager under the terms of her agreement to play at a certain theatre in the kingdom notorious as a source of typhoid. On learning the destination of my patient I conceived it my duty to warn her of the danger to which, as one specially susceptible to the effects of foul air, she would be exposed, and I, at request, made an affidavit to that effect. The lady used my advice as a plea to release of the engagement, but when my declaration was read to one of the judges of the High Court before whom the case came, he remarked that he did not see that a medical man was called upon to give an opinion of that kind until his patient had actually suffered. Had I been examined on my affidavit I should have ventured to point out to his Lordship that the efforts of a doctor to prevent disease offer more probable chances of success than do our attempts to cure it when manifested, just the same as the best lawyer is not he who gains the largest number of successful verdicts but he who, recognising the uncertainty of the law, settles the most cases without recourse to a trial in court.

I am quite aware that in all probability my statement that an abnormally large proportion of theatrical ill-health is due to insanitation will be received with incredulity by the public, and met by opposition from the managers; such is, however, my sober conviction, and not only so, for there are certain houses, not only in the provinces, but in the metropolis, from which I am almost certain to receive as patients members of the profession who in other engagements enjoy fair health.

To come now to a consideration of the actual state of affairs existing in our theatres, I would deal first with the question of their *situation*; and this has such a strong bearing upon the construction of the building in reference to proper sanitation that it merits our most careful consideration. How many of our theatres can claim perfect isolation? But few, and only those of quite recent erection; but without isolation it is well-nigh impossible either that the risk of fire, when arising

* In the case of touring companies in the provinces there is, of course, the added danger of sanitary imperfections in the lodgings occupied; since, owing to prejudice, it is difficult in many towns to procure accommodation of the better class. Moreover, the fatigue of Sunday travelling and of constant rehearsals is apt to make individuals more "receptive" of malign influences on the health.

in the theatre, can be limited to that building, or that conflagration from contiguity can be insured against.

Nor can there be thorough, or indeed sufficient, ventilation without isolation; for where there is—as exists in several cases—some sort of open space on one or other side of the building, the changed “air” is very far from “fresh,” even when mechanical aids are employed; indeed, in very many instances it is actually vitiated, being drawn from some narrow slum or back court, used, may be, as a urinal, or lumbered up with disused stage properties. I am aware, of course, of the difficulties which have existed and still exist in the way of theatres being so perfectly isolated as will be admitted by modern hygienists to be necessary. Theatres to be successful must occupy central positions, and sites in such localities are difficult and expensive to obtain. Hence we find that a large number of our theatres have been erected in pieces of ground which must have taxed the ingenuity of the architect to a considerable extent in the preparation of his plans, and in at least three instances the difficulty of available site has been met by placing the theatres below the level of the street altogether, and in such a situation as to render efficient sanitation well nigh a matter of impossibility. In an above-ground theatre, however hemmed in it may be by other buildings, space for dressing and retiring rooms may be adequate or not, and windows are at least feasible, though they are by no means the rule; but in underground theatres and in rooms built under the stage windows are either altogether absent or are of the order of a transparent ceiling, and of no practical value for ventilation. Moreover, in underground theatres there must be a constant difficulty with the drainage, where, as has actually been the case, the drains are placed at a lower level than the main sewer. It is fair to report that in two such buildings of this class attempts more or less successful have been made to remedy this grave defect, a defect one would hardly expect to find in theatres built so recently, for one dates from 1882 the other from 1874; this last was reconstructed entirely for causes of sanitation in 1883. It is difficult to acquit the architect of blame in the first instance, for with all respect to the profession, I do not think he should have consented to prepare plans on such lines. Even now such an event as percolation of sewage from an old brick drain is not an unknown occurrence under the stage in one of these reconstructed sub-soil theatres. To demonstrate still further the difficulties met with in theatres built in cramped positions, I found it not an unusual position for waterclosets to be in dressing-rooms or in hot lobbies (80° F. on Sunday morning) into which dressing-rooms opened, the only means of ventilation for the closets was into these rooms (Diagrams 7, 8, and 10).^{*} It is well nigh impossible to conceive that these arrangements were part of the original plans. While on this subject I would point to another accompaniment which I consider objectionable in underground as in all theatres, and that is having other buildings, as restaurants, erected over or in close contiguity to them.

^{*} The diagrams referred to are given in Mr. Ernest Turner's paper which follows this one.

Applying this matter of situation to country theatres, it may be added that not only is there less excuse on account of cost for non-isolation, but that, as a matter of fact, very many of such buildings—full of other sanitary defects—cannot have this particular fault of overcrowding charged against them.

Accommodation.—Theatres which have been built during the last 10 years show improvements in the dressing-room accommodation (Diagrams 1 and 2) over that provided in the older theatres; but much still remains to be done, and in only one can the arrangement be considered absolutely satisfactory (Diagram 1). In the very old theatres, especially the large ones, there are long underground rooms without either light or water. In one of the oldest we found a room employed for office purposes placed over a vault in which were three waterclosets used by the working staff, all out of order, and in two of them the pans were full. At this theatre the fire-watch is the most complete in London, so that it is guarded against the only possibility of improving its sanitary defects; if it should take fire it is to be hoped that it will be empty, as there would be very little chance for its safety, and with its wooden staircases and numerous passages, not much for those engaged on the stage. In most theatres, even in some of the larger houses, there is an absence of a master key by which all the rooms could be opened without delay in case of fire. This defect does not exist in the case of two of the large houses visited. At one theatre we were informed that we could not enter several of the rooms occupied by principals because the rooms were locked and the keys taken away by their occupants. Such a statement can, however, be hardly credited.

While on this point of fire-watch it may be remarked that at not a few theatres the fireman is a sort of ornamental appendage to the front of the house, and very ready to call a cab or run a message. I commend this circumstance to the attention of fire insurance managers and to the successor of Captain Shaw.

In some five or six of the later built or reconstructed houses, there is good dressing-room accommodation, with sufficient air-space, ventilation, and light for the occupants. In some there is enforced permanent window and over door ventilation (Diagram 3), in others mechanical means are employed. In hardly any of the theatres of more than five years' duration is there a constant supply of water to be found in the dressing-rooms; on the other hand, where arrangements for running water obtain, there also the basins were of good class and well-trapped.

But in another class of houses things are not in so satisfactory a condition. I refer to those places which were originally not intended for theatres, but were built as music or lecture halls, and have been since adapted to the purposes of comic opera or spectacular burlesque. The original requirements in regard to dressing-rooms were naturally not at all on a par with those of a theatre. All that was needed were a few small rooms to be occupied by one or two artistes at a time who came in “turn” and would take the room vacated by those who had preceded them; consequently, when it was proposed to give spectacular entertainments the accommodation was found to be

most incomplete, and where additional houses could not be acquired, room was found below the stage.

In one such theatre we discovered 15 or 16 rooms below the stage, some even at a second level, and in only three of these were there windows. In the case of two, I was informed, and for all I know in that of the third, these windows were of necessity kept shut because they opened into areas with grating coverings through which the staff and others were in the habit of urinating. One of these rooms measured $38' \times 7' \times 7' 9''$ (Diagram 4), and was occupied by 16 to 18 ladies, each of whom, therefore, supposing there were only 16 occupants, had barely over 130 cubic feet of space, enough to supply them with air, if it was originally pure for about $2\frac{1}{2}$ minutes according to the estimate of 3,000 per hour; and the space given for each individual, which should include that for dressing-table, dresses, &c., would be something like 16 square feet, or an area of 4 feet by 4.

Another instance of imperfect accommodation is represented by the theatre originally constructed for the purposes of comedy with a small company, but later employed for production of comic opera with a company four, or it may be six, times as numerous. In this description of theatre, adapted from buildings not originally intended for dramatic representation, we found, and I regret to say in many others, closets either in or close to the rooms (Diagrams 5, 6, 7, 8, 9, and 10), separated in some instances only by a partition of match-boarding (Diagram 6).

The old pan closet has been retained even in one house otherwise well nigh perfect, and a closet much advertised was repeatedly pointed out to us as the acme of completeness, albeit it is one which sanitarians generally would consider far behind the requirements of to-day. In one theatre a w.c. adjoined the dressing-room of a principal artist, and the fatal error was permitted of having the closet disused, though the cistern for the drinking water and a sink were situated in the same cabinet. Nor was it at all uncommon, when we came on a closet particularly badly situated, to be told, as a virtue of management, that it had long been disused. Needless to say, no one in these cases had thought it necessary to cut off connexion. Nor are the w.c.'s in the front of the house any better than, or, for the most part as good, as the majority of those at the back, and for the defects in their situation and for the utter absence of all ventilation the architects must surely be held responsible. In some instances it would appear as if no arrangement for such necessities had been part of their original design, for we found them literally planted in such positions that the only source for fresh air (save the mark) or for exit of foul was an adjacent cloak-room, lobby, refreshment-room, or even a portion of the auditorium. That this statement is not exaggerated is proved by the plentiful dissemination of the odour of disinfectants, and, in fact, whenever a disinfectant is to be smelt, it may be accepted that it represents, not the antidote, but the disguise of a poison it has attempted to conceal by a more vigorous attack on our olfactory sense.

On the programmes of a newly reconstructed theatre the particular form of disinfectant employed in the building is naively printed under the advertisement of the special musical organ used. In another, in

which we found a w.c. in the ladies' cloak-room ventilating onto the staircase, and a second onto the passage lobby to the stalls, we were met in all parts of the building by a printed certificate of a recent date, and signed by a gentleman who added "F.S.I." to his name that "the sanitary condition before and behind the curtain was (in his opinion) *satisfactory*."

I have alluded to an instance in which a w.c. behind the stage was contiguous to the flue of a restaurant under which the theatre was built. In another theatre a closet in the front of the house, which was indeed a part of the ladies' cloak-room, was similarly overheated, and no means of cooling existed except by opening the door which led to the passage for occupants of the boxes and stalls. The accommodation of this nature, even to Royal boxes, in more than one instance is faulty.

So much for the closets. I regret to say that the condition, and especially the situation of the urinals behind the stage, are even worse. Sometimes there are none whatever for the working staff, so that accommodation is often sought for either against the walls and down the areas of the theatres themselves or at the adjoining "public."

In one of the earlier theatres that we visited, where, as was well known, many members of the company had been recently ill, we found a stand-up urinal situated beneath the stage at the back and centre. Openings in the stage flooring really exposed the urinal to view, and these openings were in point of fact the main sources for its ventilation. We should have hesitated to mention a circumstance so damnable, and, as it might appear, so identifying of a particular theatre, were it an isolated example, but I regret to say that we found the same condition with but slight, and in no sense extenuating variations, in several other houses.

In one, the urinal of the working staff was in the corner of the stage itself; the ventilation was, however, not entirely on to the stage but into a fire-escape shaft, whence windows opened on to each half-landing of the staircase used by the company; how much of the malodorous air of this urinal was drawn from these windows into the dressing-rooms and how much driven on to the stage by down draft of cold would be a nice (?) point to determine.

Incidentally reference has been made to the extremely deficient ventilation of the working portion of most theatres. It is a pleasure to state that at two houses, where very large numbers of dancers, &c., are gathered in one room and have to make many changes of dress, the construction of the rooms and the ventilation—which is of a permanent character—are well nigh as perfect as they can be. In the smaller rooms of these theatres occupied by the "principals," especially when they are foreigners, every inlet for fresh or outlet for used air is carefully and almost hermetically blocked.

Lighting.—The electric light is now largely used behind the stage, but is often supplemented by gas burners because the artistes—quite erroneously, as is proved by their absence in the Royal English Opera House and the Savoy—insist that the electric current cannot supply sufficient heat for their purposes of "make up."

Heating.—The absence of ventilation entails such an excessive temperature that the thought of any method of warming seems hardly to have occupied the mind of the theatrical architect of the past, and except in the green room, it is rare to find a fireplace in use in rooms behind the scenes, or even to find one at all. An excellent coil arrangement exists in one of the most recently built houses.

The foregoing remarks represent in almost the fewest possible words the outcome of our inspection; it is needless to add that a paper could have been written on any one of the many headings considered, and almost on any one of the theatres, which should have occupied the limit permitted to the whole. But, in point of fact, I have been able to take but a general survey, and perhaps this is as well in an opening paper, and I have therefore asked Mr. Ernest Turner to utilize a large quantity of the information we obtained as a separate contribution to this discussion, and have had pleasure in placing at his disposal the rough sketch plans made by me at our visits for the purpose of diagrammatic illustration.

I fear that my communication will be considered as representing a pessimistic view. From the aspect of the doctor it could hardly be otherwise; for in making a diagnosis one has rather to take note of what is diseased than of what is sound. But in making a prognosis one is permitted to place in the balance both the favourable and the unfavourable; and, so doing, I venture to prophesy a greatly improved sanitary condition of our theatres in the near future. Nor would I wish it to go forth that in my opinion the sanitation of theatres is any worse, except that large numbers of persons are occupied therein for a constancy of employment, than is that of concert halls, conventicles, or institutions for the purpose of Christian association.

In conclusion, I may say that one of the conditions which I imposed on myself when undertaking this inquiry, was that my remarks should be as impersonal as possible. While, therefore, I have been careful not to actually identify any theatre whose arrangements I have felt it my duty to condemn, I have been obliged to abstain from naming those possessing characteristics which it has been a pleasure to commend.

Diagrams Illustrative of the Sanitation of Theatres.

BY

ERNEST TURNER, F.R.I.B.A., Architect to the Royal Academy of Music.

The diagrams exhibited, 12 in number, are complementary to Mr. Lennox Browne's paper, and, although they are not measured drawings to scale, but only proximate representations as to size, they are accurate in so far as they illustrate types of good and bad arrangements at the theatres visited.

In considering the matter fairly, it must be borne in mind that the buildings represented are of very different dates, and the strong contrast

which is presented between those of earlier and those of later date marks well the progress of sanitation, and will, I think, lead to the conclusion that many of the older theatres require their sanitary arrangements to be remodelled, amounting, in some instances, to an entire reconstruction of a portion of the buildings.

Diagrams Nos. 1, 2, and 3 illustrate three arrangements of dressing-rooms in relation to corridors and conveniences, the first two constituting part of the original plan of the theatre, the third, the arrangement in an added house.

No. 1 represents the dressing-rooms on each floor in one of the newest London theatres, and is in every way well planned. The corridor is well lighted, and cross ventilation is practicable when desired;

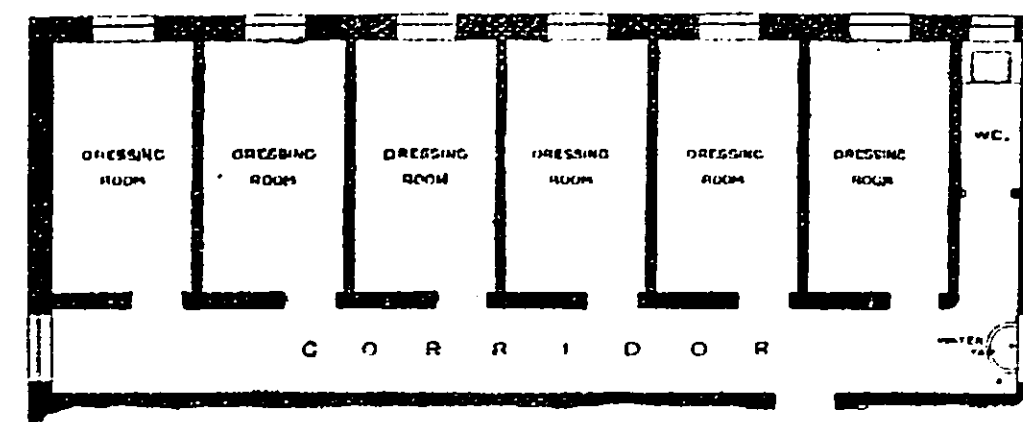


FIG. 1.

the closet is well placed; the rooms are sufficiently large and lofty and have good windows opening to the public street. The well-arranged presses and lockers with which the rooms are fitted, affording a place for everything and security against loss, render it practicable to leave the doors of the rooms open when unoccupied, although, strange to say, advantage is not taken of such facility in the very theatre under consideration.

This latter point appears to me to be worth more consideration than it generally receives, both on the score of access for the fireman and of air flushing the apartments.

There are in this theatre several floors of dressing-rooms similarly arranged; and a hydraulic lift, which travels at high speed, conveys the performers to and from the stage. The perfection which has been attained in the construction and mechanism of lifts or elevators may be the key to the problem of providing adequate dressing-room accommodation upon what might otherwise appear to be inadequate sites.

No. 2.—Here the closets are placed at the ends of the corridors, and one over the other, not an unusual arrangement in modern theatres, but necessitating at least a good air shaft, which is not generally to be found, but does exist in this house.

In many theatres it is difficult to believe that the closets formed part of the original plan of the architect, indeed, to the professional eye, there is strong evidence that they have been added as afterthoughts.

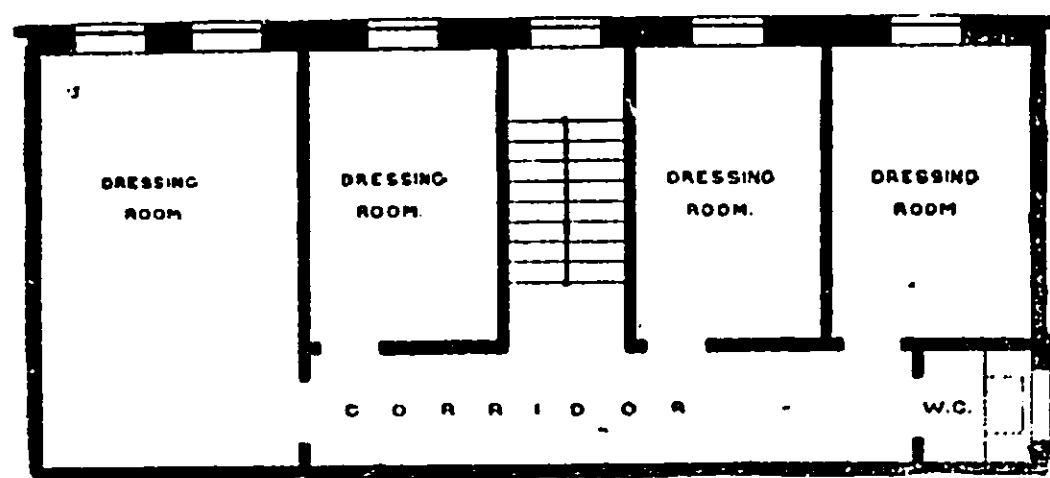


FIG. 2.

No. 3.—Although the dressing-rooms here are good, the corridor is only lighted by artificial light, and it is ill-ventilated. It may be thought that, as the buildings are chiefly occupied at night, the absence of windows in the corridors is of little importance. A visit to the theatres, and the difference that will be observed between the cleanliness and sweetness of corridors lighted naturally and artificially will soon

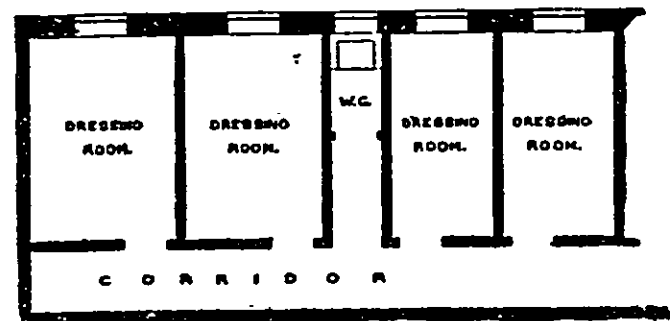


FIG. 3.

dispel such illusion. And whilst on the subject of cleanliness in corridors and elsewhere, let me draw attention to the many advantages which arise from the use of glazed bricks as internal wall surfaces. In a few of the modern theatres they have been freely used with most satisfactory results.

Nos. 4 and 5 represent two of the worst dressing-rooms seen by us. No. 4 is occupied by 16 to 18 girls, who have to remain the greater portion of the evening in this room, which is under the stage, and

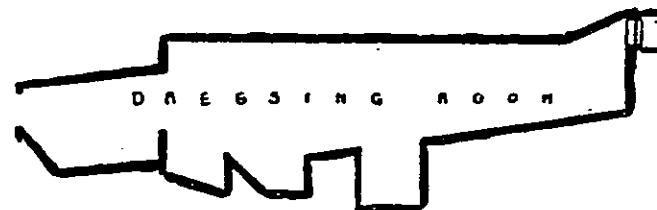


FIG. 4.

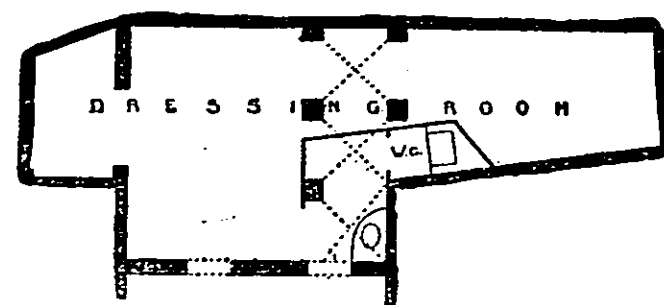


FIG. 5.

practically unventilated. Having regard to the small amount of cubic space, the number of lights and occupants, and the impossibility of air

renewal, such an arrangement must be condemned as highly insanitary. Indeed, it is nothing short of gross cruelty to compel human beings to occupy such a den.

No. 5 is another cellar dressing-room, in the same theatre, with piers and vaulted roof, almost, if not quite, as bad as the last, and has, in addition, a closet and sink in objectionable proximity. The legal definition of a "cellar dwelling" is "an underground room in which any person passes the night," and it is illegal to occupy such room unless certain regulations as to height from floor to ceiling, size and position of window, means of ventilation, &c., are complied with. These cellar dressing-rooms do not in any way comply with such regulations; but it appears that they may be occupied from 6 o'clock until 12, although occupation from 12 to 6 would be illegal.

Turning for a moment from examples of bad arrangement, it is a pleasure to be able to speak of two metropolitan theatres where, in some of the dressing-rooms used in common by a large number of dancers and supers, there is not only ample cubic space in the large and lofty rooms, but excellent natural and artificial ventilation.

Diagrams Nos. 6, 7, 8, 9, and 10 illustrate faulty arrangements of closets in relation to dressing-rooms.

In No. 6, which is a portion of an added house, the closets on two stories are practically portions of the dressing-rooms, enclosed by match-boarded partitions only. One, which was very defective and offensive,

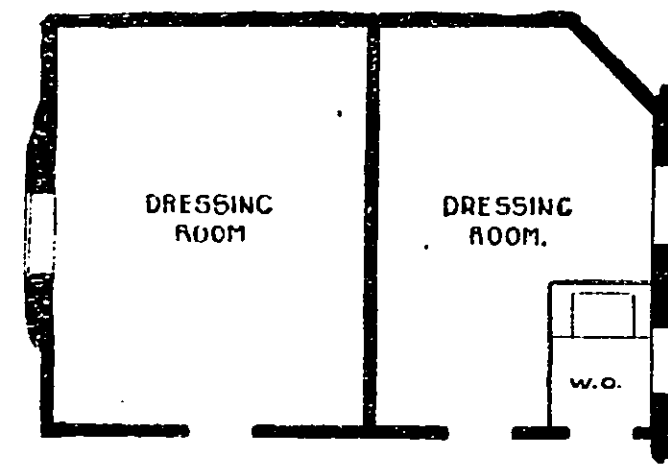


FIG. 6.

was for the accommodation of about 30 people, and was partitioned off from a dressing-room 15 ft. x 10 ft. x 8 ft. high, occupied by three ladies. This arrangement reminds me of one lately found in the kitchen of an Italian restaurant in London, where the only convenience was enclosed by a canvas screen.

No. 7 shows an exceedingly bad arrangement of unventilated lobby, dressing-rooms, and closet. The air of the latter pervades these rooms and the lobby, and to intensify the evil, the heat from the boilers of an adjoining restaurant renders this unsavoury corner almost unbearable. It is true that each dressing-room has a window, but each window opens into a very deep and narrow area common to the restaurant above, and covered by a grating with small openings.

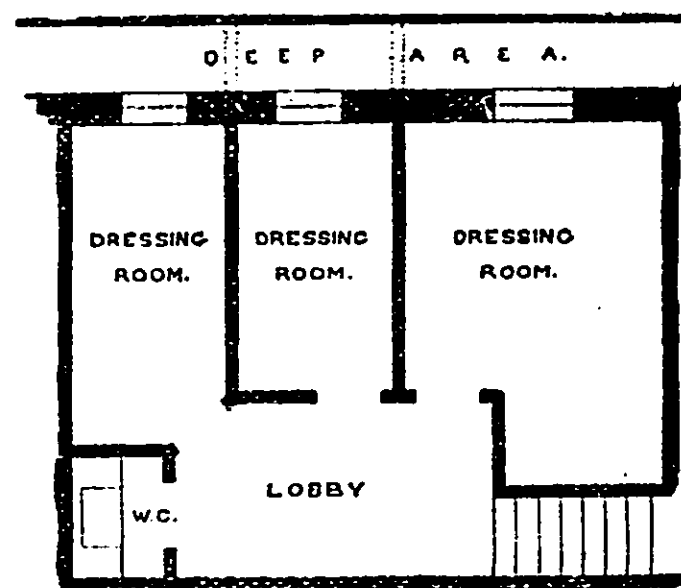


FIG. 7.

No. 8 illustrates an underground closet in connexion with dressing-rooms (occupied by four of the principal gentlemen of the company) and with staircase close to the stage; being without window to the open air, it necessarily pollutes the atmosphere of adjacent room, staircase,

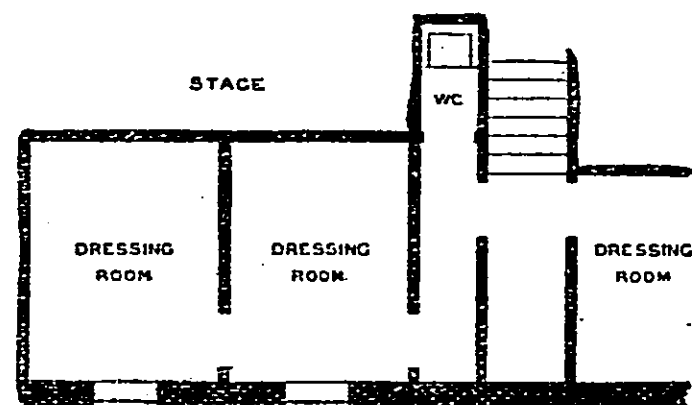


FIG. 8.

and lobby, and all the more so since, with the idea of ventilation, a small square opening has been made through the wall on to the staircase in question.

No. 9 shows another closet in the same theatre, again without window, open to the staircase and adjoining dressing-room, and situated under the cistern for drinking water, the draw off being in the

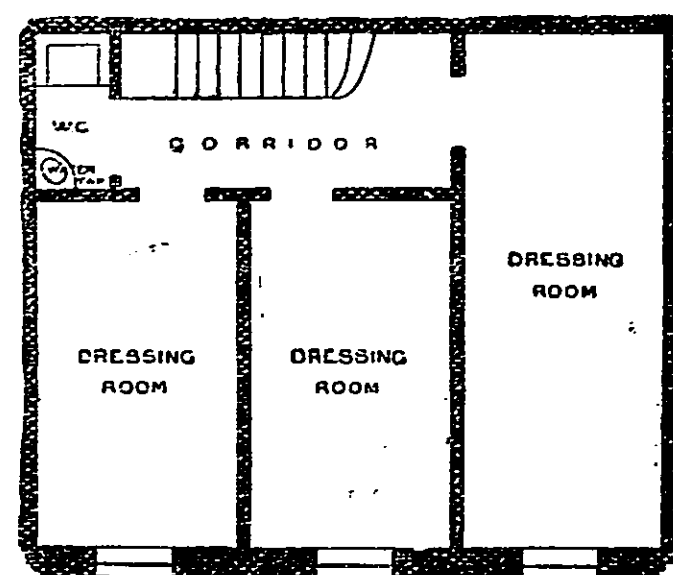


FIG. 9.

closet itself. This place, I was told, had been found so objectionable that, at the request of the occupant of the dressing-room, orders had been given that it was not to be used. No means had, however, been taken to cut off the connexion with the drain, and I need not explain to this section the probable result of the order.

No. 10 is an arrangement of closets good enough if they had windows opening into the open air, instead of, as is the fact, being

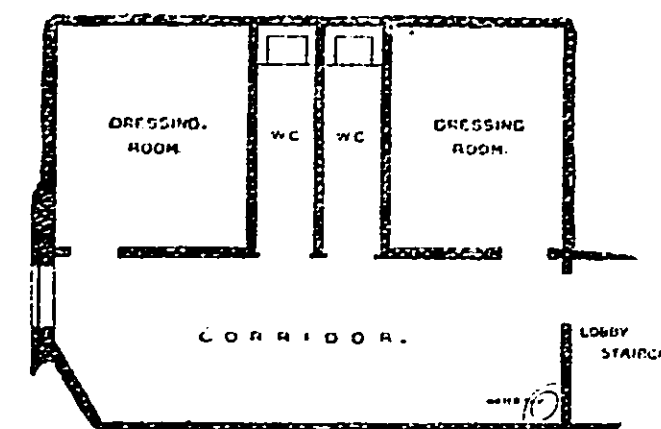


FIG. 10.

without windows, and being open to the internal lobby over the door-heads.

No. 11 illustrates an unventilated closet in relation to a private box, showing what luxury is provided for those who can afford to pay for it;

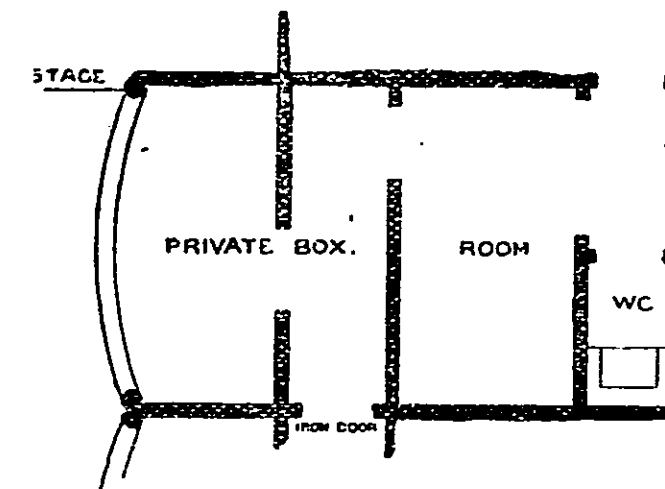


FIG. 11.

and No. 12, the arrangement of a ladies' cloak-room, this last being typical rather than unique.

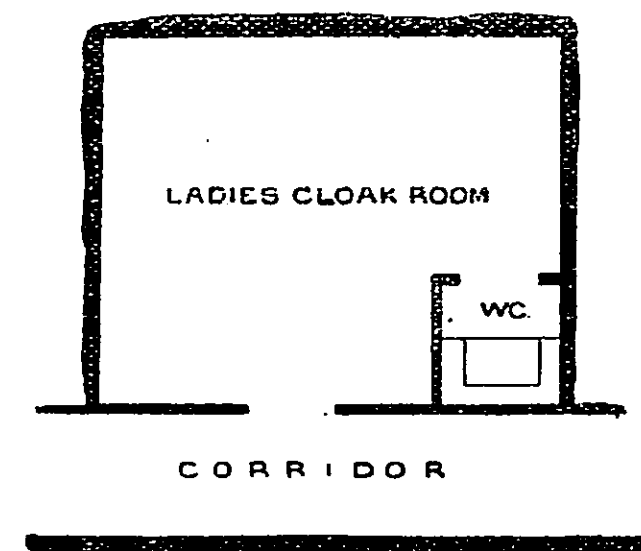


FIG. 12.

In these few brief notes I have put some of the facts plainly before you, and I have confined my remarks almost entirely to the *plan* of the apartments mentioned, the plan of the building being, from an architect's point of view, of primary importance, for, if this be imperfect, no subsequent so-called "sanitary engineering," however skillful, can make amends for the original defect.

I do not for a moment mean to imply that the introduction of modern appliances, good plumbers' work, and well-laid and ventilated drains, would not do much to improve the sanitary condition of many theatres; but, on the other hand, I feel sure that you will agree with me that many of the rooms are, from their position and surroundings, totally unfit for the uses they are put to, and that they call for abolition, re-arrangement, or re-construction.

With respect to overcrowding, one great difficulty seems to be that theatres built to accommodate small comedy companies are subsequently occupied by large companies playing burlesque and comic opera. It is obvious that whatever skill the architect may display in the original plan, and whatever control may be exercised in the official examination and approval thereof, are, in these circumstances, rendered nugatory.

In questions affecting the health of the community at large, or any particular sections thereof, Acts of Parliament and regulations are, doubtless, to a certain extent, necessary; but still more useful will be a widespread knowledge of hygiene—an appreciation of its economy and of the benefits it confers upon those who follow its teachings—a knowledge which it is the main object of this Congress in its various sections to promote.

It should be needless to say that it is solely in this spirit that my colleague and I have conducted these somewhat delicate investigations. We gratefully recognise in the general consent of managers to our request to be allowed to visit their theatres, a desire on their part to march with the sanitary enlightenment of our days, and on this account, as well as from the evidences of improved construction in each new theatre which is opened, we may look hopefully to the future. We can but trust that this discussion will hasten the new era, and that the work of this section, and of the whole Congress, will help to bring the world at large to recognise that good sanitation, so long obstructed and regarded as a bore, is indeed a boon and a blessing free of hindrance or disguise.

DISCUSSION.

Dr. Allan (Public Health Medical Society) referred to the case of a theatre recently built, where, next to the box-office, and, doubtless, in close proximity to the place where the cakes and the refreshments were placed, the watercloset and lavatory were situated. In the Bayreuth Theatre they had an excellent model to follow. It stood clear in its own space of ground, and all conveniences and other buildings were quite clear of the main buildings. There was great room for improvement in concert halls, and in some of the clubs. The ventilation in most of them was bad, and they would do well to follow the example of Dr. Lennox Browne and Mr. Ernest Turner, and track down the evils to their source and origin.

If the London County Council would add to its self-imposed censorship on the morality of theatres and music halls the duty of securing proper sanitary arrangements, and would insist on a clear space around the main building in all such cases, they would be really benefiting the community.

Mr. Walter Emden complained that while in foreign countries theatres and places of amusement were subsidised, in England they were penalised, and everybody tried to stop them. He thought those who expended their money in the business were as much entitled to the benefit of the protection of the law as other members of the community, and that they should not be harassed. He contended that isolation was not absolutely necessary. A more scientific treatment of sites would enable architects to obtain all the desirable security without insisting upon the necessity of isolation. With regard to the portions of some theatres below the ground level, the speaker contended that the placing of one tier underground was not only not injurious, but was positively advantageous. If a panic of fire occurred in a theatre it would surely be better to have to come down two staircases than four. A better division could hardly be found than commencing the main staircase at the level of the street, with the pit below, and the upper circle and galleries above. Since ventilation would necessarily be effected from the top of the building, the placing of one tier below would make no difference. The heat in theatres was made a ground of complaint. Of course it was hot in a theatre, as it was in any crowd whatever. If in the building of a theatre they tried to please everybody, there would be no building at all.

Mons. F. Bouhon, architect (Member of the Commission on Unhealthy Dwellings, Paris), said he was astonished at not having heard any resolutions presented by the readers of the papers. The arrangement shown in diagram No. 4 seemed to him the most typical of what to avoid. All Frenchmen coming to London—the birthplace of sanitation—were astonished to see so many cellars used, more or less, as dwellings. Even in great and handsome buildings they saw persons living in rooms below the ground. Cellar dwellings to a Frenchman were the most intolerable things that could be imagined. After the terrible fire at the Opéra Comique, in Paris, a law had been passed of a stringent character, one of the provisions of which was that there must never be any portion of the auditorium below the ground. Let England, which had so many living-rooms and kitchens below ground, take good heed of that new law.

Dr. Dolan (Halifax) described some miserable dressing-rooms that he had seen in provincial theatres. He had in his mind one at that moment no larger than the reporters' table, in which the girls had to do all their changes and all their dressing. On one evening he was called to one of the girls who had a sprained ankle. He found no conveniences of any kind such as the circumstances required, no hot water and no cold water, except such as could be contained in a small tin can, and no conveniences for washing. The other dressing-rooms were in the same miserable condition. He had traced absolutely typhoid fever, loss of voice, and other diseases, many of them of an infectious kind, to the defective sanitation of theatres. The mills in Halifax were under regulation, and must be sanitary, and it was not too much to expect that proprietors of theatres should be under the same obligations as to sanitary provisions. Until the force of public opinion was brought to bear upon proprietors and managers of places of public amusement, the present miserable state of things would doubtless continue. He most cordially congratulated Mr. Lennox Browne and Mr. Turner on the admirable character of their papers.

Mr. Lennox Browne, on being called upon to reply to the various speakers, said he could not agree with Mr. Emden, who had said that isolation was not necessary. How could you get ventilation if there was no open space at the back? He could not follow the meaning of Mr. Emden when he said that ventilation was only possible from the top. In a theatre at Vienna there was a fan arrangement by which hot or cold air could be admitted from a valve placed under the seat, and either hot or cold air could be turned on at the will of each individual occupant.

Some Insanitary Superstitions in House-building.

BY

H. HEATHCOTE STATHAM, F.R.I.B.A.

The remarks in this paper refer more especially to houses built in large and crowded cities. Houses built in open situations in the country are permeated by an atmosphere comparatively pure and clean. Houses in large towns are permeated by an atmosphere laden with impurities, which are continually being deposited on every surface that will retain or absorb them. They are also subject, unless carefully watched, to the incursion of various types of vermin, from the popular cockroach down to even more noxious and happily rarer examples. It is therefore desirable that they should be constructed of materials least likely to absorb and retain impurities, and that the method of construction should be such as to leave no unlighted and inaccessible spaces.

The habitual construction of ordinary houses in England is not in accordance with these requirements. For many generations the orthodox manner of making a house floor has been to lay wooden joists from wall to wall with boards nailed down above, and a lath and plaster ceiling beneath, the space between being an unseen cavern for the accumulation of whatever dirt and decaying matter can find its way in. What the results may be I once saw in the worst form in a case where the boards of an East End schoolroom were taken up to ascertain the condition of the joists. The space between those joists was filled nearly to the top with a festering mass of dirt and dust, over which the children had been daily collected. Such a floor would not be allowed in a modern London board school, but it is the accepted floor for a dwelling house; and though the conditions of a well-kept dwelling house do not encourage such an accumulation as this, I believe the tenants of the best kept London house which has been inhabited for any length of time would be disagreeably surprised at the amount of dirt they would find under their flooring boards if they looked for it. The old-fashioned system of ceiling up to the under side of the flooring boards and leaving the joists visible is far more sanitary; the drawback is that it is unsightly, and that it does not shut out sound sufficiently. Double flooring boards with felt between would get over the latter objection to some extent; but what I wish to recommend is the general adoption of solid floors of iron and concrete with a wood block or plain

parquet floor on them, for the average town dwelling house. They are almost necessarily adopted for houses in flats, why not for every dwelling house?

In the same way it has for many generations been the recognised faith that a house roof can only be made by means of rafters laid on the slope with a tie at the foot, and with ceiling joists either at the springing of the roof or part way up the slope. The advantage of this is that the upper rooms which go partly into the roof are rendered inconvenient and unsightly by a low sloping ceiling to half the room, and that above the ceiling joists is a dark cavern between them and the roof, into which no one ever sees, and where dirt may accumulate and vermin may breed undisturbed. It is really an almost alarming thought to reflect what is the probable cubic content of these dark caverns in the roofs of houses over all London. If it be thought necessary to go on building sloping roofs, either the whole slope of the roof should be thrown into the top rooms, as the visible ceiling, or the ceiling of the highest living rooms should be at the level of the roof springing, and the space between that and the rafters should be treated as storage space easily accessible and sufficiently lighted to be readily examined from time to time. But in fact it is entirely unnecessary, in these days of iron, and concrete, and tile, that we should build sloping roofs at all; the doing so is a mere superstition, except where reasons of architectural effect are concerned; and certainly architectural effect does not concern itself much in the ordinary house roof. With flat roofs with a cement finish and sufficient fall to run the rain to the gutters, we should get rid at once of all these dark caverns, the exterior and interior of the roof would coincide in shape, and convenience and healthfulness would be alike consulted.

The whole tribe of things called "skirtings" and "casings" are superstitions of the same kind, for providing dark inaccessible places where no cleansing hand can ever come. Baths and watercloset basins are surrounded with those foolish fences of joinery; whitened sepulchres, which indeed appear neat outwardly, but within they are full of—no one knows what, for no one ever looks. Let both watercloset and bath stand open to inspection all round, instead of being cased in. In the matter of the bath, the money spent on panelled casing and "polished baywood or mahogany top" would go far to render the bath itself a neat and presentable piece of furniture.

This system of ornamental casing is carried out again in the wooden skirtings which are fixed at the base of the walls of each room. Skirtings may be considered necessary for three reasons—for appearance, for a stop to the plastering, and to prevent chairs and other articles of furniture knocking against and injuring the paper and plaster. But they should be in a solid thickness of wood of no greater projection from the plaster surface than is necessary for their practical object. Unfortunately, it is considered necessary that the larger and more dignified a room is the larger moulding and the greater projection the skirting should have. As we are not going to the expense of putting down moulded timber three inches thick round the room, a moulding of the desired projection is fixed on the top and a piece of inch-and-a-quarter wood fixed between that and the floor, with a nice hollow space

behind. The result is often rendered audible by the scuttering and scrambling of the mice, who are enjoying their gambols in the private corridors which we have obligingly provided for them.

Casings for pipes are, no doubt, necessary, and are generally specified to be screwed on, so as to be removable when required. They never are removed, or the space behind seen, except when something is wrong with a pipe. They should be hinged, and made with button fasteners, so that they can be opened every day without any trouble. Among other drawbacks, they form a private lift or elevator for the cockroach, who is fond of warmth, and is enticed to ascend along the line of the hot-water pipes. The cockroach is bad enough in the kitchen, but a good deal worse in the bedroom—it is hardly worth while to afford him the luxury of a private passage, heated with hot water, to the upper floors.

The passion for sash-windows in this country leads to the employment of another system of wooden cradling built up round the windows, with hollow inaccessible boxes for the lines and weights, besides (generally speaking) another set of hollow spaces behind the back of the shutter casings. It is perfectly possible to make sash-windows without pulleys and weights in more ways than one, unless when they are very large and heavy. But the casement window has the advantage that it can be hung in solid frames without any of this handbox work round it, and making it weather-tight is merely a matter of care and scientific construction. It is worth consideration whether we should not do better to return to it as the more wholesome and sensible structure of the two.

Another curious superstition is that windows must have curtains. The recognised principle seems to be to make windows much larger than is necessary to light the room, and then to stop out a great deal of the light by hanging curtains over them. This seems hardly either sensible or sanitary. Curtains are terrible collectors of dust and dirt. Everyone knows that a curtain that has been up three weeks in London is hardly fit to touch; and is there any reason, in the nature of things, why windows must have these draperies? Suppose we tried smaller windows, and a more decorative treatment of the frames and glazing, and left them unencumbered by curtains. We should get as much light in a more healthy and sensible, perhaps even in a more decorative manner. Think of the treatment of windows in oriental houses in Cairo and elsewhere. That could not be copied for this duller climate, nor are copies desirable; but it may afford a hint for a modification of decorative treatment of somewhat similar type.

Wall paper is a simple and inexpensive means of producing decorative effect in a room, but papers should be close in texture and smooth in surface. Papers with embossed surfaces, and, above all, what are called "flock" papers, are dust holders, and such wall surfaces cannot be kept properly clean. Coloured plaster, finished with a hard surface, is more sanitary than any paper, considering that the paper has a layer of paste behind it which becomes rotten in time. If, however, papers are renewed often enough, and the plaster stripped and well scoured at each renewal, the insanitary element in them is not of sufficient importance to counterbalance the decorative gain.

Large and deep plaster mouldings and decorations are now, fortunately, going out of fashion on aesthetic grounds; they are injurious to the cleanly condition of a house, affording so many pockets for the lodgment of dirt. As long as they are kept flat and in low relief there is no harm in them. The wooden mouldings with a hollow on the top, which are now much used to take picture-hooks, are objectionable, as the hollow is always full of dust. The old brass picture-rods are much to be preferred in this respect.

Furniture, which is a kind of minor architecture, has its superstitions of construction, the worst of which is the system of finishing large wardrobes, book-cases, &c. with a cornice standing up all round the top, leaving a wide pit for dust, which is never seen, and cannot be swept. This cornice is a mere fashion, utterly useless and absurd. The top should be made level or (still better) sloping, and with no raised ledge above it, so that it can be swept. It is best of all to make large erections of this kind as fixtures carried up to the ceiling, and finished with a moulding against the ceiling; then there is no place where dust can accumulate.

The last superstition I will mention concerns that important receptacle—the cistern. It might be supposed that the reservoir where we store our water for drinking, washing, and cooking, would be an object of some interest to the householder; that he would desire always to see and know that it is pure and clean. But it is a superstition that the cistern must not be seen; it is kept in the dark, and generally in a place which is very difficult to get at. When it is supposed that it must want cleaning, it is a business of engaging a man specially who, perhaps, has to bring a ladder to get to it. I knew a case where the water in the house began to have an evil taste, and it was found that a dead bird had been in the cistern for many days in an advanced state of putrefaction. The cistern should be in a well-lighted place, where it can be easily seen every day. The best way would be to make it as an aquarium tank is made, with a front of plate glass, so that you can see the light through the water.

To keep a town house thoroughly clean is a continual fight, not only against accumulation of dirt, but against vermin. I remember one case where a nobleman who had become tenant of a house in one of the best terraces in London, at a very large rental, brought an action for compensation against the landlord because the house was found to be full of unmentionable insects from top to bottom. This was an exceptional case, and argued great neglect on the part of someone; but it is a fact that the chances are far greater for this sort of pest in houses built with hollow floors and a great deal of woodwork than they would be with solid floors and skirtings without recesses behind them. Generally speaking, the clean and healthful condition of town houses is greatly assisted by the use of non-porous materials as far as possible, and the avoidance of all dark and inaccessible corners. The present system of building town houses is exceedingly faulty in these respects, is capable of radical improvement, and should be improved accordingly.

DISCUSSION.

Mr. H. H. Collins said, with regard to solid floors, there were other materials besides iron and concrete that might be used. Among those that might be mentioned were terra-cotta and coke-breeze. One point alluded to was worthy of special consideration. In Captain Shaw's book it had been shown that wood was not the inflammable material it was generally supposed to be. It had been found that beams 12 inches square, after the fiercest fire, stood the ordeal so well, that, if peeled, they could be used again. A floor had been patented which was composed of solid wood blocks. Such floors were not very expensive, and could be produced for 6s. per yard. With regard to roofs, there were climatic reasons for preferring sloping to flat roofs. In winter flat roofs would retain a great weight of snow. The casement windows recommended by Mr. Statham would be very inconvenient, particularly in small rooms with much furniture in them. He agreed with the paper with regard to skirtings, and he objected to picture rods; there was a system of picture-mouldings, which he preferred.

Colonel Prendergast said he should have liked to hear further discussion with regard to solid floors; but met, as that section was, to deal with sanitary matters, they would, perhaps, do better to try to find out how far block floorings would tell against the efficient ventilation of rooms. If there was a ventilating flue, that flue must produce a current of air, and the instant one did that in went the bundle of rags to stop the ventilation. On the question of roofs Mr. Statham had done good service. In Italy, and in the buildings of ancient Greece, flat roofs were universal. But in this country we were told we had no climate, and, therefore, flat roofs were impracticable. If Mr. Statham could solve that problem, he would do a very great service to the community. In concluding, Colonel Prendergast said he could see no reason why they should not have solid floors made of paper.

Mr. Ralph Nevill, F.R.I.B.A., said they had in Mr. Statham's paper a condemnation of boarded floors, and if the author could get all architects to follow his example he would do them a good service. It was, however, a question of cost. Six shillings a yard did not seem much for a solid floor, but in the great majority of buildings the expense would be the great obstacle to their adoption. In the ordinary boarded floor the sole object of cleaning up seemed only to be to wash dirt into the cracks of the floor with dirty soap and water. Solid block floors would be difficult to level if laid on breeze, and such floors would, he conceived, require a layer of asphalt to prevent rot. He recommended the French system of bees-waxed floors. It was a great pity we had none in England. Ladies objected to dance on solid floors, and there was the sound difficulty. The experiments made many years ago in this line of investigation by Mr. Thaddæus Hyatt were worthy of attention. The speaker differed from Mr. Statham as to flat roofs, which would be a constant source of trouble; and such an enormous amount of guttering was required with such roofs that they would be continually in want of repairs.

Mr. J. P. Seddon, F.R.I.B.A., agreed on most points with the paper. Solid floors need be no disadvantage to ventilation. Pipes to convey air should be laid, passing from the floor through to the fireplace, just as water pipes were laid. He was in accord with Mr. Statham in his jeremiad against hollows. Hollow walls were intolerable for

harbouring vermin. A very perfect and cheap wall could be made with two 4½ inch brick walls, with an inch air space. The inside joints might be left a little open, and the cavity filled in with Portland cement grouting, and the courses might be bonded by a few tie-courses being placed under or over the window. The walls thus became very solid.

Col. Seddon, R.E., referring to the passage in favour of solid floors, described arrangements adopted by him for forming of concrete the floor of a gun battery at Portsmouth. After a time it developed cracks. These he filled up with old railway iron, which, when laid in the cracks, stopped all further vibration. He had built barracks on the same kind of site, which was very irregular, having here and there pockets of soft ground, and in other places spots of hard ground. Again, he laid in the crevices pieces of railway iron, but to form the floor he employed large man-of-war cables cut into the required lengths, crossing and re-crossing one another in all directions, and embedded in the concrete. There had been attempts to produce the same results without the use of cables, but they had always failed.

Councillor Hannam (Leeds) agreed with the suggestions for solid floors; wood blocks might be laid down for 6s. per yard of flooring, but this sum would be for the wood merely. The expense would always be a great difficulty in the way of the general adoption of solid floors. Concrete roofs also were very costly, and flat-roofed buildings always had an unfinished look. In the absence of high-pitched roofs, it would be necessary to carry their chimney stacks to a much greater height. They would often require to be 14 feet or 15 feet high above the square of the building, and in most cases such a height would, with only our present resources, be practically impossible.

Sir Arthur Blomfield said he once had experience of the advantage of using iron bars in the same way as had been described by Colonel Seddon. When he (the Chairman) was a much younger man, he had the task of erecting a church on a very treacherous foundation between a railway and a river. It had given him a great deal of anxiety. He had tried various devices with but little success, until he struck upon the plan of laying down iron bars near the bottom of the concrete. Since then he had observed no symptoms of further settlement.

Dr. Wilberforce Smith said the advantages in crowded districts of utilizing the roof seem indisputable if there be no associated drawback of an important kind. Those advantages are mainly—1. Economy of space.—The utilization of immense areas which at present are as unemployed as if they formed part of a remote prairie, and this in districts, e.g., in London, where every square yard of land is of fabulous value. The gain represents an additional stage added to each building without increased height. 2. Economy in regard to sky space.—So far from involving any encroachment on the sky-view, the plan advocated effects in most cases a gain of sky-space if it take the place of a span-roof, and it is obvious that the human beings forming the only additional mass above the roof are insufficient by their bulk to create any appreciable set-off. 3. Purity of atmosphere.—Few persons appear to have any conception of the gain of freshness in the atmosphere at the level of the roof as compared with the street below. Such was his experience when he first read a paper on the subject at the British Medical Association in 1876, and experiments made from time to time ever since have only confirmed this experience. On the extensive roof of the Higher Grade

School in Leeds, the children enjoy an atmosphere fairly comparable with that of the moor outside the town. There is a singular misconception as to the prevalence of soot about the roof. Even for the dwellings of the wealthy there would, in some cases, be great advantage in the utilization of the roof. In his experience, the residents of South Kensington, for example, notwithstanding sanitary advantages, mostly feel every summer the relaxing effect which belongs to the lower level of their district; in such situations the fresher atmosphere of upper floors is well known, and must be experienced at its best upon the very roof. 4. Minor advantages over recreation places on the level of the street are such expansion of view as a town can afford, and the increased quiet. For the tired brain of a worker in town, it is difficult to find any wholesome refreshment so prompt as a retreat to the comparative quiet and freshness of the roof. 5. Details of construction appear to involve no practical difficulty—such is the result of somewhat extensive inquiry—but here he especially desired the opinion of architects attending the Congress. The various uses to which the roof-space has been already applied include those of playgrounds for school children, and drying-grounds for clothes. The space is equally available for cultivating plants, and as a fresh air resting place for adults.

Mr. Statham, in answer to the various speakers, said with regard to concrete floors, he had only mentioned that one method of forming solid floors, because it was the least costly, and that consideration must be kept in view. He did not positively recommend flat roofs; he only suggested them.

Four-inch Drains versus Six-inch Drains.

BY

G. M. LAW FORD, Assoc. M. Inst. C.E.

It is a matter of every-day occurrence to find a 6-inch pipe used for the drainage of a single house, and this size is usually made compulsory by sanitary authorities, whether metropolitan, urban, or rural.

As a house drain is frequently dry for several hours at a time, it is obvious that where pipes of this diameter are used there must be a considerable extent of surface on which sediment is deposited, and as a natural consequence, during the periods of minimum flow this deposit will decompose and foul gases will be generated. If the house-drain is properly disconnected from the main sewer, and efficiently ventilated, a large proportion of these gases will undoubtedly be carried off and liberated in the atmosphere, but the tendency of the remainder will be to move in the direction of the house by reason of the absorptive influence of the warmer air within.

The author contends that this generation of gases in the house-drain, apart from its being adverse to the principles of sanitation, is preventible, the remedy lying in the use of smaller pipes.

Taking as an example the case of an ordinary sized town house, with an average of 10 inhabitants, and allowing 30 gallons of waste water or liquid matter to be discharged per head per day, the total volume would be 300 gallons per day, and of this amount at least one-half must be reckoned as being discharged in six hours, thus giving 25 gallons per hour as the maximum flow to be provided for. To this amount must be added the rain-fall from the roof and areas which, as a rule in the case of town houses, is taken into the sewer. The superficial area to be dealt with under this heading varies from 1,000 to 10,000 square feet; taking 6,000 square feet, which is considerably in excess of the average, and allowing for $1\frac{1}{4}$ inches of rain-fall per hour (thus providing for the heaviest thunderstorms), the total volume of rain-fall to be dealt with would be 3,900 gallons per hour. The maximum hourly discharge of sewage and rain-fall combined would therefore be 3,925 gallons, or 65.4 gallons per minute, and a 4-inch pipe will discharge this amount when running full at the very flat gradient of 1 in 207.36, the velocity produced being 2.02 feet per second, which is barely sufficient to make a drain self cleansing.

As the conditions on which these figures are based are only likely to occur once or twice a year, if at all (*i.e.*, during an exceptionally severe thunderstorm), it is evident that without special arrangements for flushing, even a 4-inch drain can scarcely be made absolutely self cleansing, more particularly as the usual gradient is from 1 in 40 to 1 in 60 with a consequent increase of discharging capacity.

The author therefore considers that under ordinary circumstances a 4-inch drain is ample for an average sized house, and that a 6-inch drain is too large to be kept free from deposit, more particularly as the majority of the pipes discharging into it are three inches or less in diameter. Baths, lavatories, and sinks never have waste pipes exceeding two inches internal diameter, and it is the exception to find more than one appliance being discharged at a time. The question therefore naturally arises "How can a 2-inch pipe possibly flush and cleanse a pipe nine times its own sectional area?"

The soil pipe is the only pipe of larger size which ever discharges at full bore, and the amount discharged at one time (two or three gallons at the most) is insufficient to make a 4-inch horizontal drain run even half full for more than a few feet.

Automatic flushing is of the greatest assistance in keeping a drain free from deposit, and should be adopted in all cases where possible, and more particularly in cases where, from the depth of the main sewer, the inclination of the house-drain exceeds 1 in 60.

A tank containing not less than 30 gallons is sufficient to cleanse a 4-inch drain by means of a 2-inch syphon and flushing pipe, and it should be placed at the extreme end or head of the drain at least six feet above the latter point.

The author maintains that by using a 4-inch drain laid at a uniform inclination not exceeding 1 in 60, aided by automatic flushing, all refuse and other matters discharged into it will be removed in the shortest time and with the minimum of deposit, and to those who say that a 4-inch drain would be choked by such extraneous objects as a duster, a medicine bottle, or a hair-brush, the saying, "a place for everything and everything in its place" may be aptly quoted, as a house-drain cannot obviously be the proper place for a hair-brush, and the removal of such articles can be effectually provided for by making every length of drain accessible from inspection chambers.

Another argument in favour of the 4-inch pipe is the increased circulation of air in the drain, as by diminishing the sectional area of the passage, the velocity of the air current is considerably accelerated; the volume of air which has to be set in motion in order to produce circulation in a 6-inch pipe being more than double (2.24 times) the volume in a 4-inch pipe.

Gases generated in a 4-inch drain would certainly be carried away more quickly than in a 6-inch drain, apart from the fact previously stated that the possibility of the creation of such gases in a 4-inch drain is reduced to a minimum, while in a 6-inch drain their existence is an absolute certainty.

To summarise briefly, the objection to a 6-inch drain is the fact that deposits must be formed from which noxious gases are generated, with the probability of contaminating the air in the house, while the advantages of a 4-inch drain are:—

- (1.) Deposit is reduced to a minimum;
- (2.) Its size is ample for the discharge of the greatest amount of waste and rain water that can possibly pass into it;
- (3.) When combined with automatic flushing at regular intervals, absolute cleansing is obtained; and
- (4.) The increased strength of the air currents and the consequential more effectual and rapid purification of the drain.

The author would, therefore, in conclusion, urge on all sanitary authorities the advisability of reducing the sizes of house-drains as laid down in the existing byelaws and regulations, for while they all endeavour to exclude sewer gas from house-drains by means of disconnection and ventilation, the question of its generation in the drains themselves has apparently been hitherto overlooked.

Thursday, 13th August 1891.

The President, Sir ARTHUR BLOMFIELD, in the Chair.

Étude sur les principales causes d'insalubrité des Habitations
Ouvrières Parisiennes.

PAR

ÉMILE CACHEUX, Ingénieur, chargé de l'installation de la Section XI.
(Habitations Ouvrières) à l'Exposition d'Économie Sociale en 1889.

Depuis longtemps on a remarqué que dans les grandes villes la mortalité varie de 16 à 50 pour cent suivant les quartiers, c'est pourquoi on y a fait de grands efforts pour détruire cette inégalité. Dès 1842, *the Society for Improving the Dwellings of the Labouring Classes* fut fondée à Londres pour tâcher de réduire la mortalité excessive que l'on observait dans les logements d'ouvriers. Grâce à ses travaux et à ceux de l'association métropolitaine, il fut bientôt démontré qu'en améliorant les petits logements on pouvait diminuer considérablement le taux de la mortalité dans les maisons modèles, et comme les résultats obtenus firent voir que les logements pouvaient être loués de façon à rémunérer convenablement le capital engagé, la spéculation s'occupa de la construction d'habitations ouvrières et elle parvint à loger les habitants de Londres, de telle sorte qu'aujourd'hui la mortalité ne dépasse pas le chiffre de 19 pour cent.

A Paris le taux moyen de la mortalité est de 24 pour cent., mais dans les quartiers excentriques il atteint 36 pour cent. Par suite, si l'on pouvait détruire les causes de mortalité qui existent dans ces quartiers de façon à y rendre le nombre des décès égal à celui qu'on observe dans les villes anglaises, on rendrait un immense service à la population parisienne.

Nous avons fait une enquête sur l'état hygiénique de plusieurs de ces quartiers et nous n'avons pas eu de peine à nous convaincre que l'influence du logement était pour beaucoup dans la mortalité élevée qui existait dans les quartiers ouvriers, c'est pourquoi, dès 1875, nous avons commencé, M. Émile Muller et moi, une campagne pour améliorer les habitations de nos travailleurs. Le succès obtenu en Alsace, par mon vénéré maître, qui construisit les Cités-Ouvrières de Mulhouse, nous engagea à persévérer dans cette voie malgré les nombreux mécomptes que nous éprouvâmes. De nombreuses personnes se joignirent à nous pour entreprendre la réforme des petits logements, parmi elles nous citerons M. Émile Trélat, qui signala au Congrès d'Hygiène de Vienne le grand inconvénient qui résulte pour les Parisiens de l'utilisation trop complète du terrain à bâtir, et il démontra que même dans les maisons les plus luxueuses la santé était compromise par le manque de lumière.

Le remède préconisé par M. Trélat est l'expropriation des maisons trop hautes et la démolition des étages trop élevés de façon à pouvoir soumettre tous les locaux d'une maison à l'action des rayons solaires. J'ai cherché à résoudre le problème du désencombrement des quartiers du centre en essayant d'attirer les ouvriers dans les arrondissements excentriques de Paris et dans les communes voisines, en mettant à leur disposition des maisons susceptibles d'être acquises par annuités.

Mon exemple a été suivi, aujourd'hui il ne reste plus de champs dans l'enceinte de Paris, et on n'y voit plus fonctionner la charrue comme du temps où j'ai commencé mes travaux. Malheureusement l'ouvrier ne se rend pas compte du dommage qu'il cause à sa santé et par suite à son avoir, en ne consacrant pas à son loyer une somme suffisante pour être logé convenablement, c'est pourquoi la spéculation ne lui fournit pas un logement à aussi bon compte que les autres choses nécessaires à la vie. Pendant longtemps les hygiénistes et les philanthropes furent obligés de lutter pour décider nos compatriotes à imiter les Anglais, mais aujourd'hui nous pouvons dire que le succès a couronné leurs efforts. En effet, l'état des habitations ouvrières parisiennes tend de plus en plus à s'améliorer, grâce aux nombreux efforts qui sont faits à cet effet. Nous sommes loin de prétendre que tous les travailleurs parisiens sont logés conformément aux lois de la morale et aux règles de l'hygiène, car pour atteindre ce but il faudrait remédier à diverses causes qui ne disparaîtront que par suite des efforts combinés de l'État, des municipalités et des particuliers. Nous avons longuement parlé, dans l'ouvrage intitulé les *Habitations Ouvrières* en tous pays, de ce qui pourrait être fait dans ce sens par les pouvoirs constitués et par l'initiative privée, c'est pourquoi nous ne dirons ici que quelques mots sur ce qui devrait être tenté pour propager les petits logements convenables. Tout d'abord nous croyons que l'État rendrait de grands services à la cause que nous défendons, s'il modifiait les lois relatives à la transmission de la propriété et à la gestion des petits logements. Ainsi, un des plus grands obstacles qui s'opposent à la vente par annuités de petites maisons, provient du prix élevé des droits de mutation qu'il faut payer lors de la signature du contrat de vente ; d'après nous, l'État faciliterait beaucoup l'acquisition de maisons par petits versements, s'il exigeait le montant des droits de mutation au moment de la signature de la quittance notariée libérant définitivement l'acquéreur à l'égard de son vendeur.

En ce qui concerne la gestion des petits logements les modifications législatives seraient assez nombreuses. Nous verrions, sans déplaisir, promulguer en France une loi analogue à celle qui l'a été en Belgique, et qui aurait pour objet de supprimer le privilège du propriétaire sur les meubles du petit locataire, mais qui, par contre, lui permettrait de l'expulser lorsqu'il ne tiendrait pas ses engagements et ce à l'aide d'une procédure qui ne reviendrait qu'à une quinzaine de francs. En tenant compte de cette proposition, le législateur couperait court aux abus signalés dans divers quartiers de Paris, qui consistent à forcer les propriétaires à dépenser 70 francs pour expulser des individus qui demandent de l'argent pour quitter des logements dont ils ne paient pas le loyer.

L'administration devrait également répartir les impôts de façon à ce que les petits propriétaires ne soient pas forcés de payer des contributions qui représentent jusqu'à 12 pour cent du revenu brut de leurs propriétés.

Ainsi que je l'ai plusieurs fois démontré, ce sont les charges excessives qui grèvent les petits loyers qui empêchent les capitalistes de faire des placements immobiliers, c'est pourquoi j'ai cherché à les faire diminuer le plus possible. D'après moi, les municipalités pourraient obtenir de beaux résultats en réduisant les charges qui incombent à la petite propriété ; ainsi à Paris une rue classée revient au minimum à 400 francs le mètre linéaire, tandis qu'il serait facile d'établir des rues coûtant dix fois moins pour desservir des cottages. En ce qui concerne la fourniture de l'eau potable, l'évacuation des eaux ménagères, l'enlèvement des vidanges, les frais qui y sont relatifs sont peu importants quand il s'agit de maisons à étages, mais il n'en est plus de même quand ils concernent des maisons pour une famille. Dans ce cas les charges d'une maison louée à 300 francs peuvent s'élever à plus de 40 pour cent du loyer, sans tenir compte des réparations. Ainsi le prix d'une concession d'eau de 125 litres par jour est à Paris de 128 francs par an, celui du droit d'écoulement des vidanges à l'égout de 30 francs, le nettoyage de l'égout particulier coûte de 10 à 11 francs. La valeur de ces taxes étant établie par maison, proportionnellement à leur nombre, on comprend qu'elle soit excessive pour l'habitant d'une petite maison. Dans les environs de Paris, les charges dont nous parlons sont encore plus élevées. A Vanves, par exemple, la Compagnie des eaux ne délivre pas de concession d'eau à moins de 70 francs par an, c'est pourquoi j'ai établi des citernes pour desservir plusieurs maisons. Le prix des citernes étant de 300 francs, la fourniture de l'eau revient par maison à 15 ou 20 francs.

A Saint-Denis, où l'on arrive à établir des maisons pour 2,000 francs, la Compagnie des eaux demande pour délivrer une concession 65 francs par an.

La Ville de Paris a édicté des règlements sévères concernant les logements. Nous croyons qu'elle les ferait mieux observer si elle s'adressait aux locataires au lieu de s'en prendre aux propriétaires. Ainsi quand un locataire est atteint d'une maladie infectieuse, on force le propriétaire à désinfecter le logement contaminé, par suite il perd non seulement son loyer, mais il est encore obligé de dépenser une somme double pour remettre les lieux en état d'être reloués. Si les locataires étaient rendus responsables des frais qu'ils occasionnent aux propriétaires, ils iraient se faire traiter dans des hôpitaux spéciaux dès qu'ils se ressentiraient des premières atteintes d'un mal contagieux.

La Ville de Paris accorde des secours aux malheureux qui ne peuvent payer leurs loyers. Ces secours ne sont distribués qu'aux locataires expulsés judiciairement. Il résulte de ce fait que ces derniers ne quittent plus un logement à l'amiable et qu'ils forcent le propriétaire à dépenser en frais de justice le double de ce qu'accorde la municipalité.

En résumé la Ville de Paris devrait favoriser la construction de maisons pour une famille et non celle de bâtiments à étages dont un des plus graves inconvénients est d'abréger la durée de la vie humaine.

Malgré les sommes immenses dépensées pour embellir Paris, la mortalité dans cette ville ne diminue pas sensiblement, elle est encore de 24 pour cent, tandis que dans plusieurs villes du Nord elle a été abaissée à 18 pour cent.

Action de l'Assistance Publique.—L'administration de l'assistance publique se borne à Paris, à payer les loyers de quelques familles malheureuses. Nous ne croyons pas qu'elle aurait intérêt à construire des maisons, soit pour les vendre, soit pour les louer, comme le font plusieurs administrations charitables en Belgique, mais nous estimons qu'elle rendrait service en prenant des obligations hypothécaires rapportant 4 pour cent, émises par des sociétés philanthropiques qui construisent des habitations ouvrières, telles que la Société de Passy-Auteuil par exemple.

Action des Caisses d'Épargne.—La Caisse d'Épargne de Paris n'a pas jusqu'à présent voulu suivre l'exemple donné par les Caisses d'Épargne de Lyon et de Marseille, qui ont consacré une partie de leurs réserves à provoquer la construction de petits logements convenables.

Sociétés Savantes.—Les Sociétés savantes parisiennes ne se sont pas encore occupées de chercher à résoudre les divers problèmes relatifs au chauffage, à la ventilation, à l'évacuation des vidanges des habitations ouvrières. La Société de médecine publique a beaucoup travaillé pour assainir les logements, mais elle n'a pas tenu assez compte dans ses vœux adressés aux pouvoirs publics des charges qui résultaient de ses prescriptions, c'est pourquoi elle a rencontré une certaine hostilité de la part d'un grand nombre de propriétaires de petits logements.

Action des Compagnies de Chemin de Fer.—Les Compagnies de chemin de fer ont contribué de deux façons à l'encombrement des habitations ouvrières parisiennes, savoir :—

- 1° en prolongeant leurs voies dans l'intérieur de la ville, ce qui amena la démolition d'un grand nombre de logements ;
- 2° en provoquant dans Paris l'arrivée de beaucoup de petits employés.

Les Compagnies ont tâché de remédier à cet état de choses :—

- 1° en créant des trains spéciaux qui transportent à bon compte les ouvriers qui habitent en dehors de Paris ;
- 2° en provoquant la construction de petits logements.

Un des procédés les plus efficaces consiste à prêter, comme l'ont fait les Compagnies d'Orléans et de Paris, Lyon, de l'argent au taux de 3 pour cent l'an, à des sociétés philanthropiques qui s'engagent à loger un certain nombre de leurs ouvriers.

Action des Industriels.—Les Industriels parisiens font peu de sacrifices pour loger convenablement leurs ouvriers, car la main-d'œuvre n'est pas rare à Paris, et l'organisation du travail est telle que la majeure partie des objets manufacturés sont faits avec des machines, ce qui permet d'employer des hommes n'ayant pas fait d'apprentissage spécial.

Action de la Spéculation.—La spéculation s'est occupée dans ces derniers temps de faire des petits logements convenables ; malheureuse-

ment par suite du prix élevé de revient des habitations, les logements mis à la disposition des travailleurs se composent en général de deux pièces et d'une cuisine et se louent de 300 à 500 francs suivant les quartiers. Il est donc nécessaire que la philanthropie s'occupe de la question des habitations ouvrières, jusqu'à ce que la spéculation trouve intérêt à établir des petits logements.

Dans quelques cas spéciaux des industriels ont résolu le problème de loger le travailleur, convenablement et à bon marché. Ainsi M. Fouquiau vient de commencer le lotissement de 180,000 mètres de terrain, dans le XVIII^e arrondissement. Il construit des maisons qui comprennent quatre pièces et il les vend moyennant une annuité dont la valeur est inférieure à celle du loyer d'un logement de surface équivalente. Son type le meilleur marché est vendu clefs en mains au prix de 6,000 francs ou moyennant le paiement comptant d'une somme de 500 francs et celui d'une annuité pendant 50 ans. La valeur de cette annuité est de 390 francs pendant les quinze premières années qui suivent la signature du contrat et de 190 francs pendant les trente-cinq autres. L'acquéreur peut se libérer par anticipation.

M. Verberckmoës a construit des maisons à étages à Clichy en opérant de la même façon que la célèbre société, *the Improved Dwellings Company*, de Londres. Il a acheté un terrain, d'une superficie d'une centaine de mille mètres, couvert de constructions dans un état déplorable qu'il commença par démolir, puis il lotit son terrain en le perçant de rues, il en donna une partie à la commune pour faire un groupe scolaire et il provoqua la construction d'une église en cédant à bas prix l'espace nécessaire. Pour amener du monde sur son terrain, M. Verberckmoës construisit cinq maisons à quatre étages qu'il divisa en petits logements et qu'il loua de façon à retirer un revenu de 4 pour cent net de son capital engagé. Les maisons étant constamment occupées, M. Verberckmoës chercha à augmenter l'importance de ses opérations en s'adressant au Crédit Foncier, mais cet établissement ne put lui être d'aucun secours, car d'une part il prête de l'argent au taux de 4.5 pour cent et d'autre part il n'avance sur hypothèque que le tiers du prix de revient d'une maison destinée à loger les ouvriers. Plusieurs autres établissements de crédit immobilier ayant refusé de consentir à prêter de l'argent à des conditions plus avantageuses que le Crédit Foncier, M. Verberckmoës s'adressa au public pour trouver l'argent nécessaire à l'utilisation de ses terrains. A cet effet il proposa d'apporter à une société constituée au capital d'un million, dix mille mètres de terrain en échange d'actions libérées, dont la valeur eut été égale à celle du prix de revient du terrain apporté. Malgré la situation morale et financière du promoteur de l'entreprise et l'appui moral qui lui fut donné, le public resta indifférent à ses démarches.

Une autre tentative faite par les industriels de Saint-Denis eut un peu plus de succès, mais elle repose plus sur la philanthropie que sur la spéculation, c'est pourquoi nous en reparlerons un peu plus loin.

Action de la Philanthropie.—La philanthropie a servi de base à des opérations immobilières relatives aux petits logements, soit à des sociétés, soit à des particuliers.

La plus ancienne société créée à Paris dans ce but a été la Société des Habitations Ouvrières de Passy-Auteuil. Grâce aux hommes dévoués qui la dirigent—parmi lesquels nous citerons M. le Sénateur Dietz-Monin, M. le Député Siegfried, et M. Cheysson—elle a obtenu de beaux résultats qui éviteront bien des démarches à des sociétés analogues. Ainsi la Société de Passy est arrivée à ne payer que 30 francs par tuyau de chute horizontal, qui dessert une quinzaine de privés, tandis qu'un particulier serait obligé de verser à la caisse municipale une somme quinze fois supérieure, soit 450 francs. Espérons que ce précédent déterminera l'administration des égouts à modifier la taxe relative à l'écoulement des vidanges à l'égout.

La Société de Passy-Auteuil a émis des actions hypothécaires qui rapportent 4 pour cent l'an; comme ces obligations sont garanties par des propriétés qui ont une valeur double de celle des titres émis, elle a mis à la disposition des travailleurs des placements plus avantageux que ceux de la Caisse d'Épargne.

L'association philanthropique, grâce au zèle de M. Georges Picat, qui a entrepris une véritable croisade pour propager les habitations ouvrières convenables, affecta, il y a trois ans, le produit d'une donation de 600,000 francs faite par M. Heine, à la construction de maisons à petits logements. La première de ces maisons située rue Jeanne d'Arc est divisée en logements de deux pièces, la deuxième établie boulevard de Grenelle contient des logements de trois pièces. La société reconnut que les logements de trois pièces revenaient à un prix trop élevé et qu'il fallait habituer progressivement la population parisienne aux avantages d'une habitation spacieuse, c'est pourquoi elle divisa un troisième bâtiment qu'elle construisit avenue de Saint-Mandé, en logements contenant au plus deux pièces et un cabinet assez vaste pour pouvoir y coucher un enfant.

Les maisons de l'association philanthropique sont louées de façon à faire rapporter 5-6 pour cent brut au capital engagé, 1-6 pour cent, soit 28 pour cent du revenu brut, sont affectés aux charges. Cette proportion est un peu trop faible pour tenir compte des charges d'une maison occupée par des ouvriers, car la pratique a démontré que jusqu'ici le revenu net obtenu a été de 3-80 pour cent. La société pourra donc, dans un temps fort peu éloigné, suivre l'exemple donné par la fondation Peabody en Angleterre, et construire de nouveaux immeubles.

On reproche aux maisons de l'association philanthropique de contenir des pièces qui n'ont qu'une seule fenêtre exposée à l'air extérieur et des privés qui ont un accès direct dans des chambres où il est possible de placer des lits. Nous regrettons que l'habile architecte des maisons de l'association philanthropique ne se soit pas mis à l'abri des critiques que des étrangers pourraient faire à sa distribution en se basant sur la législation sanitaire qui est plus stricte dans leur pays que dans le nôtre. Ainsi, en Angleterre, il est interdit de construire des maisons dites *back-to-back*, c'est-à-dire des habitations qui ont une seule façade exposée à l'air extérieur; et en Allemagne on ne tolère pas que des privés donnent directement dans une chambre

destinée à l'habitation. Il faut dire que les privés des maisons de l'association philanthropique sont établis suivant le système du tout à l'égout et qu'ils sont soumis après chaque opération à un lavage énergique produit à l'aide d'un appareil fournissant dix litres d'eau à cet effet.

Jusqu'à présent, la pratique n'a révélé aucun inconvénient sérieux relatif à la distribution adoptée par M. Chabral, et grâce aux avantages qu'il a su mettre à la disposition des habitants des maisons dont nous parlons, chaque fois qu'un locataire donne congé dix autres se présentent pour le remplacer.

Nous ajouterons que d'une part la solidité des constructions et d'autre part leur revenu certain ont décidé la Compagnie des chemins de fer d'Orléans à prêter sur hypothèque, au taux de 3 pour cent l'an, tout l'argent nécessaire à une société fondée au capital de 30,000 francs, pour faire établir par M. Chabral des maisons analogues à celles qu'il a fait exécuter pour le compte de la société philanthropique.

Une société d'un genre particulier, la Société française des habitations à bon marché, présidée par M. Siegfried, a déjà rendu, quoique de fondation récente, de grands services en cherchant à provoquer la formation de sociétés de construction d'habitations à bon marché. Grâce à des conférences faites par MM. Siegfried, G. Picat, Rochard, plusieurs sociétés analogues à celles qui fonctionnent avec tant de succès à Mulhouse, à Rouen, au Havre, à Lyon, ont été créées à Belfort, au Havre, à Oullins et à Saint-Denis. La fondation de cette dernière société est due à un concours organisé par la Société française des habitations à bon marché. Ce concours avait pour but de lotir un terrain d'une surface de 10,000 mètres et de le couvrir de petits logements, 48 concurrents répondirent à l'appel de la société. Les projets exposés à l'Hôtel de Ville furent examinés par M. le Président de la République et par un grand nombre de notabilités.

Des prix d'une valeur de 3,000 francs furent distribués à la suite du concours, mais aucun des concurrents n'ayant rempli les vues du comité d'organisation de la Société des habitations économiques de Saint-Denis, je fus chargé par lui de m'occuper de la question. J'ai commencé par faire une enquête sur les petits logements de Saint-Denis, et je reconnus que si d'une part ils étaient dans un état déplorable, d'autre part il y en avait près des 1,200 qui étaient vacants. Je pus d'autre part m'assurer que la mortalité dans les quartiers ouvriers variait entre 30 et 40 pour cent, c'est pourquoi je conclus de mes recherches qu'il était plutôt nécessaire de construire des maisons modèles que d'établir un grand nombre de logements. Le comité d'organisation adopta mes vues et il se contenta de constituer la société au capital de 300,000 francs, divisé en actions de 500 francs dont le revenu a été limité au taux maximum de 4 pour cent.

Une création originale est due à la Société coopérative du XVIII^e arrondissement. Cette société rencontrant des difficultés pour se loger convenablement acheta un terrain et construisit une maison à l'aide d'un prêt. Grâce aux bénéfices réalisés sur ses opérations la société sera bientôt libérée. Les étages de la maison de la société sont divisés

en petits logements qui présentent une disposition remarquable. Le fourneau de cuisine est adossé à la paroi de la salle à manger, percée de façon que de cette pièce on puisse voir le feu de foyer qui sert à cuire les aliments. L'ouverture est encadrée du côté de la salle à manger par un chambranle de cheminée. En été on ferme l'ouverture à l'aide d'un registre de fonte.

Un grand nombre de particuliers ont contribué à l'amélioration des petits logements parisiens, soit par leurs écrits, soit par leurs travaux pratiques. Citons parmi les écrivains les plus remarquables, MM. Jules Simon, G. Picat, Émile Muller, A. Raffalovich, Anetole Langlois, Cheysson, Antony Roulhet.

Pour mon compte j'ai essayé de propager le plus possible les principes qui doivent guider un bon constructeur en publiant avec M. Émile Muller l'ouvrage intitulé les *Habitations Ouvrières* en tous pays,* dont à l'occasion de l'Exposition Universelle de 1889 nous avons publié une deuxième édition. J'ai publié seul l'*Économiste Pratique* et l'*État des Habitations Ouvrières* à la fin du XIX^e siècle, pour rendre compte des travaux pratiques que j'ai faits dans le but de démontrer la possibilité d'introduire, en France, les *Building Societies* qui ont rendu tout de services en Angleterre et en Amérique. A cet effet j'ai construit une centaine de maisons suivant une vingtaine de types différents moyennant des prix qui ont varié de 3,400 à 10,000 francs.

J'ai donné les plans d'exécution de mes types dans mes ouvrages, et je suis persuadé que si une société faisait en grand ce que j'ai réalisé en petit, elle obtiendrait des avantages bien plus sérieux que moi et qu'elle arriverait facilement à rendre beaucoup de locataires propriétaires, soit d'une maison, soit d'une somme d'argent, par le seul fait de payer régulièrement leur loyer pendant un certain temps.

The Insanitary Conditions of Workrooms, Bakehouses, etc., in Paris.

BY

MONSIEUR F. BOUHON, Architect, Paris.

This paper recounts what has been done in Paris by a sub-committee, charged by the Commission on Insanitary Dwellings to prepare a Bill, to be presented to the Chambers, to deal with the workrooms and kitchens of pastrycooks. With M. André Gély, of the Paris Municipal Council, the writer and three other experts gathered a large body of evidence bearing upon the complaints of the insanitary condition of many of these establishments, presented by Messrs. Hudelo and

* *État des Habitations Ouvrières* en tous pays, par Muller et Cacheux. *État des Habitations Ouvrières* à la fin du XIX^e siècle. *L'Économiste Pratique*, par É. Cacheux, Baudry et Cie, 15 rue des Saints-Pères, Paris.

Napias. The causes of unhealthiness found were so much alike in the different cases, and so general, as to justify the sub-committee in regarding them as vices inherent, so to speak, to the business. They were chiefly want of light and air; dangerous position of the ovens and furnaces; open gutters passing through the workshops; want of water, and consequent uncleanness generally; proximity to the workshops of water-closets and urinals, and the presence, even in the rooms themselves, of portable apparatus for the same purpose, such as open barrels; and, above all, the miserable and dangerous sleeping arrangements for apprentices and workmen. Many employés were compelled to sleep either in the workrooms themselves or in places better described as holes or cellars than as chambers. The fatalities recently occurring in the Rue Gay-Lussac, and in other parts of Paris (they were euphemistically called accidents), were only too easily accounted for by the facts observed by the committee. The furnaces, generally fed by charcoal and deprived of flues, were often placed in cellars in communication with living and sleeping rooms. The gutters in some cases ran with a mixture of soap-suds and rain-water; the floors, of broken tiles, harboured grease, fat, and more repulsive deposits in other cases; and in most the walls and floors were incrustated with fermenting accumulations of humidity, grease, and sugar, which gave out a sickening smell. In some laboratories were found receptacles for the household slops, unsealed, with no siphon or trap, communicating directly with the sewers, and admitting sewer gas unimpeded into the workrooms. All these causes were fruitful in rendering these workshops sources of infection,—attacking not only the workmen, but not infrequently the employer himself, and the members of his family,—and sources of corruption for the alimentary products turned out of the workshops. The worst danger of all arose from the practice which prevailed of making the apprentices sleep in the workrooms. In the Rue Gay-Lussac, in April last, three workmen or apprentices were suffocated by the fumes of the furnace by the side of which they slept. A few days later, of four pastrycooks' workmen and apprentices sleeping in a cellar, unventilated and unlighted, three were suffocated, and the employer himself, who slept above in the back shop on the ground floor, was nearly overcome by the carbonic acid fumes emanating from a furnace in the basement. In this basement the four unfortunate employés (three apprentices and one adult) slept two by two in beds placed in a hole opposite that containing the oven, both being scooped out of the earth under a passage to which access was given by an open gateway. The writer regards the "Bakehouses Regulation Act of 1863," as a piece of severe English legislation which France ought to follow in the main; on that Act was founded a Bill which the sub-committee proposed for adoption in Paris. The principal provisions of this Bill were that the laboratories and kitchens of such establishments should not be less than 9 ft. 4 in. high, should be lighted from the street or a wide court, and should be freely ventilated by air; waste water not to pass across the floor except in hermetically sealed pipes, properly trapped; every furnace to have a hood, conducting the smoke into a chimney not less than 12 in. by 10 in. in section, and extending

to the top of the house; and, wherever possible, a second tube of the same dimensions should be placed at the end opposite to the chimney. All sinks and openings for waste water to be trapped; there should always be a sufficient supply of water for drinking purposes; and no urinal, water-closet, or apparatus of like nature should be tolerated in any laboratory, kitchen, or bakehouse. All drain-pipes should be on the principle of "all to the sewer"; proper closets and urinals should be provided outside the workshop, all supplied with sufficient and proper apparatus, and trapped. Sleeping in places devoted to work, or in proximity to ovens, or in any underground room whatever, should be absolutely forbidden. Finally, the author calls attention to the desirability of limiting the number of persons sleeping in a room in proportion to its cubic contents, and to the immorality likely to result from apprentices and adults sleeping together indiscriminately.

Common Lodging Houses.

BY

P. GORDON SMITH, F.R.I.B.A.

In approaching the subject of common lodging-houses it is necessary to come to a clear understanding as to what constitutes a common lodging-house; for outside the circle of officers and members of local governing bodies, there appears to be but an indistinct notion of what a common lodging-house really is. Not infrequently it is erroneously mixed up with that kind of model lodging-house which is now often advocated and provided as dwelling accommodation for the poorer classes of the labourer and artizan community in our cities and towns. Nor must the common lodging-house be confused with either the Seamen's Lodging House dealt with under the Merchant Shipping (Fishing Boats) Act, 1883 (Section 48), or with the night refuges provided by certain philanthropic individuals and societies. The application of the term common lodging-house has given rise to many questions, legal and otherwise, as to what houses ought to be classed as such, and be registered accordingly, and I feel sure that many of our friends, especially our foreign visitors, will need some explanation upon the point, the more so as common lodging-houses form the subject of several special legislative enactments.

In the absence of any complete statutory interpretation of the term, I will first explain that a common lodging-house is, in a certain limited sense, a sort of inn or hotel resorted to by certain of the very poor for temporary residential purposes, in which sleeping accommodation is provided in common, in one or several rooms, at a charge of 4*d.* or 6*d.* per night, and where those who resort to it cater for themselves as regards food, and ordinarily use one kitchen in common.

On several occasions efforts have been made to define with precision what constitutes a common lodging-house. It has been held that evidence that hawkers, itinerant picture-frame makers, chair-makers, musicians, bone-gatherers, and persons suspected of begging resorted to a house for lodgings and had their meals in the kitchen at the same table, paying 6*d.* per night each, is sufficient to establish that the house is a common lodging-house requiring to be registered under the Public Health Act, 1875. It will thus be seen that the question as to what is a common lodging-house depends, not so much upon the precise definition of the term as the consideration whether the circumstances of its occupation are such as involve supervision by the sanitary authority in order that its general cleanliness, ventilation, good ordering, &c., may be secured.

Common lodging-houses had existed in Great Britain for many years prior to legislative enactments for controlling them. In the "Report of the Poor Law Commissioners," 1842, the late Edwin Chadwick gave descriptive statements showing the horrible condition—sanitarily and socially—of the common lodging-houses in all parts of the kingdom, and showed how prolific they were in the propagation of disease and vice. But it was not until 1851 that Lord Ashley—better known later on as the philanthropic Earl of Shaftesbury—induced the Legislature to pass the Common Lodging Houses Act, an Act the preamble of which states that "it would tend greatly to the comfort and welfare of many of Her Majesty's poorer subjects if provision were made for the well-ordering of common lodging-houses." That Act, however, and a subsequent one passed in 1853, were, so far as they related to common-lodging houses in the provinces, repealed by the Public Health Act, 1875; and, while the control and supervision of the common lodging-houses within the Metropolitan district (exclusive of the City) was allowed to remain in the hands of the police as enacted under the original Acts, that of the common lodging-houses throughout the rest of England and Wales was entrusted to the local sanitary authorities existing or constituted under that Public Health Act. As regards the City of London, the Common Lodging Houses Act of 1851 specially exempted the City from the operation of that Act, but the Commissioners of Sewers, acting as the Sanitary Authority for the City under the Sanitary Act, 1866, control houses let in lodgings, and have a code of regulations very similar in their general requirements to the bye-laws as to common lodging-houses in force in other sanitary districts.

That the subject of common lodging-houses is one of some importance as affecting directly and indirectly the whole community, will be better understood from the fact that, according to the evidence given in 1884 before the Royal Commission on the Housing of the Working Classes, as many as from 20,000 to 30,000 persons resort to them in London alone for lodgings every night, and some of the houses are certified to hold upwards of 500 lodgers. According to the Report of the Commissioners of Metropolitan Police for 1889 there were 988 common lodging-houses on the Register, making up, in the aggregate, accommodation for 33,964 persons.

From information kindly furnished to me by the officers of certain provincial towns, I am able to show the extent to which the system of common lodging-houses prevails in each of the towns named.

Name of Town.	No. of Common Lodging Houses on Register.	Aggregate No. of Beds in Common Lodging Houses on Register.	Largest number of Beds in any one Common Lodging House on Register.		
			For Men.*	For Women.*	For Married Couples.*
Birmingham -	86	1,861	186	13	12
Liverpool -	878	9,895	172	66	230
Manchester -	231	6,556	619	53	60
Salford -	58	1,419	148	10	5
Bristol -	51	1,006	103	6	8
Leicester -	27	601	107	21	6
Nottingham -	50	762	50	21	10
Leeds -	88	2,714	555	0	43
Newcastle-upon-Tyne.	96	1,053	30	12	10
Hull -	53	1,353	90	8	16
Bradford -	52	930	128	19	13
Sheffield -	40	1,273	85	20	14
Brighton -	18	292		30	4
Portsmouth -	17	303	49	8	4

* In some instances the arrangements admit of the beds in these columns being interchangeable.

It will be well, perhaps, to briefly specify the accommodation that ought to be found in a complete common lodging-house. This should comprise an adequate day room for each sex, fitted with a fireplace and range suitable for the cooking of the lodgers' food, also a sufficient scullery or wash-house. Likewise dormitories for each sex, furnished with single bedsteads, bedding, &c. Lavatories, separate from the dormitories, are also necessary; and suitable and sufficient closet accommodation. In addition to the separate dormitory accommodation for each sex, cubicles or separate rooms may be provided for married couples, for, be it remembered, that any man and woman applying for such accommodation—and the Act of Parliament imposes no duty on the keeper of a common lodging-house in regard to the family relationship of the lodgers—may be received as such in a common lodging-house. In some few common lodging-houses a separate reading room has been provided, but this is comparatively exceptional. In several I have noticed that lockers are provided, in which those lodgers who may be regarded as regular customers can, for a trifling extra fee per week, leave their property with a certain amount of safety.

A few instances have come under my notice in which buildings have been specially erected as common lodging-houses, but these are comparatively rare. More frequently the common lodging-house is a capacious dwelling house which has ceased to serve its original purpose, owing to entire change in the character of the neighbourhood, and which has

been altered and adapted to serve its new purpose; but more often it is a warehouse or factory that has been altered and adapted to the purpose. These latter are generally the best kind of building for the purpose, as they usually have large rooms capable of fair light and ventilation. Some buildings of this sort now provide accommodation for 200 to 300 lodgers, and consequently involve a considerable amount of capital, and of attention and management on the part of the proprietor.

I propose to state briefly some of the chief conditions under which common lodging-houses are allowed to be carried on, and then to refer to a few of the more important of those conditions, with the object of ascertaining how far those conditions can be regarded as adequate and satisfactory.

The statutory laws require the controlling authority in every district to keep a register of the common lodging-houses within their districts, with the names and addresses of the keepers, and the number of lodgers which each house is authorised to receive. The keeper of every such house is required to have it registered, and the controlling authority are not to register any such house until they have had it inspected and approved for the purpose by some officer in their employ; they may further require, as a condition of registration, that the keeper shall produce a certificate of character; also that he shall exhibit the words "Registered Common Lodging House" in a conspicuous place outside the house. He may further be required to comply with sundry other enactments as to water supply, periodical lime washing of walls and ceilings, reporting any occurrence of infectious disease amongst the lodgers, the admission of the duly appointed officer to inspect the house, &c. In the provinces, moreover, every sanitary authority is required to make byelaws* for the following objects, such byelaws being confirmed by the Local Government Board in London before they can be put into operation:—For fixing and from time to time varying the number of lodgers who may be received into a common lodging-house, and for the separation of the sexes therein; for promoting cleanliness and ventilation in such houses; for the giving of notices and the taking precautions in the case of any infectious disease; and generally for the well ordering of such houses.

In the Metropolitan District corresponding regulations are issued by the Commissioners of Police, and the regulations now have to be confirmed by the Local Government Board.

It will be obvious that one of the chief features in the foregoing enactments which calls for careful attention, is that which requires the controlling authority to cause every common lodging-house to be inspected by some responsible officer in their employ, before placing it on the Register and certifying it as fit for a certain number of lodgers. For the guidance of sanitary authorities and their officers, the Local Government Board have issued a memorandum, of what should be looked for on the occasion of such inspection. In that memorandum it is pointed

* The model byelaws of the Local Government Board. Annotated edition. Knight & Co., London, 1890.

out that the house should possess the conditions of wholesomeness needed for dwelling houses in general; and that it should further have arrangements fitting it for its special purpose of receiving a given number of lodgers. The details as to general wholesomeness are set out, and the method of determining the accommodation is then given. The numbers for which the house and each sleeping room may be registered will depend, partly upon the dimensions of the rooms and their facilities for ventilation and partly upon the amount of accommodation of other kinds. In rooms of ordinary construction to be used for sleeping, where there are the usual means of ventilation by windows and chimneys, about 300 cubic feet will be a proper standard of space to secure to each person; but in many rooms it will be right to appoint a larger space, and this can only be determined on inspection of the particular room. The house should possess kitchen and day-room accommodation apart from its bedrooms, and the sufficiency of this will have to be attended to. Rooms that are partially underground may not be improper for day rooms, but should not be registered for use as bedrooms. The amount of water supply, closet or privy accommodation, and the provision of refuse receptacles should be proportionate to the numbers for which the house is to be registered. If the water is not supplied from works with constant service, a quantity should be secured for daily use on a scale, per registered inmate, of not less than 10 gallons a day where there are waterclosets, or five gallons a day where there are dry closets. For every 20 registered lodgers a separate closet or privy should be required. The washing accommodation should, wherever practicable, be in a special place and not be in the bedrooms; and the basins for personal washing should be fixed and have water taps and discharge pipes connected with them.

Time precludes us from considering all these particulars in detail, but there appear to me to be one or two important points that deserve special attention. There is, for instance, the question of fixing the number of lodgers to be received into each particular common lodging-house; and there is the question of the separation of the sexes, and the provision for married couples.

As regards the methods by which the accommodation of a common lodging-house is fixed, this should depend not only upon the numbers which the dormitories may be calculated to hold, but upon the provision of adequate day-room space for the lodgers. In fixing the accommodation of the dormitories, it is usual to reckon not less than 300 cubic to each adult lodger. Although this minimum amount is a very small one, it has been arrived at by a careful regard partly for health considerations and partly in view of the difficulties of lodgment in the metropolis and other populous places. This standard, however, should under no circumstances be diminished; it is only where there are at least the usual means of through ventilation by proper windows and chimney flues that so small an allowance is permissible; but where there are only indifferent means of ventilation, or where the room is of unusual height, or where the room is used by day as well as by night, a larger amount of space per lodger ought ordinarily to be required. In

the case of children under 10 years of age, it is usual to reckon two such children as one person. Children, however, are not by any means numerous in common lodging-houses.

Much as I should like to see a larger minimum standard of space allowed to each lodger, I am not prepared to suggest that the amounts above referred to should be increased, since the difficulties of securing larger amounts would, I believe, be practically insurmountable; but I do think that the utmost care should be exercised to insure that where only those small amounts of space are afforded, all available means of ventilation are not only provided but are made use of; and it is in this respect that the usefulness of constant inspection will be most evident. At the same time it must continually be borne in mind that the ordinary *habitué* of a common lodging-house is an individual who cares nothing whatever for ventilation or fresh air, provided he is warm; that he is often under-fed, and but poorly clad; and that in wet weather his clothing is rarely dry. Under such conditions it is not surprising if he selects the lodging-house where the dormitory is (to him) the most comfortable and free from cold draughts and fresh air. The keeper, too, has the interest of his customers at heart, and he gladly sees the street-hawker, organ-grinder, pedlar, and other customer come night after night to his establishment; in fact, like every good hotel-keeper, he strives to make his customers comfortable according to their individual ideas of comfort; otherwise, if he has a large establishment, he may find, perhaps, a hundred of his beds empty, and this would inflict on him a loss of some 10% or more a week; and, however important we may consider the ample supply of fresh air in the dormitories of these lodging-houses, we have to take care not to apply the rules as to ventilation with undue rigour, or in a manner that would indeed drive away those whose comfort it is our desire to increase.

The question of warmth is, of course, closely associated with ventilation, and if the lodging-house keeper invariably had a reserve of bed clothing and blankets that could be resorted to in cold weather, there might possibly be rather less difficulty with regard to ventilation. But while the reserve of blankets is rarely large (and there is no great encouragement to be very profuse in their supply, since the losses by theft, both in regard to sheets and blankets, are considerable, for they get torn up for use as underclothing or to serve as bandages for wounds, &c.), the difficulty of getting fresh air into the dormitories, unless it were first warmed, will always be great, since there is scarcely any ventilator that will escape obstruction unless it be wholly invisible and inaccessible. In the day time the windows of the dormitories have to be kept fully open for a specified time morning and afternoon, but means for the constant ventilation of the dormitories when occupied at night are indispensable, and the less visible they are the better. Compared with the amount of space per lodger prescribed by the police regulations of Paris and Berlin, our own 300 cubic feet is decidedly small. In Paris the lodging-houses under systematic supervision are required by the police to have in each occupied room a minimum height of $2\frac{1}{2}$ metres, and each lodger 14 cubic metres of air space, which is equal to some 480 cubic feet. In Berlin the police

regulations applicable to lodging-houses under their inspection require a minimum amount of 3 square metres of floor space and 10 cubic metres of air space, equal to about 350 cubic feet for each lodger, this latter being reduced to one half in the case of children under 6 years of age, and to two-thirds for children between 6 and 14 years old.

The separation of the sexes in common lodging-houses is a further point which, apart from its moral aspect, is not without an important bearing on the general question of hygiene. It is a matter dealt with by byelaws in the provinces and by police regulations in the metropolis. In the byelaws it is usual, except as regards husband and wife, to prohibit any person of the male sex above 10 years of age from using or occupying a room used or occupied as a sleeping apartment by persons of the female sex, and similarly to prohibit any person of the female sex from using or occupying a room used or occupied as a sleeping apartment by persons of the male sex above 10 years of age. These rules do not interfere with the children of tender years remaining with their parents at night. How far it is desirable to separate the sexes elsewhere than in the common dormitories may be open to question, but as a matter of fact it is practically never done, except in those common lodging-houses which are intended for one sex only. In the others; men and women associate freely in the common rooms, where clothes are mended and often washed and dried, unlimited cooking goes on, and meals are taken. I assume that the Legislature intended the separation of the sexes to be applicable only as regards the common dormitories, otherwise specific arrangements would be made, as they easily might be, for the same separation in the day rooms. The separation of the sexes does not, of course, apply to married couples, since man and wife could no more be lawfully separated in a common lodging-house, where they pay for their accommodation, than in an ordinary inn or hotel, provided the accommodation afforded be such as will conform to ordinary rules of decency, and is duly certified by the responsible authority. That this accommodation may be, and frequently is, improperly used, will not, I think, be denied, but this point is beyond the scope of the present paper.

Cottage Homes for the Industrial Classes.

BY

ROWLAND PLUMBE, F.R.I.B.A., F.S.I.

In common with many experts who have given great attention to the subject, I hold strongly the opinion that every effort should be made to prevent any further concentration of industrial homes in the already overcrowded streets of the central districts of the metropolis. These residences should be scattered widely, and should be situated as far as practicable from the already congested central districts, and the working classes should be induced to spend their hours of rest and recreation in the purer and more abundant light and air of the suburbs. Especially

is this desirable in the case of the wives and children, even though quarters may be found in the best built and most advantageously situated flats in the many blocks of model dwellings that have been provided so largely of late. This opinion is strongly confirmed by the view taken in an article contained in the recently published volumes of Mr. Charles Booth's valuable work on the "Labour and Life of the People." It is written by Miss Octavia Hill, under the heading "Blocks of Model Dwellings," Vol. 2, Sec. 2, Fol. 262, "Influence on Character." The article is much too long to quote on the present occasion, but is strongly in favour of separate cottage homes, while the many objections to block dwellings are forcibly demonstrated.

In building new districts, social and class prejudices have hitherto prevented the richer and more cultured classes of the population from living in close proximity to those whom they consider below them in social standing. This prejudice is probably as strong also on the part of the poorer population, and so each class prefers to keep to itself. These tendencies are unfortunate, and in the present state of society, seemingly insurmountable. The great difference in the value of land and property in fashionable and in poorer neighbourhoods also prevents proximity of the classes; still, in providing estates for the industrial population, an attempt should be made to get as great a mixture and variety in the social scale of the inhabitants as is practicable.

Therefore in providing model villages for the artizan and industrial class, I think that provision should be made, and attractions should be laid out, for all sorts and conditions of inhabitants likely to reside in them. The site should be a salubrious one, all natural defects of soil and climate should be overcome as far as possible. The locality should be easy of access to large industrial centres, with cheap and frequent means of transit by road and rail. It should be laid out with wide and well-made roads and footways, which should be planted with suitable trees, and made as attractive as possible. The drainage and sanitary arrangements should, of course, be perfect; each home should be self-contained, and should be bright, cheerful, well arranged, commodious, and healthy; the houses well set back from the public footway, with gardens in front and a good drying ground in the rear, which could also be laid out as an additional garden or recreation ground, and where under proper regulations domestic animals and poultry might be kept.

The houses should be varied in plan and accommodation to suit the habits of all classes, and of the different sized families likely to occupy them. They should, of course, be substantially built, and every sanitary requirement should be provided. They should be decorated and finished in a pleasing manner to suit the best taste of the occupants, and a general air of comfort, brightness, cleanliness, and cheerfulness should be given to them, as also to the estate generally. Open spaces for recreation and for garden allotments should be provided. Pressure should be brought to bear upon the local authorities so that the provisions of the Education Act, the Baths and Wash Houses Act, the Public Libraries Act, and all other beneficial legislation of a like character may be carried out, and suitable buildings for the same should be provided. Churches, parish rooms, public board schools, polytechnic institutes, coffee taverns, and

clubs of all kinds should also be provided; a sufficient provision of shops should likewise be built in suitable positions; and the question of public-house accommodation should also be most carefully considered, and (if provided) not placed in positions likely to create discomfort and disorder.

The classes of people inhabiting such estates should pay weekly rents, and habits of thrift should be encouraged by always insisting that the rents should be paid at least one week in advance. The inhabitants should also be encouraged to invest even small amounts in the capital of the company, so that they may co-operate in its undertakings. Houses should not be sold to individuals, as in that case abuses at once spring up, but the whole estate should be owned and managed by one company, the tenants being shareholders wherever possible. The inhabitants should be encouraged to take an interest in the maintenance of the company's property, and forms should be provided on which should be stated any want of repair or other matter requiring attention, these should be left at the estate office, and a staff should be appointed to attend to the same. The company should maintain and manage a proper staff of officials and workmen to attend to all matters of repair and maintenance. It should be established on a proper business footing, and financially it should be so managed as to pay a remunerative rate of interest to its investors. However philanthropic the motives of the promoters may be, there should be no sense of favour to the inhabitants, who should be encouraged to feel that they are paying a fair rental for the accommodation provided. The company should aim at paying a dividend on each estate of 5 per cent.; but it is highly probable that as such property extends and the security increases in value, the public would be found willing to invest in it at a considerably lower rate.

Now the foregoing very incomplete and sketchy description of a model cottage village may seem to many overdrawn, if not altogether chimerical. In order to prove that this is not so, I propose to give a short account of the latest village of the kind that has been actually erected under my design and superintendence. This estate, having an area of 100 acres, is called Noel Park, and is situate at Wood Green, a suburb in the N.E. district, about 10 minutes' walk from the Hornsey and Wood Green Stations of the Great Northern Railway. Green Lanes and Noel Park Station on the Great Eastern Railway is actually on the estate, and steam tramways run along the main road on which it is situate.* The estate has a very gentle slope towards Tottenham; the soil is the usual dense clay found in the outlying parts of London on the north side of the river, which is always much improved by roadmaking, planting, paving, and draining.

The main avenue is 60 feet wide; other avenues are 50 feet wide, and the cross streets 40 feet wide. As the houses are built the roads are completely made up, channelled, and curbed, and the footways are entirely paved with York stone, and planted at regular intervals (mostly with plane trees). At present it is contemplated to provide a large open space as a recreation ground.

* A general plan of the estate, as proposed to be completed, was exhibited by the author.

The general drainage of the estate, in accordance with the requirements of the local authorities, has been arranged on the dual system, the rain and surface water being kept separate from the sewage. No drains run through the houses, back drains with intercepting manholes, specially ventilated, being provided for all terraces. The system of ventilation of sewers has specially been considered, the usual ventilating openings in the roads are arranged to act simply as inlet ventilators, the sewers having manholes at short distances apart, with specially designed valves and upcast ventilation shafts carried above the houses. Automatic flushing tanks are also provided.

In laying out the estate, care has been taken that all houses are set well back from the road, all having front gardens. The objectionable practice of bringing the corner houses out to the pavement line of the return roads is in all cases avoided, the corner houses of the terraces being set back, and specially designed and planned so as to form an architectural adornment to the terrace of which they form a part. There will be about 2,500 houses and shops built on this estate, mostly of five different classes. About 1,305 houses are already built, and are nearly all occupied.

The first class houses are built on plots having a frontage of about 16 feet wide and 85 feet deep, with a floor area of about 1,065 feet on both floors, containing eight rooms, including the scullery. Each house is provided with two sitting-rooms, kitchen, wash-house, and four bedrooms, also a back entrance, with coal cellar, larder, washing-copper, and water-closet, and in most cases an additional water-closet on the chamber floor. The houses are let at a rental of from 11s. to 11s. 6d. per week, including all rates and taxes, which are paid by the company. The greater number of these houses are provided with a water-closet on the first floor; and in such cases the back rooms are fitted up as kitchens and sculleries complete, so that they may accommodate two families if required.

The second class houses are built on plots having a frontage of about 15 feet 6 inches by a depth of 80 feet. The floor area is 936 feet, containing seven rooms, there being only three bedrooms on the first floor. The other accommodation is similar to that last described, except that there is no upstairs water-closet. The weekly rental of these houses is about 10s. per week.

The third class houses are built on plots having a frontage of 15 feet by a depth of about 70 feet, and possess a floor area of about 800 feet, containing six rooms, three being bedrooms. The weekly rental of these houses is about 9s. per week.

The fourth class houses are built on plots having frontages of about 14 feet 6 inches by a depth of about 70 feet, with a floor area of 660 feet, containing five rooms, there being two bedrooms on the first floor. The rental of these houses is about 7s. 6d. per week.

The fifth class houses are built on plots having a frontage of 13 feet by a depth of 60 feet. The floor area is about 470 feet, containing a front living room, with kitchen and small wash-house behind, with two bedrooms over. The rental of these houses is about 6s. per week.

In addition to the various classes of houses just described, an endeavour has been made to provide for still further varied requirements by adapting them as flats, two stories high, for two families. In the case of third class houses the staircase is shut-off, the upper floor being arranged as a separate dwelling, consisting of a living room and two bedrooms, with an outside staircase down to the back garden, the closet and wash-house being held in common. These are let at 4s. 6d. per week the lower flat, and 5s. per week the upper flat. Advantage is taken of the corner houses to get separate entrances at the side. Second class houses also are similarly arranged. Each flat has its own scullery, wash-house, and w.c. The rental of these houses is 5s. a week for each floor, and 6s. to 7s. a week for houses with special accommodation. First-class houses have been arranged in the same way. The frontages are extended from 16 feet to 19 feet, and entirely separate entrances and outside doors are given to each flat, a small additional bedroom being obtained on the first floor. The rental of these houses is 7s. a week ground-floor, and 8s. a week for first-floor flats. The corner houses have an extra floor, and are let at special rates, viz., 10s. 6d. for the first and second floors. It is proposed that by far the largest number of houses built should be of the smaller class, in order to encourage the industrial classes in the effort to avail themselves of houses at a rental which will not make it necessary to take in lodgers.

In the general planning of these houses the company does not profess to carry out any specially new arrangement; the type, with the exception of the fifth-class houses and double flats, being that which seems to have been universally adopted in all town and suburban terrace-dwellings, as giving the greatest accommodation at the cheapest rate; where however, any special requirement has to be met, as (for instance) in the case of shallow, corner and other irregularly shaped plots, the architect has availed himself of the opportunity to design plans of almost every variety of arrangement; but for the general terrace plans the Board has not found it practicable to adopt a more convenient and economical plan than that shown.

In the general view of the terraces of the first and second-class houses, a feature in the design is made of the corner houses; and with a view of breaking up the monotony of the long lines which terraces in streets produce, specially designed features are introduced at intervals so as to break up and improve the sky-line of the buildings; advantage is also taken of these features to improve the accommodation of the houses, so that a return may be obtained for the extra outlay by an increased rent, which is readily obtained in such cases.

The houses are all built with a layer of concrete over the whole area of the buildings; the walls are of brickwork, the party walls being hollow or 14" thick, to prevent the passage of sound between the tenements; slate and cement damp-proof courses are used; the walls are faced with red and yellow bricks, with terra cotta or artificial stone cills and flower guards; the roofs are mostly slated, but to give variety many are tiled; the whole being built with the best materials and designed to have a bright and cheerful appearance. The space under the ground floor is specially ventilated, as are also all the rooms, Tobin

tubes and deep inner beads to windows being provided to each room. There is a constant water supply, and no cisterns are used except the water waste preventors to the water-closets. The sanitary arrangements are of approved yet simple character, all waste and other pipes being discharged over open trapped yard gullies. No soil or rain water drains run through the houses, as the pipes are carried along the back gardens and are provided with ventilated manholes for inspection and flushing at suitable distances. There are also similar manholes at the junction of these drains with the pipe sewers in roads.

The general requirements of the inhabitants have been studied. Already the estate has been formed into a separate parish, and a church has been built holding 850 on the ground floor, with mission hall, parish rooms, and all the usual church societies. Building sites have been offered for churches of other denominations; a fine board school has also been built; various social clubs already exist, as also cricket, foot-ball, and other clubs; space is reserved for a public hall, should it ever be required, and every facility will also be given for the erection of polytechnics and other buildings for technical education; also for free libraries, swimming baths, and other similar buildings, whenever the authorities are ready to put the various Acts of Parliament providing these buildings into operation. On the other estates, halls for the use of the inhabitants have been built, but they are so little used, that there is but little encouragement to repeat the experiment. In certain parts shops have been built, also stables, and space is reserved for workshops and laundries.

Although it is not thought advisable to interfere directly with the conduct of the various societies that have sprung up, yet the managers of the estate are always desirous of helping them forward when once started by the tenants. With this object prizes are given, and other facilities granted in aid of the same. Some of the land not yet built upon is used for cricket and recreation grounds, and also for allotment gardens, and it is hoped to reserve permanently enough land for this purpose. In order to promote thrift and self-respect, the estate is managed on the lines first indicated in the first part of this paper, and no public-houses or pawnbrokers shops are allowed on the estate.

The estate is occupied by young married people, a few retired tradesmen with moderate incomes, travellers, warehousemen and clerks, railway employées, tradesmen's assistants of all kinds, artisans of all classes, cabmen, letter carriers, labourers, policemen, pensioners, &c. The inhabitants are healthy, and but few complaints are made. The death-rate on the company's estates from January to the end of June 1891 was about 14.41 per 1,000, as compared with a death-rate in the general district of about 15.25 per 1,000.

In respect to co-operation by the tenants in the development of the company, but little can, at present, be said. Every opportunity is given to them to invest; only a few shares are, however, held by them.

It is believed that this estate would have been by this time completed had proper railway facilities been provided. There are cheap workmen's trains from the Great Eastern Station on the estate, and

from the stations on the Great Northern Railway, not far distant, but these early morning trains by no means cover the necessities of the industrial population. It is a fact not generally known that, except on the Midland Railway, the third-class passenger, who is packed closely in his carriage, and allowed to travel but once, backwards and forwards, on six days of the week, actually pays, on an average, about as much for his railway fares as a first-class passenger who, having a season ticket can travel as often as he likes in comfort, and has also the right to travel on Sundays.

That there is nothing impracticable in the granting of third-class season tickets, is shown by the example of the Midland Railway. This line, as is well known, has no second-class, but its first and third-class passengers are treated with perfect equality with regard to season tickets. What is urgently needed is cheap workmen's trains throughout the day, and failing this, the issue of third-class season tickets, at cheap rates, in proportion to the other classes.

In regard to general statistics, it may be interesting to know that an average of about 25 houses per acre are built upon the estate, including space for roads, and that the population is at the rate of about seven people per house, so that when it is completed it will contain a population of about 17,500. There will then be over five miles of roads and streets formed. The outlay including the land, up to the present time has been about 460,000*l.*, and the net income is now about 21,000*l.*, so that the estate (though only about half developed) already pays over 4½ per cent. The estate is one of four held by the Artizans, Labourers', and General Dwellings' Company (which holds other properties), whose assets are over 2,000,000*l.* sterling. The company has for years paid a dividend of 5 per cent. to its original shareholders, and the shares are now issued at a premium of about 10 per cent. to pay 4½ per cent. dividend. The market price of the stock is above this.

I trust I have now demonstrated the possibility of providing for our industrial classes bright, cheerful, well arranged, commodious, healthy and self-contained cottage homes under the best sanitary conditions, at a cost which will adequately remunerate the promoters of such good work.

Block Dwellings for the Industrial Classes.

BY

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for St. Pancras.

Of all the classes into which the people may be divided, those that give rise to the most difficult sanitary, social, and economic problems are, proceeding from below upwards, the pauper, the residuum, and the working classes. The housing of the pauper is undertaken by the State; the distinguished efforts of Miss Octavia Hill and other philanthropists are directed towards ameliorating the dwellings and habits

of the residuum, the most difficult class to deal with from the variability of type and condition; whilst public companies and private individuals are engaged in constructing improved dwellings to house the working classes and gather them out from herding in tenement houses among the residuum.

In order to keep within reasonable bounds it is necessary to limit working-class dwellings to unfurnished dwellings consisting of from one to three, or, possibly, four rooms, generally let on weekly tenancy, at rentals of from 2*s.* or 2*s.* 6*d.* to 7*s.* 6*d.*, or perhaps even to 10*s.* This will include tenement, cottage, and block dwellings.

Dwellings in "made down" or "tenement" houses, houses originally constructed for occupation by one family, but let out in separate tenements to two or more families, have for years engaged the efforts of sanitarians for their improvement by adaptation, or their displacement by demolition.

The type of the true cottage-dwelling is the cottage with or without upper floor, self-contained, and occupied by only one family, although it is not difficult to apply this term too narrowly. These dwellings still exist in large numbers in the metropolis, but their construction and surroundings are the very antithesis of suburban cottage-dwellings, and they may in most cases be added to the category of desirable demolitions.

Block dwellings, on the other hand, are understood to comprise sets of dwellings super-imposed one above the other on the same base, possessing a common stair, and differing only from residential flats in length of tenancy, rental, and accommodation. Under the present inadequate restrictions as to construction, not a few recently constructed dwellings of this type are nearly as unsatisfactory as the dwellings they have displaced. But the majority are well-built, and it only requires the framing of bye-laws, and their due enforcement in the construction of this class of buildings, to ensure that in future all shall be constructed with due regard to health. This is a subject which urgently needs the attention of the legislature.

In Mr. Charles Booth's recently published work on Labour and Life of the People, Vol. II., London, the existing block dwellings of the metropolis have been classed in various categories, of which the following is a summary:—

Light, Air, and Sanitation.	Blocks.	Tenements.	Population.
"Very bad" and "bad" - -	115	6,850	37,011
"Fair," "good," and "very good" -	360	28,921	151,197
TOTAL - -	475	35,780	189,108

To provide for increase of population, cottage-dwellings on new estates in the suburbs or the country, coupled with cheap and expeditious transit, are most desirable.

But in order to promote the health and comfort of town dwellings, the demolition of permanently insanitary and overcrowded dwellings and of houses falling into dilapidation and decay is necessary, and it is then a question of utilising the site. If the site is to be devoted to other purposes, then provision for a number of persons equal to the population displaced may be made by the erection of cottage-dwellings in the suburbs, for instance, in demolitions made for railway purposes. If, on the other hand, new and improved dwellings are to be erected upon the site, these may be either cottage or block dwellings.

The effect of clearing small areas appears to be, firstly, to displace all grades of occupants alike, and to re-distribute them in the surrounding neighbourhoods, and, secondly, when the new and improved dwellings have been erected, to set up a reverse current by which the better grades are drawn into the new buildings, leaving the indifferent and inferior in occupation of the older buildings on the areas surrounding the site cleared; whether the new buildings be urban or suburban the same process of re-allocation takes place.

It cannot be doubted that the air and the surroundings of the suburb are more beneficial to the health, especially of growing children, than those of the town; but the disadvantages of distance make themselves appreciably felt in the expenditure of time, energy, and money on travelling, the relaxation of family ties, and the curtailment of home life, the husband and other members of the family taking meals away from home, the frequent loss of work if the exigencies of occupation require the worker to be at short call, the long absence in occupations entailing exceptionally early or late hours, the increased expenditure in the family marketing, the extra cost, &c., if other members of the family besides the husband work away from home, and other disadvantages.

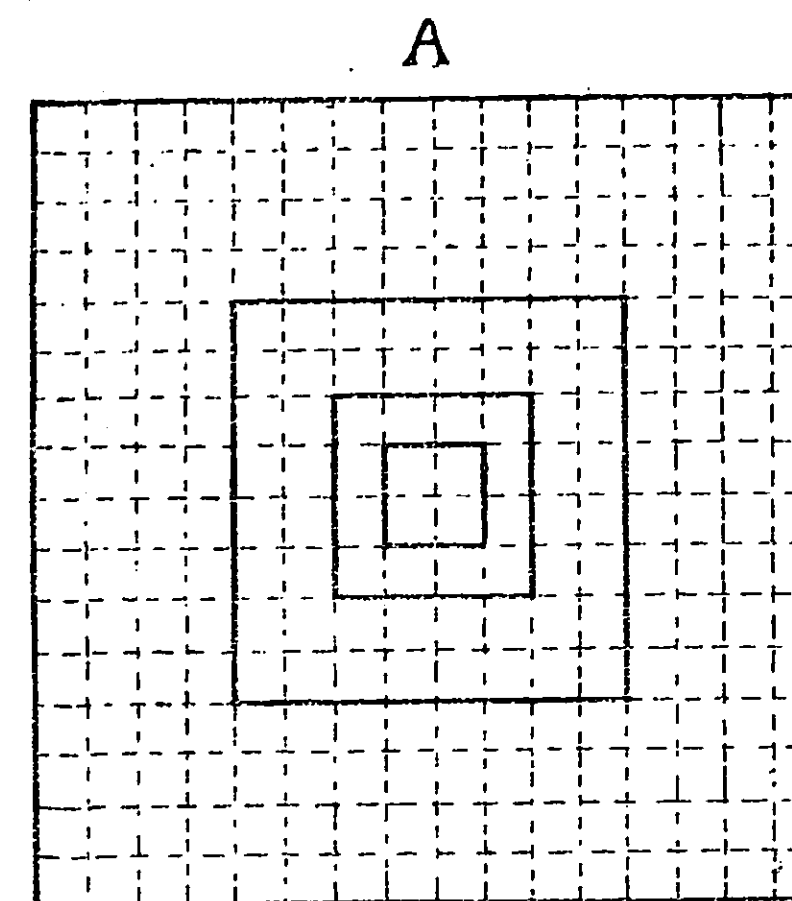
The success of suburban villages shows that these disadvantages may be overcome, and that the conditions may be made to fit the occupations of certain classes; but, on the other hand, the evidence of representative working men before the Select Committee of the House of Commons inquiring into artisans' and labourers' dwellings went to show that to many classes of workmen the disadvantages of distance were insuperable, and these classes must be housed upon the cleared sites, whether cleared by public undertaking or by private enterprise.

It then becomes a question whether small or large buildings should be erected upon the site. To erect cottage-dwellings in the centre of cities would be costly, and would place the rental beyond the reach of the classes for whom they are intended. Besides, the overcrowded condition would be reproduced in housing the same number of persons on the same area, or a large proportion must remain unprovided for.

The object to be aimed at is to diminish the crowding by expanding the population through a greater amount of cubic space with increased light and air; and, whilst reconstructing, to provide improved sanitary arrangements, and to so dispose the dwellings as to enable them to be effectually supervised and protected.

The first consideration, therefore, is the amount of cubic space enclosable on square space.

The square space required for a cube to stand upon so that it may be surrounded by a square open area equal in width to half its height, (assuming that contiguous cubes would provide the other half, so as to complete a width of surrounding area equal to the whole height) would be twice the length of the base or side of the cube squared, $(2S)^2$: whilst the capacity of the cube would be the length of the side cubed, $(S)^3$.



Length of Side (S).	Cubic Capacity $(S)^3$.	Square Space required $(2S)^2$.
10 feet.	1,000 cubic feet.	400 square feet.
20 "	8,000 "	1,600 "
30 "	27,000 "	3,600 "
40 "	64,000 "	6,400 "
50 "	125,000 "	10,000 "
60 "	216,000 "	14,400 "
70 "	343,000 "	19,600 "

So that a cube containing 64,000 cubic feet would require only 16 times instead of 64 times the area of square space required by a cube containing 1,000 cubic feet,—a simple and striking illustration of the gain of cubic space upon square space by increase in size under similar conditions. The effect upon the construction of buildings, although following parallel lines, is not such a simple deduction; but upon the same area and under the same conditions a much larger proportion of cubic space to square space may be enclosed by increasing the size of building, and the dwelling space may be further increased by the economy of staircase space and terrace construction in erecting rows of blocks.

In order to estimate the comparative amount of cubic space enclosable in actual building it is desirable to briefly consider the height, depth, length, and spacing of blocks.

The height of rooms must be proportionate to size for the purpose of lighting and ventilation. Windows materially influence the height; it is undesirable to have windows that cannot conveniently be seen through or be easily manipulated. A window six feet high is ample, and if the bottom rail be not more than $3\frac{1}{2}$ feet from the floor, and the top nearly reach the ceiling, as it should do, we have a height of over 9½ feet. Even half underground rooms are restricted to a height of 7 feet, a very minimum. Sir Douglas Galton considers it desirable in small rooms to obtain a height of 10 feet to facilitate ventilation. Increase of height beyond what is necessary and desirable increases the number of stairs required to reach the next floor and diminishes the number of storeys, or renders it necessary to increase the elevation, in either case increasing the proportionate cost. So that about 10 feet may be assumed as a good standard for moderate sized dwelling rooms. Whatever the height adopted, it is not desirable that the rooms in the upper storeys of a block should be of less height than those of the lower.

The number of storeys is obviously governed by the height of the rooms and the total height of the building.

The total height of blocks is limited by many considerations. It is highly desirable, almost necessary, that a street should run between every alternate row of blocks. Although in the metropolis in old streets, houses can be and are being constantly raised to heights out of all proportion to the intervening space, no new street can be formed of less width than 40 feet, and no new building which shall exceed in height the width of the street can be erected on the side of a street less than 50 feet wide. Last year only, a clause was introduced into a General Powers Act of the County Council limiting the total height of buildings to 90 feet. So that, provided it does not exceed 90 feet, the height of buildings is under no legislative control, except in new streets between 40 and 50 feet wide. With increased height, difficulty of access to the topmost storeys increases, and the rentals tend to diminish. There is additional cost for increased strength of construction, and the gain in cubic space in proportion to square space tends to diminish. Beyond a certain height lifts would be required, the construction and working of which would add to the cost, and endanger the lives of the large infant population prevalent in these buildings. There is a height beyond which it is on all counts false economy to build. So that blocks would be limited to a height of from 40 to 60 feet, or to four or six storeys of 10 feet; practically the latter is about the present maximum limit.

The depth of a room according to Trélat should not exceed one-and-a-half times the height from the floor to the top of the window. This would give an incidence of 30° to the rays of light reaching that portion of the floor furthest from the window; if an angle of 45° were required the depth would equal the height. According to the latter, a room 10 feet high would be 10 feet, and to the former 15 feet deep as a maximum. The depth of ordinary double fronted terrace houses may be roughly taken as varying from 25 to 35 feet, and by doubling the maximum assumed depth of a single room, as above, a depth of 30 feet is reached.

There is no advantage in constructing rooms for the working class families of a width or length in the line of frontage requiring more than one window to adequately light them, and it is highly desirable that they should not exceed a length that can be adequately lighted at the sides. The incidence of light entering horizontally impinges on the lateral walls at an angle of 45° , the dark angles on each side of the window diminishing or increasing as the side walls approach or recede, and the width of the room must be governed more by the width and situation of the window than by the height or depth of the room.

Block dwellings encourage increased length as well as depth of rooms on account of the greater economy of ground space obtained in many storeyed as contrasted with single-storeyed buildings. Firstly, because the initial ground space occupied by the increased area of the building serves a number of storeys, whereas in single-storeyed buildings increased area of the building requires a correspondingly increased amount of ground to be covered for each separate building. Secondly, because the greater the area of building served by a single staircase, the greater the economy of staircase space. So that the length of a single block is limited by the number of consecutive rooms accessible from the same staircase.

The healthiest condition of construction is that in which through ventilation, or perfation, may be obtained. Blocks may be so constructed as more or less to reproduce one of the bad features of back to back houses. Corridors and lateral passages are undesirable, and it is also undesirable that bedrooms should become passage ways to rooms beyond; these considerations limit the number of consecutive dwelling-rooms on either side of the staircase.

The length of a row of blocks is limited by the length of the ground area, but it is also desirable that the blocks should not be more numerous than the superintendent can efficiently supervise and protect.

It is unnecessary to enter here into the disadvantages and unhealthiness of single-fronted dwellings, especially when erected in terraces, from the absence of rear space and of through ventilation or interior perfation. This is exhibited in its worst form in back to back houses, when two rows of single-fronted dwellings are erected with their fronts facing in opposite directions, the same back party-wall serving both rows, and a public street running along each front. Given the principle that the fronts of all buildings should face open spaces proportionate to the height of the buildings and along their whole length, and that the rear space should not only remain open, but should not be converted into a public thoroughfare (a most important point), there is no economy of ground space in constructing single-fronted buildings, whether they are back-to-back or not.

Out-buildings, towers, or projections abutting at right-angles to the line of frontage are objectionable by impeding light and air on either side, in proportion to the distance they advance from the main front, and according to orientation. On the other hand, there is great advantage in being able to obtain cross-ventilation and cross-light between the main building and the projection when this contains the sanitary

arrangements. Where such projections are constructed an additional amount of open space should be required in proportion to the projection, and the projection should not be allowed to advance so as to obstruct exterior perfilation, and on no account so far as to close up the stretch of open space, whether in front or at the rear, forming a cul-de-sac in either case, the one of the courtyard and the other of the street, nor should terraces be permitted to abut directly upon one another at right angles. Orientation also will necessarily affect the lighting, the least obstruction to the sun's rays being presented by buildings running north and south.

Terraces of blocks being double-fronted, both rear and front should face open spaces proportionate in width to the height of the buildings. The question whether this proportion should be equal to the height, according to Dr. Clement; or to one-and-a-half times the height, according to Dr. Trélat; or should vary with latitude and orientation, according to Adolphe Vogt; or with city zones according to Von Gruber; was discussed at the Vienna Congress, and remains undecided. But that the width of open space on both frontages should be proportionate to the height of the dwellings is accepted, and anything less than a width equal to the height of the building above ground level would be unacceptable to hygienists.

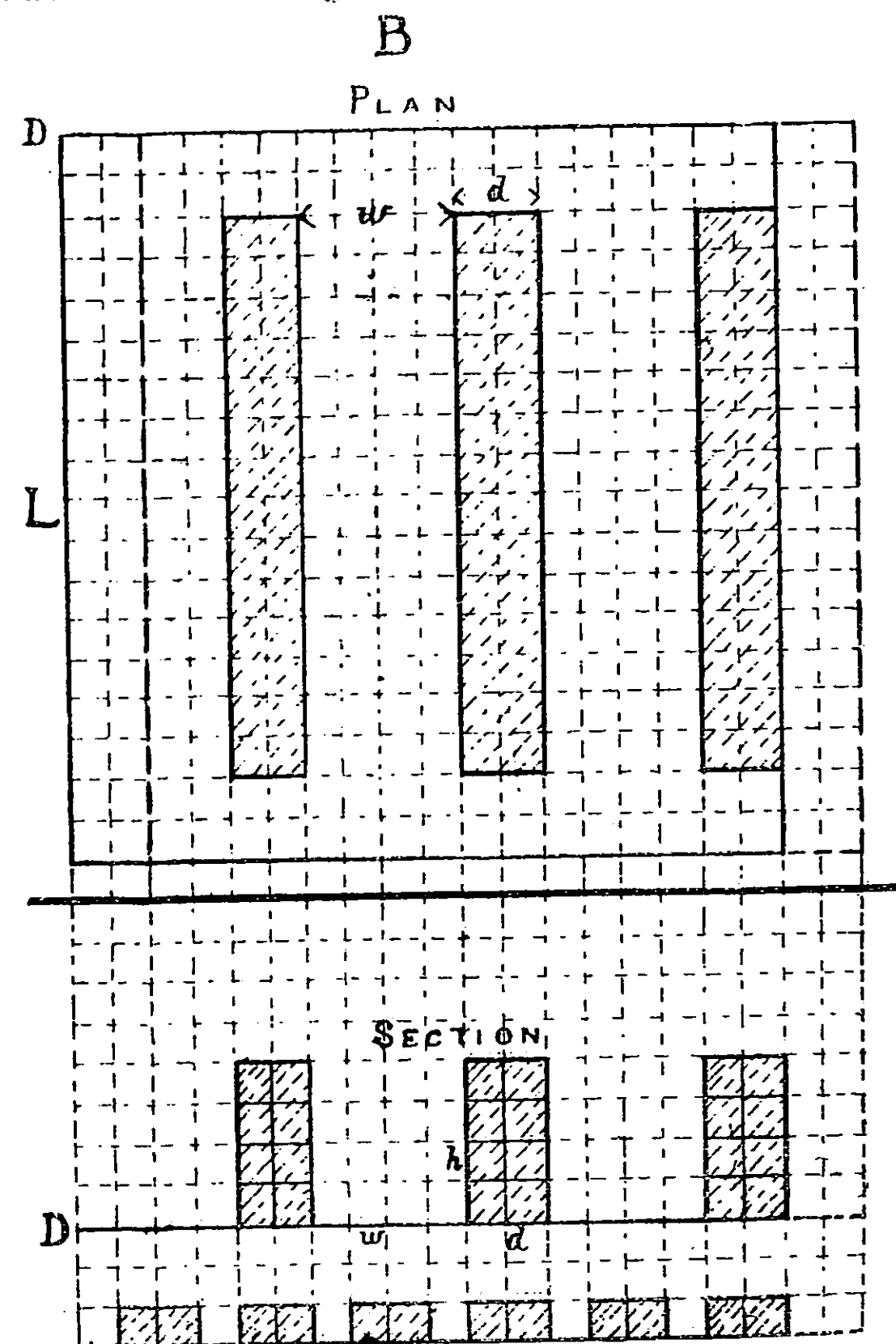
The reckless manner in which at the present moment blocks of dwellings are being erected, with an utter disregard for this provision of light and air, calls most urgently for legislative restrictions in the construction of this class of buildings.

Present metropolitan legislation, so far as front space is concerned, only affects buildings in new streets, and new streets are few and far between in London; furthermore, it does not affect streets over 50 feet wide. So far as rear space is concerned, it only provides for a space 10 feet wide extending the length of rear fronts of buildings from 15 to 30 feet wide, 450 square feet being held to suffice for any length over 30 feet, but even this inadequate provision is inoperative when the site has previously been occupied in whole or in part by buildings; and, furthermore, when it does become operative it permits the whole of the open space to be built over up to the level of the first floor.

The growing antipathy of philanthropists to block dwellings is greatly justified by the dread of the ultimate effects of the total absence of any restrictions as to this class of buildings erected on old sites. The crusade against insanitary dwellings, without adequate restrictions upon the buildings that will replace them, may make the last state worse than the first. The attitude of antipathy must become one of sympathy, and the efforts of sanitarians and philanthropists should rather be directed to righting the wrong as soon as possible.

Having briefly considered the conditions of construction, we may now proceed to calculate the relative amount of cubic space enclosable on a rectangular area under varying conditions of height of building. Such a calculation would only apply to a small area, at the most limited to a few acres, for in a larger area other factors would be introduced which are beyond present consideration.

When superimposing dwellings one above the other, for every additional floor or storey, the floor area of the storey is economised, and it is only necessary to provide space equal to the areas of the two fronts. One interspace will serve the opposed fronts of two blocks, that is, each block will have on either side of it one-half the amount of open space due to it, and the width of open space to be calculated with each block will be proportionate to the height and number of the storeys; the same applies to the ends of the rows of blocks. Therefore, the depth of the block, plus the width of the open space on one side, will equal the depth of total space occupied by one block, and this divided into the total depth of the area will give the number of blocks. Assuming that the length of the blocks is equal to the length of the area, less the space required at each end, and that each storey or stage is of the same height, then the cubic capacity of one block multiplied by the number of blocks will give the total cubic space enclosable.



Let it be assumed that the total area is 500 feet by 250 (about 2·87 acres) the former being the depth, the latter the length coinciding with the long axis of the buildings; that the depth of each block is 30 feet, allowing two rooms each of 15 feet deep; that the height of each floor is 10 feet; and that the width of intermediate space is equal to the height of the blocks.

(1.) The first step is to find the number of rows of blocks.

Let D = total depth of area;

d = depth of one block;

h = height of one storey;

n = number of storeys;

w = width of one interspace;

then $w = h$ and $\frac{D}{d + nh}$ = number of blocks.

If 1 storey high - $\frac{D}{d + h} = \frac{500}{30 + 10} = 12\cdot500$ rows of blocks.

„ 2 storeys „ - $\frac{D}{d + 2h} = \frac{500}{30 + 20} = 10\cdot000$ „

„ 3 „ „ - $\frac{D}{d + 3h} = \frac{500}{30 + 30} = 8\cdot333$ „

„ 4 „ „ - $\frac{D}{d + 4h} = \frac{500}{30 + 40} = 7\cdot142$ „

„ 5 „ „ - $\frac{D}{d + 5h} = \frac{500}{30 + 50} = 6\cdot250$ „

„ 6 „ „ - $\frac{D}{d + 6h} = \frac{500}{30 + 60} = 5\cdot555$ „

„ 7 „ „ - $\frac{D}{d + 7h} = \frac{500}{30 + 70} = 5\cdot000$ „

(2.) The second step is to find the cubic capacity of one row of blocks.

Let d = depth of one block;

h = height of one storey;

n = number of storeys;

L = length of area;

then $d \times nh \times (L - nh)$ = cubic capacity of one row of blocks.

cub. ft.

If 1 storey high - $d \times h \times (L - h) = 30 \times 10 \times (250 - 10) = 72,000$

„ 2 storeys „ - $d \times 2h \times (L - 2h) = 30 \times 20 \times (250 - 20) = 138,000$

„ 3 „ „ - $d \times 3h \times (L - 3h) = 30 \times 30 \times (250 - 30) = 198,000$

„ 4 „ „ - $d \times 4h \times (L - 4h) = 30 \times 40 \times (250 - 40) = 252,000$

„ 5 „ „ - $d \times 5h \times (L - 5h) = 30 \times 50 \times (250 - 50) = 300,000$

„ 6 „ „ - $d \times 6h \times (L - 6h) = 30 \times 60 \times (250 - 60) = 342,000$

„ 7 „ „ - $d \times 7h \times (L - 7h) = 30 \times 70 \times (250 - 70) = 378,000$

(3.) The third step is to find the total cubic space enclosable.

Let N = number of rows of blocks;

C = cubic capacity of one row of blocks;

then $N \times C$ = total cubic space enclosable on the area.

If 1 storey high - $12\cdot500 \times 72,000 = 900,000$ cubic feet.

„ 2 storeys „ - $10\cdot000 \times 138,000 = 1,380,000$ „

„ 3 „ „ - $8\cdot333 \times 198,000 = 1,650,000$ „

„ 4 „ „ - $7\cdot142 \times 252,000 = 1,800,000$ „

„ 5 „ „ - $6\cdot250 \times 300,000 = 1,875,000$ „

„ 6 „ „ - $5\cdot555 \times 342,000 = 1,900,000$ „

„ 7 „ „ - $5\cdot000 \times 378,000 = 1,890,000$ „

On this area 500 feet by 250 feet, equal to 2·8787 acres, the amount of cubic space enclosable per acre, would be—

1 storey high - 312,641 cubic feet.

2 storeys „ - 479,383 „ - 53·3

3 „ „ - 573,175 „ - 19·5

4 „ „ - 625,282 „ - 9·1

5 „ „ - 651,335 „ - 4·1

6 „ „ - 660,020 „ - 1·3

7 „ „ - 656,546 „ - 0·5

} Increase per cent.

On the above area buildings four storeys high would enclose double the amount of cubic space of buildings one storey high under the same conditions.

On a larger area the increase of cubic space would be proportionately greater. For instance, if the area were double the depth and length (11·4784 acres), then under the same conditions the following would approximately be the amount of cubic space enclosable per acre:—

1 storey high - 320,220

2 storeys high - 501,950 = 56·7

3 „ „ - 614,300 = 22·3

4 „ „ - 687,000 = 11·8

5 „ „ - 736,000 = 7·1

6 „ „ - 766,650 = 4·1

7 „ „ - 786,800 = 2·6

8 „ „ - 798,450 = 1·4

9 „ „ - 803,800 = 0·6

} Increase per cent.

So that, given an area, the greatest amount of cubic space enclosable with due regard to health provisions may be calculated, and the cubic space adopted as a uniform standard more valuable than the mere number of tenements, or of rooms, or the square space, as a basis of calculation for the size of block buildings, cost, accommodation, density, and mortality. And in proportion to the cubic space enclosable the number of persons housable on an area may be calculated.

Restriction of time will only allow of a brief but sufficient reply to the prevalent objections to blocks.

It has been urged that block dwellings are, from their unsightliness, repellent to the classes sought to be attracted; but it is a poor compliment to the resources of architects to attribute to them inability to provide embellishment at moderate cost by beauty of form, colour, and ornament. The objection that the working classes avoid them on account of their collective arrangement, and the objection that a class superior to those they are intended for takes possession of them, as well as the fact that residential flats are in favour may be left to the objectors

to reconcile with the construction of the dwellings and the habits of occupants.

It has been anticipated that blocks may rapidly deteriorate; but when substantially constructed, with due regard to sanitary and social requirements, their condition will depend upon efficient supervision and maintenance. Under proper management the one roof, drain, staircase, water-supply, gas service, &c., upon which so many are dependent is less likely to remain defective or unremedied than when under less direct supervision, and with fewer to complain, as in smaller buildings. Only improper usage can cause deterioration, and this applies equally to the small as to the large building.

The staircase open to the street is rightly regarded as a most objectionable feature. The staircases of tenement houses whose front doors are rarely closed are largely accountable for the defilement and destruction in this class of houses, and the same deterioration will ultimately doubtless take place in the blocks which replace them. It is necessary to distinguish between being open for the purpose of light and air, and being open to the access of any and everybody who chooses to enter. The former is as highly beneficial as the latter is detrimental. The staircases should open into the intervening space between the rows of blocks, but there should be only one public or main entrance to the courtyard or garden of block dwellings, and this should be directly under the control of the superintendent. The legislature is largely responsible for these open staircases, by the unreasonable manner in which the inhabited house duty is assessed, which compels the staircase to be open and form part of the street in order to claim exemption for the dwellings under 20*l.* a year (7*s.* 8½*d.* per week) rental. This is a condition that urgently requires alteration.*

Apart from the influences of town life, is there any reason to suppose that block dwellings are *per se* unhealthy? Residential flats are not held to be less healthy than self-contained houses. Provided that the proportion of open to covered space is adequate to permit of proper access of sunshine and daylight, of sufficient aëration and perfusion, increased height of building can scarcely cause any direct injury to health. On the other hand, the conditions of life are dissimilar in cottages and in blocks in important respects.

In block dwellings the families, and especially the children, are brought into closer and more frequent contact, and the sanitary arrangements are under more constant supervision. The effects of these conditions upon the mortality, as compared with London generally, have been most ably demonstrated in a paper upon the vital statistics of block dwellings read before the Royal Statistical Society in February of this year by Dr. Newsholme. He showed that, notwithstanding that the age-distribution of population in Peabody buildings was much less favourable to a low mortality than in London as a whole, the death rate was 2 per 1,000 lower, and that the birth-rate was much higher,

* The Customs and Inland Revenue Act, 1891, which has only just become law, indirectly removes the obstruction hitherto existing to the construction of block dwellings with one main entrance under the superintendent's control.

and the infantile mortality much lower than in all London. But that the death-rate of children between one and five years of age was higher, and was caused by scarlet fever, diphtheria, and still more largely by whooping cough and measles, diseases to which children are so prone, and which are communicated mainly by direct infection. In this respect the social condition induced by block dwellings resembles schools, and is equally remediable. Another point elucidated was the influence exerted by the greater supervision of sanitary arrangements, in the fact that the death-rate from typhoid or enteric fever was one-half that for all London, and it is well recognised that this disease is the best test of sanitary conditions available.

Time, again, will not permit of the consideration of the various classes of block dwellings, but the distinction between dwellings with private sanitary and domestic conveniences and those with conveniences in common is important, as it materially affects the social conditions, as well as the cost, and also the cubic dwelling-space available. The higher aim should be to construct blocks of "homes," the expression so aptly used by Mr. James Moore, the well-known secretary of the Improved Industrial Dwellings Company. This may be supplemented by baths and wash-houses supplied with hot and cold water and hot drying closets, a mortuary, means of isolation for minor infectious ailments, possibly a reading and a recreation room, or any addition that may make the workman's quarters in towns desirable residences according to the rental he can afford; and efficient regulations must be trusted to complete the work.

The high price of land impels private individuals and companies to erect block dwellings in great cities; but there is a limit to the size of these blocks, especially in height, as I have shown; with each storey of the building raised the economy of space increases in a correspondingly diminished proportion, so that the ratio of height of building to width of interspace being fixed, economy will self-impose a limit to the size of block dwellings.

The conditions of construction requisite to secure adequate light, air, space, and sanitation, in order to prevent injury to health may be defined. The maximum amount of cubic space encloseable on a given area in accordance with these conditions may be calculated. In proportion to the cubic space enclosable, the maximum population housable on a given area may also be calculated. But in the construction of block dwellings, the requisite conditions should not be permitted to be infringed, and to insure that these conditions will be observed, their construction should be controlled by special legislative enactment, imperial or local.

The reasons for demanding special legislation are various. All buildings, whether inhabited or not, are controlled by special legislation, but the requirements, and particularly those for open space, are totally inadequate for dwelling-houses of large size. Large blocks of dwellings, such as workhouses, prisons, asylums, barracks, &c., are erected under the responsible supervision of governmental or public authorities, which ensures due provision with regard to health being made; but no special

control is exercised to prevent irresponsible individuals from erecting a class of block dwellings inferior to the dwellings they displace. By special permissive enactment, the Government has provided in the Public Health Acts Amendment Act, 1890, that a building not originally constructed for dwelling purposes shall not be occupied as a dwelling unless it satisfy the requirements of the surveyor, but there is no definition of what these requirements are or should be. Factories are controlled by special legislation. Special legislation, again, has been created for the exemption of block dwellings from inhabited house duty, and upon medical officers of health the onus has been thrown of certifying that these buildings are constructed with proper provision for health, but there are no definitions of the conditions that entitle to this exemption. The Housing of the Working Classes Act, 1890, deals with houses unfit for human habitation, but there is a wide margin between the absolute unfitness of existing structures and the requirements necessary for future erections.

In order, therefore, to enable the special legislation already created in regard to existing block dwellings to be complied with, and also to prevent such dwellings from being erected in future in a manner prejudicial to the public health, special legislation to control the construction of block dwellings for the industrial classes in cities is indispensable.

Two and Three-Storeyed Tenements for the People.

BY

LOCKE WORTHINGTON, A.R.I.B.A.

The following remarks and figures are an effort to assist in showing the desirability and to prove the commercial possibility of constructing in our crowded centres of population isolated model homes for the weekly-wage-earning classes, in buildings of two and never more than three storeys in height, in accordance with certain arrangements of planning.

Although it may be well that philanthropy should be the motive in all schemes for the housing of the people in the metropolis or other centres of population, their execution should be based on a sound commercial foundation, and the rental of the buildings such as to secure a reasonable dividend. True philanthropy dictates the desirability of low tenement houses, and I have worked out two schemes to prove their commercial possibility.

The various commercial companies and other agencies which are employed in the metropolis in improving the dwellings of the weekly-wage-earning class have almost invariably erected blocks of tenements three, four, five, six, and even seven storeys in height, so arranged as to

crowd the greatest accommodation on the site, with often but little consideration for proper light and air, and constructed so as to save expense by the provision of common entrances, staircases, and conveniences. Many of these model blocks in London are excellently planned and built, while some are so arranged and constructed as to be no better than the condemned houses they replace.

It is not the province of this paper to enter into the merits and drawbacks of these existing metropolitan model blocks, which are being laid before the section by other members.

It would be well for the community if the 30 metropolitan agencies were to work more in the spirit of the following suggestions, which have already been tried, though not to any great extent, in the metropolis:— (1.) To buy up and put in order the existing dilapidated cottage tenements to be found in almost all localities of the metropolis. (2.) To construct in the suburbs, off the regular line of street traffic, two-storeyed houses at a rental within the reach of the classes earning low weekly wages. (3.) To erect in the metropolis new model tenements, never more than three storeys high, and, in so far as possible, private isolated homes.

With regard to No. 1, viz., the improvement of existing small houses:—If well carried out and superintended, Miss Octavia Hill's plan of purchasing houses, purifying them, and fitting them for habitation, is excellent and beneficial in all ways. With rentals varying from 2s. to 10s., the cost of accommodation per family has been 118*l.* to 130*l.*, and the undertaking pays an average of 4 to 5 per cent. On the other hand, the cost of accommodation for families in such model blocks as are to be found in Farringdon Street, for instance, varies from 171*l.* to 315*l.*

With regard to No. 2, viz., the construction of suburban dwellings:—There is an estate in South Bermondsey which provides the following luxurious and private homes for 6s. 6*d.* The houses are built for two families, each tenant being responsible only for his own tenement, which consists of a parlour, bedroom, kitchen with the best kind of kitchener, and scullery with fireplaces, copper, sink, &c. With the exception that one tenement is above and the other on the ground floor there is no difference between upstairs and downstairs, and the homes on the first floor are so planned that the upstairs occupiers can, if they wish, keep themselves entirely private. On a similar principle, but with less luxury, suburban houses should and could be built at a rental of 3s. to 4s. 6*d.* Such homes are undoubtedly the most popular if the workman can arrange to live in the locality.

In support of No. 3, viz., the construction of cottage homes in the town, let me say that the existing model blocks often do not let well in localities where small houses enter into competition, even where the dilapidated condition of such houses may be both injurious and uncomfortable. Tenants prefer an uncomfortable cottage to a tenement in a large block of dwellings.

I have taken some pains to interview the superintendents and tenants of many model blocks in the metropolitan area, and also the

tenants in many of the dilapidated houses of our side streets, and almost invariably they state that they have a deeply-rooted dislike to living on the same staircase as 20 other families, who may or may not be respectable, and consider moving into "the buildings" as only a step better than going into "the house."

Estimate proving the commercial possibility of isolated houses in parts of the metropolis being buildings constructed only two stories in height.

CAPITAL ACCOUNT.

	£	s.	d.
Contractor's tender for building 200 cottage homes complete, according to drawings, specifications, and quantities -	29,000	0	0
Add for unforeseen extras and fees -	2,500	0	0
Total building capital required -	£31,500	0	0

ANNUAL EXPENDITURE.

Annual rental of land at $2\frac{1}{2}d.$ per sup. foot per annum -	616	10	0
Maintenance, on precedent of properties in the neighbourhood of Whitechapel, including rates, taxes, repairs, collection, management, empties, arrears of rent, &c. -	951	0	0
Sinking fund -	40	0	0
Total maximum annual expenditure	£1,637	10	0
Total income from rents -	2,795	0	0
Total expenditure -	1,637	10	0
	£1,157	10	0

This return of nearly 4 per cent. would become a safe $4\frac{1}{2}$ to 5 per cent. if the tenements were three instead of two storeys high. The rents average 2s. 6d. a room, the majority being two-room tenements. The homes are isolated, and the accommodation is liberal.

The above figures are based on competitive tenders procured from contractors in the spring of 1890 on definite sites, in order to verify the statements made in the author's pamphlet "The Housing of the Poor in London," April 1890, which was a plea for 'Cottage Homes' in the Metropolis.

DISCUSSION.

Mr. E. Bond, M.A., Hampstead, speaking on the question of flat roofs, said that people would not use them. They were difficult to keep dry, and expensive in plumbing. Architects had put up a number of buildings with flat roofs, but somehow they did not take. With regard to the cottage-dwellings advocated by Mr. Rowland Plumbe, he was glad to hear so pleasing an account of the experiment at Noel Park, but he regretted the mention made of Miss Octavia Hill, because the latter did not go so far as Mr. Plumbe, although that lady had undoubtedly a *penchant* for cottage-dwellings. He knew a lady who had lived for a considerable period in a block of dwellings, and who spoke of them very highly. He was of opinion that when such dwellings were properly looked after, the objections commonly brought against them would be found to have no good foundation, but the lady admitted that the system would break down if anybody who chose to pay the rents demanded were admitted. A proper superintendent and proper regulations were necessary, and the regulations must be enforced strictly, as in city residences they always were. He was not an advocate for surrounding London with groups of houses such as Noel Park. London might be considered a huge wheel, of which the lines of communication were the spokes. Noel Park was on one of the great lines of communication, and if such groups continued to be multiplied they would soon have crowded agglomerations in certain spots with great open spaces intervening. London was made up of a number of once separated villages, now in process of time connected. The cottage-dwelling, which had usually one story above the ground-floor, was the commonest type of London house, and if, as had been stated, there were only 200,000 persons dwelling in the blocks, they were not likely just yet to oust the cottage-dwellers. With regard to block dwellings, he did not think there was much in the noise or in the height objection. A more formidable objection was the want of proper spacing. If the sites were of sufficient area for the number of blocks to be erected, the ground-floors ought to be as light as the upper floors. There was an enormous difference in the price of sites in different parts of the metropolis. He knew of sites where the price of the land would reduce the ground-rent per room to 3d., 3½d., or 4d., while other quite similar sites, bought in the ordinary market, would cost 7d. per room.

Mr. Noble Smith, F.R.C.S. Edin., said that the last speaker declared that the flat roof had been tried as an experiment, and had failed. That might be only because it had not been sufficiently tried. They could not hope to influence much the formed habits of the adult; it was the young whose habits they might be able to reform. A most prolific cause of disease and death among children was due to rickets. It had always been found that as opportunities of getting exercise in fresh air increased, the tendency to rickets diminished, and that disease alone was the cause of so large a proportion of all ailments that it was worth a great effort to reduce it. Nine-tenths of the cases of accidents treated in hospitals were accidents occurring in the streets—children run over or knocked down by vehicles. The effluvia of the streets was injurious, and rendered them very undesirable places for recreation.

Mr. Ralph Nevill, F.S.A., pointed out that much of the unhealthiness of back streets had passed away through the introduction of asphalt. All back streets and courts should be asphalted. The whole life of people living in courts had been changed by asphalt. Concrete

might be successfully employed for flat roofs, but nothing was so likely to be permanent as asphalt. The principal objection he had to urge against flat roofs was that there was no society there. The cottages that surrounded our village greens in England were among the great beauties of English landscape. Block dwellings were not attractive to country people, and such people would not go on roofs. With regard to spacing, he agreed with Dr. Sykes, and pointed out how the latter's arguments might be strengthened.

Mr. J. P. Seddon, F.R.I.B.A., said that London was no place for factories, and some day when we had stilled an archbishop, we should find that out. London would be greatly improved if through the squares, which at present seemed to be given up to cats, they were to drive wide boulevards.

Mr. S. M. Burroughs pointed out that in New York City the upper floors were more sought after, and obtained higher rents, than the first and ground floors. A higher value was placed upon the flats the higher you went up. The houses were higher, and had a larger number of floors than those known to our builders. The high price of land was the cause. It was the public that had given the high value to the land, and yet the public were not allowed to have any share in the profits. On the contrary, it had to pay more and more as the increment grew, to persons who had not earned it.

Mr. Hooper (Director of the Victoria Dwellings Company) referred to the paper on "Block Dwellings," and to the objections commonly urged against them. One of the best-founded objections was the great height of the buildings. They caused draughts of cold air in the streets below, and shut off from them the rays of the sun. It would be an improvement to increase the size of the windows. He had had some experience of the use of flat roofs as playgrounds. It was not of a favourable character. The tenants at the top were inconvenienced by the noise, and gave notice to quit. The Company had been obliged to forbid the use of the roofs for playgrounds. It was very difficult to keep such roofs watertight. The erection of blocks of dwellings, in places till then occupied by small houses, had often been found beneficial to a district. One such district, which had always been a terror to the police, on being cleared and the site occupied by blocks of dwellings, had been rendered quiet and tranquil.

Mr. H. L. Beckwith (Liverpool) wished to mention some of his Liverpool experiences of blocks of dwellings in the Scotland-road district. Large numbers of people of the lower class had been cleared out of small old houses and sent into blocks, but it was found that they would never buy coals as long as the doors and windows were intact. If Dr. Sykes could suggest a remedy for that, they would be greatly obliged to him.

Mr. Councillor Hannam (Leeds) agreed that it was very difficult to make flat roofs watertight, and he regarded them as things of the past. With regard to small houses, he said they had in Leeds a large number of back-to-back houses. They admitted that such houses were bad in principle. They could forbid them, but to do so would be as useless as to forbid the putting up of walls anywhere round about Leeds. The Council must pass the plans sent in, if they fulfilled certain conditions. They had 50 blocks of dwellings, each of eight buildings in a block. He was glad to welcome the remark that the width of the street should be in proportion to the height of the houses.

Mr. H. H. Collins said he did not wish it to go forth that the section approved of building back-to-back houses, which stood condemned by the whole world. As to block dwellings, a great objection to their use was exactly what Mr. Bond had said, though with different intent. Mr. Bond had pointed out that it was requisite to carefully select the tenants, as, otherwise, they would get undesirable ones, and that a superintendent was wanted to see that the regulations were complied with. That seemed to him to be the description of a prison rather than a home, and that was just why costermongers and similar classes of people preferred to live in their insanitary dwellings to going into the sanitary but inquisitorial ones. With regard to the philanthropists who formed companies with a large amount of money, and paid dividends of 4½ and 5 per cent., they could make conditions with county councils, and get land at a far different price to that which the ordinary builder had to pay. The consequence was that there was no healthy competition between private and public enterprise. Frequently he had advised friends to acquire some plot that was admirably adapted for artisans' dwellings, but the answer had been that they could not afford to let the rooms under 3s. 6d. a week. If they went to the Peabody Buildings, they would find that the rooms (built with charitable funds) did not cost more than 1s. 10½d. to 2s. There was no use in investing money under these conditions, for, even if the rooms were let, tenants were certain to move as soon as there was a vacancy in Peabody Buildings. It was antagonistic to private enterprise to compete with public or semi-public funds. Sir Sydney Waterlow made it a boast that they could make more than 5 per cent., but they only gave shareholders 5 per cent., and no more. It seemed to him time to turn the tide in favour of these companies being placed in the hands of the trustees. As to the character of the tenants, it so happened that there was a block of buildings at Canonbury almost identical with the plan of Dr. Sykes, which had been intended for the artisan class, the outside rent being 2s. 6d. per room. But all these buildings were not occupied by the class for which they had been intended. There were no inquisitorial conditions. All they wanted were people who were respectable and paid the rent. There was the usual inspection every six months to see that the repairs were attended to. To his astonishment, he heard music going on in these buildings, and he found them to be occupied by clerks, and so forth. Referring to working men's houses in suburbs, arrangements should be made with the railway companies to enable the occupiers to recoup themselves for the time and money required by travelling.

Dr. Grimshaw, Registrar-General for Ireland, said that comparison of the experiences of various towns was of the greatest importance, and he would give them his experience with regard to Dublin. Most of what he had so far heard related to London, where altogether different circumstances prevailed, the area between the city and the suburbs of Dublin being perhaps one-twelfth that of London. His remarks might also be of interest to the other towns represented. In the first place, the artisan must live near his work, not necessarily in distance, but in point of time. The cost of covering a great distance was counterbalanced by a heavy rent in town, and the expense was, therefore, the same thing. For the artisan's health, however, it was better to live out of town. The Dublin Artisans' Dwellings Company had been founded some 17 years ago, with a view to carrying out the Act which had just then been passed. They had commenced with a capital of 50,000l., which had been gradually raised by subscriptions and loans to 200,000l. They had tried both block

buildings and cottages, the result being that the cottages had been much preferred, and they also paid better, for two reasons. The first reason was greater economy in construction; and, in the second place, it had been found that the tenants deserted the blocks for cottages if any cottages were built within a reasonable distance of blocks. People were quite willing to pay more rent for a cottage than for rooms in a block. The result in one portion of Dublin was that the company actually had to reduce the rent of blocks in order to enable them to compete with their own cottages erected in the vicinity. The company paid a dividend of $4\frac{1}{2}$ per cent., and had a considerable depreciation fund. He wished to mention these points specially, as there seemed to be some sort of controversy as to which was the best form of house for the artisan. Dublin artisans undoubtedly preferred the cottage, in which they took more interest than in blocks, and which they liked to make homely by little decorations. He might mention that the reason why he was so intimately acquainted with the interior and the little artistic efforts was that for some years a prize was offered for the best kept house. Anyone who chose to put his name down for these prizes was enrolled, and he had undertaken to act as chairman and organiser to go round these places and examine them, the result being that the cottagers invariably beat the inhabitants of the block habitations for tidiness, neatness, artistic arrangements, and for window gardens and flowers. Therefore, he was one of those who believed in the moral influence of things of that sort, and, morally he thought cottages were a superior method of housing the working classes to block dwellings. He would mention that the death-rate in these houses was singularly low as compared with that of the whole of Dublin, but Dublin was unfortunately, a town with a very considerable death-rate. The width of streets was a matter which came only slightly into question in Dublin, because it was not the habit there to build very high houses, owing to the fact that ground rents were not as dear as in London. However, as a medical man, he looked upon the width of streets as one of the most important elements in the matter of health. It was not merely a question of air-space that was involved, but also a question of light. Human beings were as much dependent upon light for their health as plants, and would come into a half-starving condition without sufficient light and air-space as the latter. The question appeared to be whether the housing of the working classes was to be carried on as philanthropy, as business, or as a mixture of both. His opinion was that enlightened business companies who had regard for fair dealing with their tenants possessed quite sufficient philanthropy, and yet worked on sound business principles, and he considered that the plan adopted by the Corporation of the City of Dublin in dealing with the problem was founded on the best principles. The Dublin Corporation provided nightly lodgings, single rooms, and dwellings for very poor people, either single or married without children. They had also supplied small cottages at very low rents, limiting these according to the circumstances of those who occupied them, on the principle that this part of their work was, in fact, in the nature of philanthropic efforts to assist these people.

Mr. Councillor Atha, Leeds, said he had understood, two days previously, that the question of back-to-back houses or cottage dwellings *versus* flats or blocks was to have been adjourned to the present sitting. He did not know what his friends might think of him if he stated that he lived in a district populated by 75,000 people, and that 75 per cent. of the houses were back-to-back ones. But he wished gentlemen to understand that

there were back-to-back houses and back-to-back houses, and those constructed in Leeds must not be compared with the old-fashioned ones,—badly spaced, with dirty corners, &c. They were constructed on sound principles, with good sanitary arrangements for cleanliness, the prevention of dirty corners, &c., and the death-rate of his district had been almost the lowest of the borough when the last figures were taken. It was 18 and a fraction, whilst in other districts it was over 22. Mr. Atha, assisted by an illustration on the black-board by the Chief Inspector of the Leeds Corporation, explained that there were blocks of sixteen houses arranged in two rows of eight each, and separated in the middle by a space of 15 ft. wide. That space contained the closets for the sixteen houses. The streets running round the blocks were 36 ft. wide, and were well looked after. He was very much startled to hear anybody advocate erecting great buildings for the working classes in London, because there was a danger in throwing too many human beings together. Their system of back-to-back houses distributed the population over a large surface, and if properly built, the whole of the blocks could be kept as dry and well ventilated and as healthy as any other houses. If they forced upon the working population houses at higher rents, they would pay as long as they were in good employment, but with lack of work settling in they could not pay. Their principle of giving the men cottages, even if built back-to-back, made them saving and thrifty, because they felt they had homes in their cottages. There were hundreds and thousands in Leeds who strained every nerve to purchase the freehold of their own cottages. Under other systems all the individuality would be driven out of them.

In answer to various questions by the **Chairman**, the Chief Inspector of Leeds said that every house was self-contained, except the conveniences. There were two bedrooms, two sitting-rooms, kitchen, scullery, and a spare room. Every room had a window.

Mr. Gordon Smith said he was very anxious that the gentlemen from Leeds should not go back to Leeds under the impression that back-to-back houses were at all admissible. He thought that question had been quite settled, and he was prepared to show that there were no advantages and a great many disadvantages, in back-to-back dwellings. As regarded cost, there was practically no difference, as no more than the requisite conditions were insisted upon. As regarded the difficulties they had to deal with at Leeds, he knew that they were acting under an Act of Parliament, but that could be altered very easily if there were a desire to that effect. That had been done in Liverpool, Manchester, Birmingham, and other important towns.

The Chairman (Mr. Blashill) held that every kind of view had now been well discussed, and he would now use his privilege of making some observations. It was quite true that a large percentage of the population in any kind of town was desirous of rising and of improving their homes, and, as a general rule, did very considerably rise. But, unfortunately, there was also a number whose tendency was exactly in the opposite direction, whatever kind of accommodation was offered to them, and with them there was the trouble. There were good, bad, and indifferent everywhere; but the young wanted teaching, and, therefore, the principles advocated by those in power must be the very best from every point of view. Every class of habitation wanted supervision as far as it was found necessary. If it were shown that the higher classes neglected their habitations, they would also have to be supervised. He could not agree with

those who spoke so strongly about the impossibility of supervising the erection of houses. If they gave the local authorities sufficient power, they would exercise it with care and tenderness. The officer appointed was too often in the painful position of being obliged to pass building which he would have wished not to pass. In his opinion the authorities of great and important communities should have the power of fixing the lowest scale of accommodation, an irreducible minimum, in which any of their members should live. That might seem a radical proposition, but sooner or later it would have to come to that, even for "unskilled" labourers. He did not know what "unskilled" labour meant, unless it referred to people who could not do anything. He knew of no labour that did not require some skill, and they were not going to erect wretched buildings simply because a certain small class of the population did nothing, and could not work, and called themselves "unskilled labourers." As to the kind of houses in which people should live, there was a diversity of taste as of means. Some people liked to live in a block, or let them call it "residential flats": it might suit them; others might prefer a house. It was simply a question of £ s. d. It had been said that land was dear, but then wages were high. There was no place in Europe, he ventured to say, where so much food and clothing and other commodities could be got for so little money as in London. What they had to do was to increase the wage-earning power of the individual, and not to encourage him to say that he was ignorant and therefore compelled to live poorly. More money must be got, not the accommodation minimised. As to height of buildings, the rule in the London County Council now was not to let buildings go higher than four stories, and the Council had now land to dispose of for such buildings. One gentleman had spoken about taking away factories from towns; but towns were not meant primarily for residences, and secondarily for factories; but, in the first place, for work, and in the second place, for residences. He would not live in London, nor in any town, if he had not work to do there, and therefore the idea of doing away with the factories was fallacious. They must make the dwellings healthy, and the factories wholesome places to work in. They had heard what the gentlemen from Leeds had to say about back-to-back houses. He regretted exceedingly to have heard such a story. The feeling in that room was one of distinct disapproval, and he hoped that they would take this lesson back to Leeds with them. From what he had gathered, Leeds had not adopted the Public Health Act in those points which dealt with back-to-back houses. If 75 per cent. of the people of Leeds lived in such houses, and had to put up with all these unhealthy arrangements, it was a lamentable state of affairs, and he thought it was not the kind of thing that would commend itself to the section.

Mr. Rowland Plumbe said he was rather anxious to state that he did not for one moment wish to say that block buildings could be done away with. Mr. Bond seemed to think that his opinion was entirely in favour of village homes, which, however, he knew to be an impossible plan. He would say, however, that the more we got our working-classes into fresh air, and to live in homes of their own, the better it was for us and for them. He would like to call attention to the necessity for legislation in order that third-class passengers might be treated on the same footing as first and second-class passengers. Cheap trains up to half-past five in the morning and, perhaps, double the fare two hours later, were of very little use to the majority of workers. If pressure could be brought

to bear upon the railway companies to give cheap fares to third-class passengers, a great problem would be solved as to housing the working classes in village homes.

Dr. Sykes said that the requisite conditions for light, air-space, and everything else could be observed in block dwellings, as in other classes of dwellings. But there was no legislation for the control of the construction of this class of dwellings, although they required particular control. They might build the largest building nine stories high, with 300 sq. ft. of open space, which was monstrous. That was done in the metropolis, and they would admit that this was a serious question, and that something must be done. He moved the following *Resolution*:—

"That special legislation is requisite for the control of the construction of block dwellings for the industrial classes in cities."

This was seconded by Mr. Plumbe, supported by Dr. Wilberforce Smith, and agreed to.

Friday, 14th August, 1891.

The President, SIR ARTHUR BLOMFIELD, in the Chair.

English Isolation Hospitals.

BY

Dr. R. THORNE THORNE, M.B., F.R.S., F.R.C.P.

The statutory methods adopted in England and Wales for the promotion of public health may, for administrative purposes, be divided into two classes:—1st, those which are purely permissive, their adoption being left to the discretion of the local sanitary authorities; and 2nd, those which the Central Government have the power of enforcing in cases of default. The former constitute numerically the main bulk of the sanitary measures adopted in this country, and to this class belongs the provision of hospitals for the isolation of cases of infectious diseases, the statutory enactment as to which is to the effect that:—
"Any local authority *may* provide for the use of the inhabitants of "their district hospitals . . . for the reception of the sick."
—Public Health Act, 1875, section 131. But notwithstanding the voluntary character of the action taken under this section, and the fact that the total cost of procuring and maintaining any such institution has to be entirely borne by the local community for whom it is provided, noteworthy progress has been made in this direction, and the isolation in sanitary hospitals of such cases of infectious fever as cannot properly be isolated in their own dwellings now forms an important and an increasing element in the protection of the public against the spread of "dangerous infectious disorders."

In a report which I presented to the Local Government Board some nine years since, on "The Use and Influence of Hospitals for Infectious Diseases,"* I stated that out of about 1,510 provincial sanitary authorities in England and Wales in 1879, 296 possessed some means for the isolation of the infectious fevers, other than that intended for poor-law purposes; and I find that, since that date, loans, amounting in all to 448,769*l.*, have been granted to over a hundred sanitary authorities for the provision of isolation hospitals. Some of these loans, it is true, relate to the replacement of former hospitals by more efficient ones, and to the extension of existing ones; but, on the other hand, a number of isolation hospitals have been erected out of current rates and otherwise than by the aid of loans, and I am probably correct in stating that some adequate means for the isolation of infectious diseases are now possessed by at least 400 urban, rural, and port sanitary authorities; and, it may be added, that there is already evidence that the adoption by a large number of sanitary authorities of the permissive clauses of the Infectious Disease (Notification) Act, 1889—a measure by means of which early and precise information is secured as to the extent to which infectious diseases prevail in any district—is likely to lead to a substantial increase in the number of English isolation hospitals.

Diseases calling for isolation.—The infectious diseases which, in this country, especially call for isolation in hospital are, in the order of their importance, as follows:—Scarlet fever, typhus, small-pox, diphtheria, enteric fever, and cholera; and to these may be added, as being less frequently isolated in hospital, erysipelas, measles, whooping-cough, and puerperal fever. So far, there is no evidence that aggregation of the infectious sick suffering from any of these diseases, except small-pox, such as is likely to be carried out by any ordinary sanitary authority, leads to diffusion of infection to the surrounding community, provided the hospital be properly constructed and administered, and subject to a zone of some 40 feet being provided between all buildings intended to receive infected persons or things and the boundary wall, or close fence, around the site. Experience has shown that it is otherwise with small-pox; and it yet remains to be ascertained what are the circumstances under which cases of that disease can be aggregated for the purposes of sanitary authorities, without risk to the community. Fortunately, owing to the protection afforded by vaccination, small-pox does not, as is commonly supposed, stand foremost amongst the infectious fevers calling for isolation in hospital. As a rule, port sanitary authorities alone make special provision for cholera.

The following are some of the principal points to be kept in view in providing for the other dangerous infectious disorders which have been referred to.

Extent of provision to be made.—Speaking generally, it has been estimated that the provision of one bed per 1,000 inhabitants, is

* Supplement by the Medical Officer to the Tenth Annual Report of the Local Government Board [C. 3290] 1882.—Re-issued 1884.

sufficient for the permanent requirements of a sanitary district. But such requirements will necessarily vary in accordance with the character of the population. Thus, in a locality where the population is well-to-do and most houses are of a size and construction that offer reasonable facilities for the isolation of single attacks of the current infectious fevers, the amount of hospital accommodation needed for public health purposes will be less than in a manufacturing or colliery district, where infectious disease cannot be treated in the houses in which it breaks out without very great, if not certain, risk of spread. As yet, no sufficient experience is available as to the effect of the compulsory notification of infectious diseases on the amount of accommodation which should be maintained for isolation purposes. It may reasonably be expected that in time such a measure will so far prevent the diffusion of infection as to reduce the amount of standing hospital accommodation necessary for the isolation of the infectious fevers. But, as yet, from the experience of some sanitary authorities, and especially as regards such a disease as scarlet fever, the new sources of information of which authorities become possessed have led to an increase in the number of persons removed to hospital, and thus to a need for additional means of isolation.

Character of accommodation required.

Premising that all the conditions which are deemed essential in the provision of a healthy dwelling-house are to be regarded as equally desirable in the case of an infectious hospital, I would only here refer to such other points as involve considerations peculiar to such hospitals.

(a.) *As regards site.*—It is, as a rule, undesirable to select any site which is less than some two acres in extent; and even then regard should be had to the need for extension of hospital buildings, whether for temporary purposes or owing to increase of population. Where practicable, only single-storey hospital pavilions should be contemplated; and having regard to their distribution on the site, and to the out-door exercise of convalescents, 20 patients per acre will generally be found to be the limit of aggregation of sick on area.

(b.) *As regards buildings.*—The administrative building should be distinct from all others. Nurses, when off duty, will live and sleep in it; tradesmen will call there for orders and with supplies; and relations will there make inquiry as to the progress of the sick. This building should always be so placed as to control all access, from without, to the ward-pavilions and other hospital buildings. The laundry, ambulance-shed, disinfecting apparatus, and mortuary should also be in one or more buildings separate from the administrative building and the ward-pavilions.

No sanitary district can be regarded as properly provided for unless it has immediately available sufficient accommodation for the isolation of two different infectious diseases in both sexes, and some means for the special isolation of one or two patients needing separate accommodation, as, for example, cases in which the nature of the disease is, at first, doubtful. These requirements are usually met by the provision of two

pairs of wards or rooms having no aerial communication with each other, together with one or two special isolation rooms. In sparsely populated districts these requirements may be combined in one pavilion the several apartments of which open separately onto verandahs. Such a building is commonly styled an isolation-pavilion.

Each ward-pavilion should admit of cross-ventilation by means of windows in the two opposite side walls; the closets and ward sinks, having themselves independent means of cross-ventilation, should be entered from the wards by means of a cross-ventilated lobby; all angles, vertical and horizontal, should be rounded to prevent deposit of dust, &c.; and a nurses' duty-room should be provided. Assuming that each ward will contain the ordinary proportion of acute and convalescent patients, and that it is adequately ventilated and warmed, a minimum of 2,000 cubic feet of air per head is generally found to suffice in order to maintain reasonable purity of air. But much depends on the allotment of this amount of air to the individual patient. No excess in the amount of total air provided—as, for example, in the case of lofty wards—can compensate for crowding patients on the floor-level; and hence the beds should be so arranged as to ensure for each patient a floor-space of some 156 square feet. And since it is in the neighbourhood of the patients' mouth and nostrils that it is above all important to maintain the purity of ward-air, it is of all things necessary to allot to each bed a separate amount of wall-space, not less than some 12 feet in length.

(c) *As to allotment of bed-space.*—The best position for the beds is that one bed should occupy each wall-space between a pair of windows, the head of the bed to be at least one foot away from the wall, so as to facilitate movement of air about the patient's head.

Medical advice is often sought as to the number of beds that should be placed in any one ward of an infectious hospital. In suggesting an answer to this question, I cannot avoid the conclusion that the practice of treating sick persons under circumstances which admit of the air by which they are surrounded being charged, more or less, by the emanations of other sick persons is wrong in principle, and that from this point of view any aggregation of the sick in wards is undesirable. But other considerations must, in the case of a large proportion of the population, be regarded as outweighing this one; and all that can properly be contended for is, that the limit of such aggregation shall be decided by considerations such as are involved in securing freedom from any recognisable risk, together with such efficiency in general administration and nursing as is consistent with a reasonable regard for economy.

The several infectious fevers, doubtless, differ in regard to the amount of nursing which the sick require; but taking them as a group, and assuming that the ordinary proportion of acute and convalescing cases at varying ages are brought together, it may be held that any one nurse can rarely be expected to take charge of more than 12 patients. The moment this number is exceeded, the nursing staff has to be doubled; and directly a second nurse is required, it would be better in the interests of the sick, that those whom she nurses should

be in a separate ward. Holding this in view, I believe it will generally be found desirable that infectious hospitals should be built in pavilions so contrived that in each there shall be two wards, one for males and the other for females, containing together not more than 12 beds; the two six-bedded wards to be separated by nurses' duty-room and an entrance lobby.

The principles which have been laid down are embodied in the Memorandum as to Isolation Hospitals, issued by the Medical Officer of the Local Government Board; and they are those which now govern the construction of nearly all modern isolation hospitals in England and Wales.

The Heathcote Hospital, Leamington.

BY

KEITH D. YOUNG, F.R.I.B.A.

This hospital was erected in 1889 by the Warwick Joint Hospital Board, the constituent authorities of district being the urban districts of Leamington Spa, Warwick, Kenilworth, Lillington, and Milverton, and the rural sanitary district of Warwick Union. Since the formation of the joint district the districts of Lillington and Milverton have been amalgamated with the borough of Leamington.

The site is six acres in extent, two and a half acres of which are enclosed and appropriated to the hospital use. It stands on the high ground in the middle of open fields, and is about midway between the towns of Warwick and Leamington.

The population within the joint district was, when the hospital was erected, about 55,000, and of this number some 44,000 were within a radius of three miles from the hospital site.

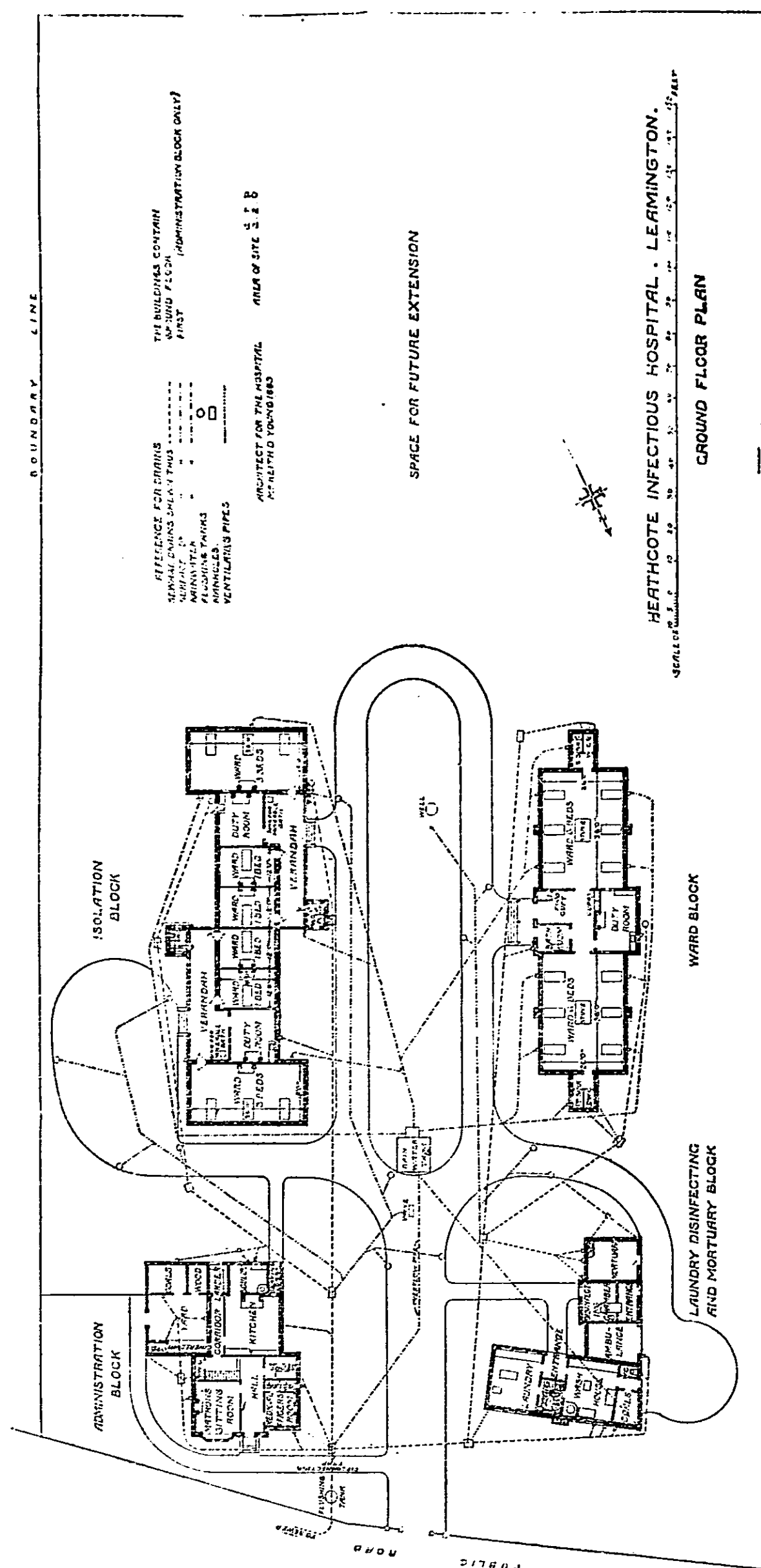
The area of the district is 44,507 acres, and its rateable value 340,000*l.* The accommodation provided is equal to one in every 2,000 of population.

The buildings are four in number, and each is entirely detached from the remainder. They are:—

1. The administration block;
2. The isolation block;
3. The ward block; and
4. The laundry block.

The site is enclosed on three sides by a high wooden fence; the front towards the high road having a dwarf wall and an iron railing.

The two blocks occupied by patients, and the laundry block, are each 40 feet distant from the boundary, and an inner fence at a distance of 40 feet from the front gates prevents patients from approaching too near the latter.



The administration block is the only one of the four buildings two storeys in height, the rest being one storey only. It contains on the ground floor a sitting-room for the matron and nurses; a room, with a lavatory and w.c. attached, for medical officers; linen room, w.c. for nurses, kitchen, scullery, and larder, with wood and coal stores, and servants' w.c. in the yard. At one corner of the kitchen is a serving hatch opening into a covered porch at which the meals for the patients are given out.

On the upper floor are bedrooms for the matron, nurses, and servants, and a bath room.

The isolation block is divided into two equal parts by a wall, and the arrangements on one side of the wall are an exact counterpart of those on the other side, the entrance to one side being on the east, and that to the other side on the west.

Each half of the building, therefore, contains a large ward for three beds, two small wards for one bed each, a nurses' duty room, and a w.c. and slop sink. These rooms communicate with each other by way of an open verandah, roofed over at the top, but quite open in front.

Each large ward is 36 feet long by 18 feet wide, the smaller wards being 18 feet by 12 feet, and all are 12 feet high. The allowance of floor space is 216 feet per bed, and of cubic space 2,592 feet per bed. The large wards are lighted by three windows at each end, the smaller ones by one window on each side, being in the proportion of one square foot of window surface to about 65 feet of cubic space. The windows, which form the principal means of ventilation, are divided into two parts by a transom which is fixed about 1 foot 6 inches down from the head of the frame. Below the transom are ordinary double hung sashes provided with a deep bottom rail and a cill board which permits of the lower sash being raised and a current of air admitted in a vertical direction between the two sashes, at the same time preventing free access of air at the cill level. Above the transom is a "hopper light" hung on hinges at the bottom to fall inwards, and provided with glazed cheeks at the sides to prevent down draughts.

In addition to the windows, openings are made at the floor level behind each bed, and provided with Ellison's radiator ventilators; there is also an extraction flue in each ward carried up alongside the smoke flue from which it is separated by iron plates. The inlet to the flue is at the ceiling level, and a Bunsen burner is provided with a view to produce an upward current when the fire is lighted.

The wards are each provided with a Boyd's hygiastic ventilating grate; these grates have at the back of the fire an air chamber which is supplied with fresh air from the outside. The air being warmed by contact with the heated fire-brick back of the stove passes into the room through a grating above the fireplace.

The walls of the ward are lined to a height of 5 feet with tinted glazed bricks, above which they are plastered and distempered. The floors are laid with yellow deal in 3-inch widths, ploughed and tongued.

The vertical angles of the walls, the horizontal angles at the junction of floors and walls, and of walls and ceilings are all rounded, so also are all the angles of door panels and of the windows and in the finishing of the doors and windows rounded fillets only are used, no recessed mouldings being used anywhere.

The nurses' duty room is provided with a small range with oven and boiler, and hot water is laid on from the latter to the sink, the movable bath, in corridor, and the slop sink. There is also in this room a small dresser, and a glazed porcelain sink.

Outside the duty room is a recess, where the movable bath stands. A glazed fireclay sink let into the floor takes the waste, and taps fixed to the wall afford the supply of hot and cold water.

The water-closet and slop sink are placed in projecting buildings, entered from the verandah. The walls of these offices are lined with glazed bricks, and the floors are of cement. The slop sinks are of porcelain, provided with a flushing rim, in addition to the hot and cold water taps. The closets are Hellyer's pedestal hygienic, the trap and basin being made in one piece of porcelain, and are fitted with 3-gallon flushing cisterns, and hard wood rim seats hinged at the back.

WARD BLOCK.—This building is entered from the centre, and affords accommodation for 12 patients, all of one disease, the beds being equally divided between the two sexes. In the open porch at the entrance are two doors; one of these gives access to the entrance lobby, the other being an outer door to the bath room. The object of the latter is to enable a patient on being discharged to leave the building directly from the bath room. The bath room thus becomes a discharging room; not perhaps an ideally perfect arrangement, but certainly a better one than if the patient had to re-enter the ward after his final bath.

To the left of the entrance is a smaller cupboard with a window for food, and opposite are cupboards for patients' clothes and linen. Between the wards is the nurses' duty room, in which is a small range with boiler for supplying hot water to the bath, sinks, and lavatory basins, a dresser, and a porcelain sink.

The wards are each of them 36 feet long and 26 feet wide, and contain six beds each. To each bed is allotted a floor space of 156 feet, and a cubic space of 2,028 feet, and the distance from centre to centre of each bed is 12 feet. The window area is in the proportion of about 1 foot of window to every 60 feet of cubic space. The means of ventilation are similar to those adopted in the isolation block. The grates also are similar, but in these wards are placed in pairs, back to back, in the centre of the floor, with descending fines carried under the floor to vertical chimneys in the outer wall. The latter are swept from the outside.

The water-closets and slop-sinks are placed in the projecting buildings at the end of the wards, from which they are separated by cross ventilated lobbies.

The construction of these wards as regards internal finishing of floors and wall surfaces, &c., is in all respects similar to that of the isolation block.

A speaking-tube connects the duty room with the administration block.

The laundry consists of a wash-house fitted with the usual appliances for washing, an ironing room and a drying room heated by the flue of the ironing stove, and fitted with a radial drying horse. Adjoining is a w.c. and a coal store.

The disinfecting house is divided into two parts by a brick wall. The apparatus, which is one of Washington Lyon's high-pressure steam machines, projects on each side of this wall, so that the infected clothes are put in in one chamber and when disinfected are taken out by the door in the other chamber.

The mortuary is a plain sky-lighted room, arranged for use, when necessary, as a post-mortem room. The ambulance house affords accommodation for a one-horse ambulance.

DRAINAGE AND WATER SUPPLY.—The drainage system is a dual one, the rain-water being separated from the sewage and stored in a tank for use. The drains are all laid with glazed stoneware pipes jointed with cement, with manholes at each junction and change of direction. Each length of pipe between the manholes was separately tested with water before being covered up, and all the pipes are laid on and partly embedded in concrete. At the head of every length of drain is a Doulton's 30 gallon automatic flushing tank, and at the outfall to the public sewer is a large flushing tank fixed by the town authorities. These flushing tanks were specially necessary in this case, as not only is the quantity of sewage discharged at one time necessarily small, but the sewer conveying the hospital sewage to the town sewers has to traverse a long distance before it comes near any other buildings. The soil pipes are carried up above the eaves of roofs their full diameter as ventilating shaft.

The rain water from the roofs is all collected into an underground tank, first passing through a filter chamber formed partly of coarse and fine gravel, and partly of charcoal. From the tank it is pumped for use in the scullery of the administration block and the wash-house.

The cost of the hospital was as follows:—

	£	s.	d.
1. Land - - - - -	900	0	0
2. Buildings, including laundry fittings, disinfecting apparatus, roads, paths, fences, drains, and professional charges	7,635	10	6
3. Gas mains, from nearest point up to site	84	4	4
4. Water mains - - - - -	161	10	11
5. Sewer - - - - -	299	4	9
6. Furniture - - - - -	293	17	7
	£9,374	8	1

To meet this outlay loans were obtained from the Loans Commissioners to the extent of 9,316*l.* at 3½ per cent., repayable in 30 years. The interest and repayment of principal amounts to an annual sum

of 630*l.*, which is met by a rate equal to seven-sixteenths of a penny in the pound.

As regards cost of maintenance it is not very easy to arrive at a definite figure in regard to a hospital which is liable to be occupied or not in so absolutely uncertain a way as this; but assuming the wards were empty for 12 months continuously, it is estimated that the cost of maintenance for that period would amount to 370*l.* This sum includes the following expenses:—clerk, medical officer's retaining fee, steward, matron, caretaker, out-door porter, nurse, rations for residents, coal, gas, and water, rates and taxes. For the statistics as to cost, and for much valuable information I am indebted to Mr. Alderman Wackrill, the Chairman of the Joint Board.

Local Isolation Hospitals as opposed to a Central Hospital.

BY

C. E. FEW, Vicar of Seal, Sevenoaks.

It seems to me a question well worth considering, whether it is not on the whole far better to treat fever cases in the locality where they arise rather than to transport them to large central hospitals. I am speaking only for country districts, having no experience in towns; possibly there large central hospitals are best.

It is of course impossible to go into such a vast subject as this in the brief time allotted to those who have the privilege of reading a paper at such a Congress as that now assembled. It is only just possible to treat of some of the great pros and cons, and so leave the public to decide whether or no the present system is unwise, and needs consideration, and perhaps alteration.

All hospitals require careful management and supervision; this of course is possible in ordinary hospitals, as committees of laymen can visit and judge for themselves. In fever hospitals this is more difficult, especially in country districts. The hospital being probably placed in some out of the way place, and rarely visited by any except those in charge; the outside public being practically excluded. Local hospitals would naturally be more under supervision.

It is of the utmost importance to make the hospital system popular, because notwithstanding all Acts of Parliament, poor people cannot be compelled to have doctors at all; and many a case has been and will be hushed up and treated at home, particularly when children can be compulsorily removed to some out of the way distant place, to which the parents would have to walk and lose a day's pay if they wished to inquire.

Local hospitals would certainly minimise this difficulty; the position would be known; kindly local interest would probably do its best to make each hospital as complete and attractive as possible; and

the residents would have the feeling that all care expended on the hospital would be for the benefit of their own poorer neighbours; and the cottage owners in the district should be taught, that by arranging for local treatment they were but providing that spare room accommodation which they are able to enjoy in their own houses, but have, as a rule, failed to provide for their cottagers.

It must not be forgotten that the removal of patients can only be enforced where there are not *means for isolation at home*.

A large central hospital is doubtless damaging to the value of property, not only in the immediate neighbourhood, but in the district generally, inasmuch as all the fever of an area of perhaps some 15 or 16 miles in breadth is liable to be carted into it along the country roads.

If the fact of this central hospital would free the rest of the district, the argument that some rather than all should suffer might very properly be urged; but no one *pretends that this is the case*, doctors only speaking of moving about 60 per cent. of the cases; and if only five per cent. is left behind, it is enough to start all the mischief over again.

The ambulance risks are twofold; to the patient, and to the neighbourhood.

No bad case could be moved at all, certainly not for any great distance; and surely the risk of conveying infected people through village streets and amongst the ordinary curious people of the world must be dangerous; and certainly the law as to a zone of 40 feet cannot be observed.

The cost of a permanent hospital unoccupied must be a very heavy charge, and this, possibly, for months together.

ALTERNATIVE SCHEME.

The alternative scheme I would suggest is to map out every district, and to choose sites suitable for treatment of fever in a certain area; the smaller the better.

To prepare these sites as to drainage and water supply, and to place on each a small iron room, with walls about 8 feet high, to be used as a kitchen and laundry; the rain to be collected in a tank for washing purposes.

The sanitary authority should provide a certain number of portable hospitals, say two for each relieving officer's district, and two extra ones to be kept at the union house on a two-wheeled cart, like a lifeboat, ready for immediate transmission if required, to supplement the two local wards.

These rooms should be capable of holding three, or, at a push, four patients. If cottages could be secured for kitchen and nurse, so much the better; but if not, portable rooms suitable for the nurse should be provided, one for each relieving officer's district.

These sites might be in meadow lands, 40 feet from the road, the iron room surrounded with a barbed iron fence sufficient to enclose

it, with the understanding that, when occupied, the zone of 40 feet, if considered necessary, should be wired off. The nearest point on the road could be, when required, connected by a wire to run a basket on wheels for the transport of goods, and at very little expense a pipe could be laid from the road to supply drinking water from a water cart. The drainage should consist of two cesspools ready dug, one for slop water, the other for the infected sewage; the earth excavated should be kept dry and available for earth closets.

On these sites should be erected the portable rooms when required.

Should any kindly landowner wish to provide a site for his own particular district, in addition to the public one, he shall be allowed to do so on fulfilling the above conditions, and be supplied with the portable wards, *on the understanding* that his site becomes, *pro tem.*, the official centre of fever for that area, and that all cases in that area may be brought into it during that outbreak.

By this means the whole district would have, as it were, skeleton camps arranged, and all provision made for invasion of disease, costing a mere trifle when unoccupied, and capable of almost unlimited expansion.

In case of a very severe outbreak, the medical officer of health can requisition the wards from other districts.

The Wards.—These should be bright, warm or cool, with non-absorbent walls, capable of frequent changes of air without draught. No better material is to be met with than that made by the Patent Wire-wove Waterproof Roofing Company, a strong wire-wove material, waterproof, tough; giving, when painted, a smooth glazed surface, most easily cleansed and disinfected, and a good non-conductor of heat.

The walls and roof should be double, with air space between, and the system of ventilating by Tobin tubes freely introduced. If the air can be frequently changed without inconveniencing the patient, there is not the same necessity for so large cubic space per patient.

The question of a room being too hot or too cold depends in a great measure upon its scientific construction, and the material of which it is made. Ice keeps better in lead than iron; a blanket would keep a can of water hotter, and a lump of ice longer than if either were placed in a brick cupboard; and even paper blankets are warm, or to speak more correctly retain the body heat. Hence, if you can find a good non-conductor of heat, however thin it may be, and construct the room with double walls and roof, with air space between, it would be possible for the temperature of that room to be very little affected by the outside temperature. Such a room could be kept warm by stoves in winter, and ought not to be baked by sun in the summer. A brick room exposed to the baking sun takes all the night to cool, whereas a thinner material would soon radiate the little heat it held.

In the Local Government Report, in speaking of temporary hospitals, cases are mentioned of patients dying of cold, and of water

freezing in rooms; the latter sometimes happens in well-built private houses; but if it does it must be somebody's fault; bad construction of room, insufficient warming apparatus, or inattention to fires.

Nor, again, need these portable buildings be heavy; a little science helps one in the construction, and a determination not always to build in the same groove.

I built a hospital that weighed only 13 cwt., 16 feet by 12 feet; three or four navvies had small-pox in it in one of the most exposed spots in Kent. I erected it myself in a storm of snow and hail about five years ago. Before it was erected on the spot one of the largest London builders sent his foreman to see it, who rather laughed at the slowness of my timbers. He went away and supplied a house, supposed to be like mine, using timbers at least three times as heavy. His house blew down in about a week; mine never did.

Unnecessary weight is a great mistake, particularly in a portable hospital. Thick timbers only warp and hold the damp; all you want is strength enough, and that judiciously applied.

These houses of wire-wove material can be constructed for about 6s. per square foot of floor, calculated to last for 20 years, at the cost of painting once in four. One, say 24 feet by 12 feet, could be erected in about 12 hours.

There is not, as a rule, such a desperate hurry; a doctor is cautious in pronouncing as to *the first* case of fever, and after the announcement there is always a certain amount of unavoidable delay before action can be taken.

It might be wise to engage one skilled nurse for the union; but this is not absolutely necessary. No difficulty has hitherto been experienced in procuring fever nurses when required. Moreover, in country districts, months of idleness and making gossiping acquaintances would be undesirable. A nurse in thorough training, and one who knows nobody is always the most efficient.

We come now to the relative cost. I take an estimate for a central hospital, say 2,500*l.* for 12 beds, because these figures have actually come before me, and are probably as moderate as possible, representing in the particular instance about 6*d.* per cubic foot. This figure included no water supply or purchase of site.

	£
Hospital for union, consisting of three relieving officers' districts, to hold 12 beds	- 2,500
	<hr/> £2,500

That is, about 208*l.* per bed.

Six Portable Hospitals for same district (two for each district) about 70 <i>l.</i> each	-	-	-	420
Two extra ditto, 70 <i>l.</i> each	-	-	-	140
(These hospitals, holding three beds each, would make up 24 beds).				
Three houses for nurses	-	-	-	75
Preparing three sites, say 20 <i>l.</i> each	-	-	-	60
				<hr/> £695

Say 800*l.* for 24 beds; about 33*l.* per bed, or one-sixth of cost as compared with central hospital.

In my next remarks, I hope I shall not be misunderstood to be wishing to impose on my medical friends any additional gratuitous work.

There is no profession in the world, the members of which give up so ungrudgingly so much valuable time and energy to alleviate the ills of mankind as the medical profession, in England, or on the Continent, or in the civilised world.

I am treating the matter purely as a business question; and I am only endeavouring to provide local hospitals where patients can be treated far better than in their own homes. I am also assuming that most doctors would rather keep their own patients than send away to a distance where they could not possibly find time to visit them.

Central hospitals are attended either by a resident medical officer or else by some local practitioner, who for a fixed sum, say 10*l.* or 20*l.* per annum, and 1*l.* per case, undertakes the charge of the hospital.

In the local hospital system there would be *no medical fees or charge for drugs whatever.*

Patients would be of three kinds: those treated by their own doctors privately, those on clubs, those under the parish doctor. Hence, fever cases would be only a part of the duties of the medical men working in the district, and nothing could be charged to the ratepayers.

For argument's sake, assume the moderate number of 50 cases: under the central system there would be a charge on the lowest estimate of 60*l.* per annum, under the local system NOTHING.

This amount saved per annum would alone in 20 years renew the whole of the portable hospital wards and leave 400*l.* to the good.

People say that if there is so much difficulty in providing one site, so much greater will be the difficulty to provide many. On the contrary, I believe the smaller you make your area, the less will the opposition become. We do not mind nursing our own children in our own houses, but we should strongly object to having the children of others thrust in upon us. The ills of our neighbours, even from selfish motives, we are glad to endeavour to alleviate, and for them we might even run risks; but we are not called upon to do this for people living at a distance, just because their own neighbours will not look after them and provide the needful accommodation.

DISCUSSION.

Dr. Fosbrooke, Medical Officer of Health, Worcestershire County Council, said that the Worcester County Council directed the administration of three permanent and three temporary hospitals. His experience was that the latter were no more unsafe than the former. A fever hospital, like a fire-engine, in order to be efficient for its purpose must always be kept ready for instant use. It must be ready to receive the very first case of contagious disease that broke out. The reader of the last paper spoke of permanent hospitals as if they were always inaccessible. It was not uncommon, in his experience, for patients to go eight or nine miles to an isolation hospital, and he had never known of a case of injury arising in passing through towns and villages, or where the journey had caused the patients to suffer. He could not agree with Mr. Few that temporary hospitals would be more popular than permanent ones. Parents would readily enough send their children to a hospital where they were assured that the child would be better treated and receive more care than at home. The children also were very glad to go. There need be no delay in removing patients; it was only necessary to telegraph when a case broke out, and an ambulance was sent at once. At Droitwich they were going to do away with the temporary hospital in favour of a permanent one.

Dr. Nasmyth (Sanitary Association of Scotland) said he wanted to organise in his part of Scotland (Fifeshire) a combination hospital, in which the principles of the cottage hospital and of the isolation hospital could be conveniently combined. He would like to ask Dr. Thorne if he saw any objection to such a combination. He wished to know also what distance he would consider safe for the removal of cases.

Mr. Jeaffreson (Framlingham, Suffolk,) described the arrangements in practice at an isolation hospital at Framlingham, which had been formerly always known as the "Pest-house." It was very seldom they had a case, but they were always prepared, because they gave to the nurse a retaining fee in the shape of a garden and rooms rent free. They had also a permanent hospital, but the only difference between them was that in the permanent hospital beds were kept ready for patients, but in the pest-house there were no beds. Every fresh case required fresh beds, which would be taken away and destroyed when the patient had gone. When the pest-house had no patients it was absolutely empty. In rural districts such hospitals might be empty for years. A double treatment of that kind was the best practical solution of the problem. The nurse's fee would be paid by the parish when it was a parish case, and by friends of the patients when it was a private case.

Mr. T. F. Wakefield (Chairman of Health Committee of the Corporation of Richmond) said Richmond was still seeking a site for an isolation hospital. Several eligible sites had been offered, and would have been bought, but in every case the neighbouring residents protested against the hospital being built. The County Council was about to apply to Parliament for power to deal with the whole county in regard to provision of this kind. In Surrey only one-third of the population was supplied with isolation hospital accommodation. The County Council had interested itself in trying to solve the question whether some danger of infection did not arise from the use of the ambulance itself. Finding that the bearers and attendants were themselves not attacked by infection, they had come to the conclusion that the fear of infection from the use of

ambulances was not justified. The supposed difficulty in getting patients to a hospital was chimerical. With a proper ambulance it was as easy to go 10 miles as to go one. The speaker, in conclusion, called attention to what he said was an excellent brougham ambulance, which could be seen in Long Acre, at Davis's, the coach builder's. Other County Councils would find it necessary to do Surrey was doing, and they would do well to obtain powers from the legislature to deal with the question on a comprehensive plan. The best solution of the question was, in his opinion, a permanent central hospital. In his opinion, no hospital should be considered complete without a complete apparatus for disinfecting by super-heated steam. The expense would be prohibitory if such apparatus had to be multiplied in proportion to the number of temporary hospitals that would be necessary.

Alderman Ernest Day (architect, Worcester,) said he once held the same opinion as Mr. Few, but further experience with temporary hospitals had brought him to an opposite opinion. The prejudice against living near a permanent hospital was dying out, and people were found now ready to build right up to the walls of a hospital. The objections he had against Mr. Few's interesting paper were economical ones. On the score of economy, one central institution was far better than half-a-dozen temporary ones. Each would want a doctor, making six doctors instead of one. Two or three nurses might be sufficient for a permanent hospital, but six temporary hospitals would require six times as many. The materials and all the apparatus, as well as the staff, would have to be multiplied by six, and the sites, however temporary, would be very costly. A temporary building would require to be renewed every 20 years, but a permanent hospital might last for a century.

Dr. J. Maxwell Ross (Officer of Health, Dumfriesshire,) said he had been disposed to recommend six hospitals, viz., one for each of the six districts in his county, instead of one central hospital, and the present discussion would help him to mature his views on a question in which he was greatly interested.

Councillor John Atha (Leeds) said they had formerly found it difficult to dispose of the families of persons removed from their homes suffering from infectious diseases during the period necessary for disinfecting their houses. They had now adopted the expedient of providing a shelter, where the families of infected patients were sheltered and maintained until the doctor was satisfied that there was no danger to be apprehended from allowing them to return home. At first, the County Council exacted payment for the accommodation, but eventually they had decided that the public should bear the whole cost, since it was primarily for the sake of the public health that these people were forced to leave their homes temporarily. It was still a moot question with them whether it was not more economical to put up wooden buildings, which could be burned down when no longer wanted, or to build more permanent structures.

Dr. Thorne-Thorne, in replying, said he was so much in sympathy with Mr. Few in principle that he was sorry to have to differ from him *in toto* with respect to method. His plan of multiplying temporary hospitals would be a most expensive one, and it would probably be found that when everything necessary had been supplied to his temporary hospitals, ten times the estimated cost would be incurred. Dr. Fosbrooke had always been a difficulty in the way of the advocates of permanent hospitals, because his establishment seemed to be so successful, and was

so well conducted as almost to amount to a refutation of their arguments. Now that even Dr. Fosbrooke admitted failure, the question was settled. If wood were used in the construction of temporary hospitals they should be burned down; but they never were. The wooden buildings were left to rot on the ground, and he could show samples of wood from such structures which would horrify any sanitarian. A proper ambulance would be an excellent thing. It should be of simple construction, and should only require two movements in order to load and unload the patient—one push to get him in, and one pull to get him out. To properly warm wooden hospitals was very difficult. He had in mind such a hospital where, although they had killed two patients with the heat, they could not, even with roaring fires, prevent water from freezing at the bedsides of the patients. They must have thick walls if they were to keep out the cold in winter. In summer there was nothing like tent treatment. Permanent hospitals ought to be solid buildings, well constructed, and attractive.

The Rev. Mr. Few, in his reply, said he was satisfied to have been able to bring his scheme forward. No one had been able to dispute his main facts. Before a sound conclusion could be arrived at, the question would require mature discussion by the public. With regard to sites, they could often be arranged for in advance, to be only actually purchased on a future emergency. He had found that plan practicable in his own parish. Richmond was a town where the distances were small, and certainly a central hospital was best in such cases.

The Arrangement and Construction of Asylums.

BY

RICHARD GREENE, F.R.C.P., Ed., Medical Superintendent, Berry Wood Asylum, Northampton.

If it be desirable that the greatest care and judgment be brought into action in the construction of all large buildings, it is imperative that asylums for the insane should be above the suspicion of fault. Here large numbers of patients are kept in confinement. They have had no choice in selecting their place of residence, and no voice in fixing the duration of their stay. They are suffering from one of the greatest, perhaps *the* greatest, affliction that can befall a human being, and common justice requires that their terrible calamity should not be increased by unhealthy surroundings; but, on the contrary, that all the aids of hygienic and other sciences should be called in to lighten their burden and promote their cure.

It is sad to think of the condition of the insane in olden times. Suitable provision was not even dreamt of. Old prisons, monasteries, or, in fact, any building not good enough for anything else, was the lazar-house into which the poor lunatic was consigned. Indeed, it was not until the dawn of this century that the subject was seriously con-

templated with a view to reform, and by far the greatest strides have been made during the present reign—the Victorian era—which has to be credited with so much that is good in all departments of our civil life.

It may be said that the old asylums were simply conglomerations of buildings, without attempt at harmony, architectural effect, or hygienic conditions. Few examples of these exist in England at the present day, but in some continental countries they are common enough yet. During the early part of this century an Act was passed which rendered the building of county asylums, and of making adequate provision for the insane poor, incumbent on the various quarter sessions throughout England. It is impossible to refrain from stating that this duty was in most instances admirably performed by the county magistrates, and the modern English county asylum is an institution which is in all countries looked on as a model, both as regards construction and system of management. The visitor who for the first time inspects some of our provincial asylums will be struck with the beautiful sites which have been selected for them; with the carefully laid out grounds and recreation courts; their comfortable, almost luxurious appearance, and with the freedom which the patients almost universally enjoy.

The only building to which a modern county asylum can be compared is a general infirmary, and even here there are many points of difference. These points are more noticeable on an internal inspection than on an outside view, and they are caused by the different objects which have to be kept in sight when the buildings are being designed. A very good hospital might prove an indifferent or even bad asylum, and a good and well-planned asylum would be a second-rate hospital. The grand distinction between the two is that in the hospital the majority of patients are in bed during both day and night, whereas in asylums the majority are up by day. Also, an infirmary does not require single-bedded rooms, while in an asylum at least one-fourth of the numbers should be accommodated in rooms having only one bed. These conditions render the designing of an asylum a much more complicated work than that of an hospital.

The site of an asylum should be carefully selected, and a gravel soil obtained, if possible, but inasmuch as an asylum should occupy a position somewhat centrally disposed to the population from which it draws its patients, it is evident that the desirable soil cannot always be obtained, at least it cannot always be had at a reasonable price. When, therefore, the building has to stand on clay, the most careful and thorough subsoil drainage must be carried out.

Some authors have described a variety of insanity as "phthisical insanity." Whether it is perfectly correct to so describe it I am not at all sure; but it is certain that the insane suffer from tubercle more frequently than the population generally; and as it has been proved that sub-soil drainage lessens the mortality from consumption, the point needs no further argument to enforce it. The group of diseases coming under the name of "rheumatism" is also greatly modified by the nature of the soil.

In England it is important to avail ourselves of every gleam of sunshine vouchsafed to us. A southern aspect should therefore be insisted on, and the building should be placed on gently rising ground not too high above the sea-level, as exposed sites are apt to be cold during the winter months for an invalid's residence.

The amount of land should be sufficient to protect the patients from the gaze of the inquisitive; but a large estate is neither necessary nor desirable. High roads and public footpaths should be at some little distance.

In many districts stone is to be had cheap for building purposes, and in these cases it will most likely be used for asylum construction; but perhaps the majority of our asylums are built of brick. We have outlived the time when "Capability" Brown said that "a red brick house puts the whole valley in a fever"; and when Repton called a brick house "a scarlet sin against good taste." Our views have changed for the better since 1773, when Brown died, and we now think that a well-designed brick house improves a landscape, especially if it be made of the beautiful plum-coloured bricks common in Queen Anne's time; but not so easily obtainable now. Whether brick or stone be employed the quality should be of the best. Porosity, or a tendency to scale or crumble should be guarded against, or the wall will prove damp. In some counties it is the custom to have the outer walls made with an air space of two or three inches. This not only prevents the damp from penetrating, but it has a tendency to equalise the temperature of the ward. Perforated bricks make a wall which is at once strong, light, and dry.

The inner walls should be plastered throughout, or, preferably, covered with Portland or parian cement. It is not on æsthetic grounds only that I insist on this, but for sanitary reasons also. The joints of brickwork can never be made perfectly smooth. Dust collects in the grooves and irregularities, and dust too often means disease. A skirting-board implies that there is a space at its back for collecting dust and dirt, and for affording a pleasant playground for rats and mice. It should be abolished, and a strip of wood about two inches wide and one inch thick nailed to the floor close to the wall.

The space between the foundation walls should be filled in, and a thick layer of concrete should rise to within an inch-and-a-half of the floor level. On this concrete wood blocks should be laid, a thick layer of Stockholm tar being placed next the concrete. By these means neither damp, sewer gas, nor vermin can get under the floor. It is also both warm and the tread noiseless—important points in asylums and hospitals.

The favourite kind of window at present is the ordinary double hung sash window. Why it should be the favourite is not easy to see.

In asylums it has to be blocked both top and bottom, merely allowing an opening of about four or five inches. The consequence is that the amount of air admitted is insufficient in warm weather. Further, it is most difficult to keep clean. Dirt accumulates between the sash and the frame, and the cords are constantly breaking. A

modification of the French casement is much to be preferred. The upper part should be an oblong swivel, or hinged fanlight, and the lower divided at its centre by a strong mullion; the sections being fitted with sashes moving on central pivots. An asylum needs abundance of light, and the windows should be more numerous, perhaps, than in any other building. Unfortunately, the amount of glass necessary for light is apt to make the wards somewhat cold in winter. It would be very desirable to have all the windows double, and in this case the inner window might be on the double-hung sash principle. No blocks would be necessary, and ventilation, without draught, would be easily maintained. Wherever practicable the windows should be placed opposite to each other, and the width of the room should rarely exceed 25 feet, or perfilation is likely to be imperfect. The upper panels of the doors should be, almost without exception, of strong plate-glass, and the lower panels of open ironwork, fitted in some cases with light wooden shutters.

The staircases are almost invariably of stone. In most asylums they are too narrow, and the risers too high.

In designing any building the first principle is, that it be perfectly adapted for the purpose in view, and no flight of genius on the part of the constructor can justify his swerving for a moment from that principle. If the edifice can be made beautiful, so much the better; but beauty must be made subservient to utility and to hygiene. It is often justifiable to decorate construction, but hardly ever to construct decoration. What then is the best design for an asylum for the insane? The old conglomerate style is gone for ever, and the linear is fast following it. Nevertheless, there is something to be said in favour of the latter, especially if the word "linear" be not too literally interpreted, and the less important wards placed in *échelon*. It is, however, not very suitable for asylums exceeding 300 beds. Nowadays the block system in one of its many forms is that which is almost invariably followed in the construction of asylums of 500 beds and upwards. There are five chief ways in which the blocks may be arranged.

1st. The blocks are placed on either side of a straight corridor of communication. This does not look well in elevation, and it covers much ground, but it is a simple form of construction, and might be found really good from an hygienic point of view, because the circulation of air would be free, and the drainage easily arranged.

2nd. There is the broad arrow form. Here the straight corridor is, if I may venture to say so, bent at its centre and the blocks arranged in *échelon*. I am inclined to think that this plan is better adapted for an hospital than for an asylum. The difficulty of supervision must be great, at least in large asylums.

3rd. We have the corridors arranged in the form of the letter H, the blocks being attached to the free sides of the letter. In my opinion this is an objectionable form.

4th. The blocks are arranged in quadrangles, or rather parallelograms; the important blocks facing due south, and the other blocks having their ends south and their sides east or west; the administration portion of the asylum only being to the north. Several asylums have lately been built on this principle, and for compactness and facility of supervision it is unrivalled.

5th. We have the horseshoe form of corridor with the blocks placed all round the outer edge. It is probable that this principle will ultimately be developed into the best plan of all.

A detached hospital for infectious disease should form part of every asylum.

The height of a building will profoundly affect its hygienic qualities, because the higher it is made the greater will be the interference with the circulation of air around the ground floors; the greater will be the difficulty in lighting and ventilating the corridors of communication, and in securing perfect sanitary arrangements throughout. I have, therefore, no hesitation in stating that an asylum should never exceed two stories in height, and if any part of an asylum be three stories in height, the whole building may be described as faulty or unsuitable. Apart from the sanitary aspect of the question there are reasons why no part of the building should be three stories, but these objections are scarcely relevant here. I should, however, like to go further and affirm my conviction that a one-story building would be by far the best, whether viewed from a point of management as regards the staff; of comfort as regards the patients, or of ease in carrying out the principles of modern hygiene. Of course the objection would be at once raised that the amount of land covered by the building would be enormous. My answer to that would be that a one-story building for 500 or 800 patients would not need more ground space than one of two stories for 1,000 or 1,600 patients, and many of our public asylums exceed even the latter number. If I say that no asylum should exceed 800 beds I do not think I shall find my assertion contradicted by anyone conversant with the inner working of such institutions.

Whatever form of construction be adopted the blocks will be so arranged as to lie around, or on either side of the administrative department, which thus forms the centre, and contains the various offices, including a large recreation hall.

The patients' blocks will be divided into day-rooms and dormitories. The former will vary in size, containing from 10 to 50, or, perhaps, 100 patients; the latter will range from three-bedded rooms to those in which 100 may be placed. The size is somewhat important, as it is always difficult, and sometimes impossible, to provide efficient cross-ventilation in small dormitories. Probably those containing between 20 and 30 beds will be found the best. As I have already said, about one-fourth of the dormitory space should be in single-bedded rooms.

As regards the cubic space allowed per patient in a county asylum, it is in all 1,080 cubic feet, 600 being allotted to dormitory and 480 to day-rooms. The superficial space is 50 feet for the former and 40 for the latter. It follows, therefore, that the rooms are usually 12 feet high. This total of 1,080 cubic feet is by no means excessive; but it may be sufficient, provided the air is very frequently renewed. As each individual renders impure between 2,000 and 3,000 feet of air every hour, it follows that the air in asylum dormitories must be renewed from four to five times every hour, and this renewal of air is one of the most difficult problems with which the medical superintendent has to deal. In summer it can be managed, provided the external air is not perfectly still,—a condition which does not often continue many hours at a time in England,—but in winter, when the air is cold, and when the low nerve force of the lunatic has to be considered, the question bristles with difficulties, and I doubt whether any very satisfactory solution of the problem has yet been found. Abundance of open fires would meet the difficulty, but apart from the expense of such a system, it could not be carried out safely in dormitories occupied by the insane. Hot air may be supplied by one of the various slow-combustion stoves, by hot water or steam pipes, or by driving hot air into the rooms by means of fans. All these methods, however, provide warm air, and the patient is thus compelled to warm his body with the air he breathes—a proceeding wholly opposed to both the teachings of nature and to the principles of hygiene. I have elsewhere admitted that this artificial way of warming dormitories and day-rooms is often the least of two evils; but it must not be pushed; must be carefully watched, or a high death-rate from consumption may be expected. The fan system possesses one advantage over the others, namely, that in warm weather pure, cold air may be driven in, and thus other means of ventilation may be supplemented. There is, however, nothing special in the ventilation of an asylum.

The same may be said concerning the disposal of sewage, and the arrangement of baths and closets. The latter are usually placed in small blocks in rear of their respective wards. Care should be taken that the connecting passage between the wards and the closets is short—not exceeding a few feet—because if it be long there is some danger of it acting as an extraction flue, and by drawing the foul air into the ward increasing the very danger it is intended to prevent. A stove placed in the closet block would obviate this risk. A well equipped Turkish bath should never be omitted.

The main flue from the furnaces should be carried underground for some distance from the building, and the chimney should rise high enough to carry the smoke well clear of the grounds. It is a good plan to make use of the chimney as a sewer ventilator, and for this purpose a 12-inch pipe should be taken from the highest point of the main drain to the base of the chimney.

Much of the health of the patients will depend on an abundant supply of pure water. It should not be less than 30 gallons daily for each patient.

The electric light has not as yet made much way in asylums. Its gradual introduction is certain, and with the abandonment of gas another element of danger will be banished from the lives of the insane.

It will be gathered from what I have said that the hygiene of an asylum closely resembles that of any other large building. It is somewhat more difficult to carry out; but the special points are few, and need little emphasis to impress themselves on the minds of those conversant with the principles of general hygiene.

Construction and Arrangement of Asylums.

BY

G. T. HINE, F.R.I.B.A.

Asylum construction differs from other branches of architecture in its relation to hygiene in that it demands a consideration of the mental as well as of the physical welfare of the people, and no architect can hope to attain much success in asylum construction, who does not devote some study to the nature of the malady and habits of the unfortunate class for whom he provides accommodation.

The old days of prison-like cells, iron fetters, and strait waistcoats have happily passed away, but still there is much to be done by way of improvement; and an architect may assist materially in lessening the troubles and contributing to the cure of these poor people by the care and consideration he gives in providing them with bright and healthful homes, from which the idea of detention is as far as possible removed.

Unfortunately he has too often to contend with the objection that asylums are provided out of the county rate, and that his duty to the ratepayer demands that cost should be a first consideration. Unlike the hospital, where only physical disorders are treated, and a simpler form of construction is required, the lunatic asylum has not the pecuniary support, and therefore, to a less extent, the sympathy of the public; and too frequently an architect's first instruction is, that the cost per bed must not exceed a figure which is more applicable to the workhouse than to the hospital.

But in these days of progress, it is coming to be understood that we can do better service to the ratepayer by giving first consideration to other points than that of mere cost, and that in providing buildings skilfully designed and well constructed, we afford the best opportunities for successful treatment and speedy cure, and thus are studying the truest economy.

In the short time allowed me for this paper I must restrict the interpretation of my theme to its narrowest limits, and regard the

asylum as meaning only the pauper institution, and not the hospital for private patients. The first principles, however, of arrangement and construction are more or less observable in all forms of homes for the insane, and if we allow a somewhat more luxurious development in the private asylum, we might fairly apply the following observations all round.

Before touching upon the construction of asylums I ought to say a few words on the selection of a site, though unfortunately it rarely comes within an architect's province to advise about this; generally the site is purchased before the architect is called in to design, or compete for the erection of the building.

A word in passing about competitions, which are unfortunately gaining ground—I say unfortunately, because they are not always calculated to produce the best results. Too much importance is attached to the mere design, without regard to the details of construction, or the practical experience of the author; and it not unfrequently happens that a good workable plan has to be sacrificed to the symmetrical outline, necessary to make it attractive *on paper* and give the author a chance of success.

A site should, in my opinion, be, firstly, on high ground. I believe, in a mentally hygienic sense, much depends on elevation. It is a known fact that in some parts of the world the intellectual standard is lower in the lowlands than in adjacent higher districts; and I should much like to see some statistics of cures effected in asylums on elevated situations, as compared with others on lower ground. Secondly, the soil should be dry, and sufficiently porous to allow of the sewage being used on the land; and thirdly, an abundant supply of good water should be available.

If the site is on a slope, it should be a southern one, or should allow of the rooms constantly occupied by patients facing the south or south-east. Sunshine is a necessity where the relief of mental depression is aimed at, and care should be exercised in reserving the best aspects for the patients' *day* rooms.

In the general arrangement of an asylum, the first question to be determined is the principle on which it should be built. In this country asylums are built either on the "pavilion" principle, where the different blocks are connected together, and communicate with the administrative centre by one-story corridors, or as continuous buildings; the latter being the most common and convenient plan for small asylums. Another form of asylum of recent adoption in America, and on the European continent, is that of entirely detached blocks, placed more or less distant from the central or main building, comprising a number of villas, in which patients can be very effectually segregated. It is claimed that the curative results are higher in this than in any other form of asylum; but I hope we may have a description of these buildings from some of our distinguished visitors, and I shall confine myself to the principles of construction known and adopted in this country.

When the principle is determined, the first care should be to arrange the wards in the best positions for aspect, light, and air, and all within easy reach of the administrative centre. In small asylums this is a comparatively easy matter, but in buildings accommodating from one to two thousand patients much consideration is required to succeed in all these respects. It is also important that the wards should be arranged so that the medical officers in their rounds may not have to retrace their steps unnecessarily.

The position of the wards is a matter of equal importance the day-rooms should all, if possible, have a southern aspect, certainly every ward should have one or more day-rooms to the south; and the blocks should not be built to look out on to one another. In large asylums this almost necessitates a plan on the "echelon" principle; and in *very* large buildings even this requires modification, or the length of the corridors would become quite impracticable.

On the classification of patients, and the positions of their various wards, much of the convenience of working depends.

In all asylums, unless built for special cases, there should be accommodation for the following:—

1. Sick and infirm, including a small ward for newly-admitted patients.
2. Acute or refractory cases.
3. Epileptics.
4. Quiet and working patients.

Some of these wards, again, admit of further sub-division, but the first and second should always be designed to allow of classification by providing two or three day-rooms in a ward, with one or more dormitories on the same floor, in addition to a proper proportion of single rooms.

The infirmary wards, which, including the reception ward, should generally provide accommodation for one-fourth the total number of patients, are best placed nearest to the administrative centre and to the medical officer's rooms, and should not exceed two storeys in height; or, if three, the top floor should be devoted to dormitories for quiet patients. Each ward should be self-contained on a floor, and should comprise one or more roomy dormitories, one with a southern aspect for bedridden patients, and with windows on at least two sides to allow of cross-ventilation, as indeed should be the case in *all* dormitories where practicable. The superficial area and cubical contents of these rooms should very much exceed those occupied by healthier patients (the Lunacy Commissioners say one-third more); at least two comfortable day-rooms should be provided for convalescents, one especially for dining in, as these patients rarely go to the general hall for this purpose.

The number of separate single rooms in an asylum is a point about which there is much diversity of opinion, and must to some extent be determined by the character of the patients. Generally, if the dormitories are numerous, and moderate in size, single rooms for one-fifth of the total number of patients will be considered sufficient, but

these must be judiciously distributed in something like the following order:—

Acute and refractory cases	-	1	single room to every 3 patients.
Epileptics	-	1	„ „ 5 or 6 „
Infirm	-	1	„ „ 6 or 7 „
Quiet and working	-	1	„ „ 10 „

Single rooms should have shutters to the windows, and, except in the infirmaries, where one or two may conveniently be provided with open fireplaces for special cases, no single room should be warmed in this way. It is essential, however, that *every* apartment should be warmed and ventilated with proper inlet and extraction flues, of which more anon.

Doors *without* inspection holes or shutters are, in my opinion, best. In epileptic wards a narrow panel or other clear opening must be left to allow of an attendant hearing a patient when in a fit; but in other cases I think inspection holes or shutters suggest espionage, and are therefore undesirable, particularly as it is an easy matter to use a silent lock actuated by the handle, when the door can be opened as easily as a shutter, without disturbing the patient.

But to return to the infirmary. This should have, in addition to the single rooms last-named, rooms for attendants in proportion to the number of patients, excluding night attendants, who should be housed in a block by themselves in a quiet quarter; also lavatories, store rooms, and water-closet annexe, in common with all the other wards; and in addition to these, bath and dressing rooms. The other patients in asylums of any size will usually bathe in a general bath-house, but infirmary patients should have separate bath-rooms in their wards.

Each ward should also have a scullery, fitted with a small range, washing-up sink, and cupboards for crockery and utensils.

The water-closet annexe in the infirmary, as in all other blocks, should be constructed in a spur, separated from the building by a cross-ventilated passage. It should include closets, in the proportion of one to 10 or 12 patients, with an additional one for attendants, a small room for slop-sink and brushes, another for dirty linen, a coal place, and, on the male side, urinals. In addition to the general annexe, large dormitories in the infirmary wards should have a water-closet and slop sink attached, but separated by a cross-ventilated neck or passage.

While on the subject of closet annexes, I will refer to one or two special details of construction, as it will be impossible, in a short paper like this, to speak at length on all such matters. It is assumed that any architect entrusted with the erection of an asylum is well versed in all the leading questions of sanitary science.

The walls of all these offices should be faced internally with glazed bricks, or lined with enamelled tiles, which, though costly in construction, are easily washed and kept sweet and clean, and never require any outlay in paint. The floors should be of concrete, tiles, or some equally imperishable material not affected by wet. The doors of water-

closets should be low and raised a foot or more from the floor, to allow of observation, and should open outwards. The closet apparatus should be of simple construction, without valve or anything to get out of order. I prefer a hopper basin, straight down behind, with earthenware trap all in one piece, rather than a "wash-out" basin—a good quick acting cistern with large service pipe, but *not* with automatic action. Patients should at all times be encouraged in habits of cleanliness and order; and by automatic contrivances which relieve them of responsibility it seems to me you frustrate rather than encourage a healthy condition of mind. The objection of an occasional unflushed basin is a trifling matter, and one quickly remedied by the attendant. Urinals are best with only a back and an open channel, without wings or splash pieces; the less surface there is to wash the less chance of smell.

Next to the infirmaries should come either the ward for acute cases or for epileptics. In a small asylum the latter might be on the ground floor, with a ward for acute cases over; but, in any case, epileptics should, if possible, be housed both day and night on the ground floor. Their wards should be bright and roomy, the day-rooms rectangular, without breaks or obstructions, behind which a patient might get lost sight of while in a fit. There is not the same advantage in subdividing these rooms, as these patients are generally quiet, and, in their healthier moments, are more rational and appreciative of surrounding advantages than other classes of patients. The adjuncts to the ward should be the same as in the infirmaries, but with only one bath in connexion with the dormitory, for cases of emergency. The dormitory should be spacious, and large enough to hold fully five-sixths of the patients in the ward, the remainder sleeping in single rooms, which, unlike other wards, should open out of the dormitory; one or two only opening out of day-rooms for the use of troublesome or invalid patients during the day.

The ward for acute cases may be situated either on ground or first floor, if made sound proof, to prevent the disturbance of patients in rooms above or below. This ward is best broken up by dividing the day rooms into several smaller rooms by partitions partially glazed, so as to allow of the charge attendant controlling the entire ward. The single rooms, accommodating one-third of the whole number of patients, should open out of the day-rooms. There should be one or more associated dormitories on the same floor for troublesome cases; the remaining patients sleeping on the top floor of the building. In other respects this ward need not differ from the infirmaries already described.

The wards for quiet and working patients, or as they are generally somewhat erroneously termed, "chronic cases," may be very simple in design and arrangement. Were it possible to construct the entire asylum on this principle—as are those for imbeciles, built by the Metropolitan Asylums Board—that great desideratum, a cheap asylum, might be more readily obtained.

These wards may consist of large day-rooms, with associated dormitories of proportionate size, and a small number of single rooms. The dormitories may all be on the top or two upper floors.

A specially roomy boot-room, which I have omitted to mention as attached to all wards for outdoor boots, hats, and cloaks, should be situated near the outer entrance, with some lavatory basins for patients to wash in when coming from the workshops or off the land.

In addition to the foregoing, it is often convenient to have wards of simple arrangement in connexion with the workshops on the male side, and the laundry on the women's side.

Before leaving the wards, I should add, that, whether built on the block or continuous-buildings system, they should always be carefully designed with reference to the position of staircases, both for convenience of visiting and for affording means of escape in case of fire. No ward, particularly on the upper floors, should have less than two exits, at opposite ends, making it impossible for any patient to be cut off from escape.

Staircases should be of ample width, and easy of ascent, and always of non-combustible material, for which purpose concrete is better than stone.

It is scarcely necessary to say that floors constructed on a fire-proof principle offer many advantages both against the spread of fire and the conduction of sound, and do not add so much to the cost of a building as is generally supposed. The Lunacy Commissioners require that the ceiling next the roof of all rooms occupied by patients shall be of fire-proof construction, and therefore, in two-storey buildings only one more floor remains to be of similar construction to make the building entirely fire-proof.

Coal lifts are sometimes introduced in asylums, but, in my opinion, are better omitted, as being dangerous, and also as robbing patients of work which they can generally well do. Sometimes I provide an outside staircase to a coal place in the W.C. annexe, the inner and outer doors of which have different keys, thus allowing coal to be brought by men to the women's side without their being able to get into the ward. These staircases also constitute additional ways of escape in case of fire.

The administrative department should be centrally situated between the male and female blocks, and arranged to allow of easy approach to the recreation hall, kitchen, stores, and laundry buildings from both sides, without the two sexes coming into contact. It should comprise—

1st. A large hall for recreation purposes, capable of seating fully half the number of patients in the asylum, in which a stage should be arranged in a recess at one end, with convenient approaches and dressing rooms.

In small asylums the hall is frequently placed on the ground floor, with the chapel over it, this being convenient for approaches, and also economical in construction.

2ndly. A good kitchen, with sculleries, larders, and pantries sufficient for all patients and officers in the asylum, and near to the recreation hall, if this be used as a dining room. In some asylums one or

two large patients' dining halls are provided in addition to the general hall, when this is used exclusively for recreation purposes. Mess rooms for attendants and nurses should be situated near the kitchen.

3rdly. A general or steward's store, which, like the other buildings, should be easily accessible from both sides, and also have a cart road approach for delivery of stores.

4thly. The laundry buildings, which, if not quite central, should be on the women's side, but with a direct approach from the men's wards, and should comprise wash-house and ironing rooms, foul wash-house, and, in large asylums, separate wash-house for officer's linen; also, drying stoves in each of the wash-houses.

An admirable system of drying, which I first introduced at Nottingham, and am now using in two other asylums, is obtained by blowing or drawing warmed air through the horses by a fan. The clothes are thus dried much quicker, and with a fresh and sweet result. I find at Nottingham that before all the horses are filled, the clothes are dry on the first horse, and thus a constant succession of changes can be made, and the clothes dried as quickly as they are washed.

5thly. The central buildings should also include, near the principal entrance, one or two good visiting rooms; also committee, waiting, and porters' rooms, a superintendent's office, and rooms for the assistant medical and other officers of the asylum.

The superintendent's house, which, in many asylums, is incorporated with the central block, should, in my opinion, be an entirely detached building, or, at the most, be connected with the asylum by a corridor of some length.

The responsibilities of a superintendent make it very desirable that he should at times be able to shut his mind to his work, and this he could do more effectually if his house were some little distance from the asylum. Moreover, if a married man, it is not fair to his family that they should be brought up in close association with the asylum and its influences; and I venture to think further, that a superintendent's work would generally be better done with his office in the asylum and his house some little distance away, and without any corresponding disadvantages, providing that a telephonic or other means of communication be arranged between his house and the asylum, and that one or more assistant officers sleep in the main building.

The position of the chapel is another vexed question. It should be designed in all respects to convey to patients the idea of church, and for this reason is better a detached building in the grounds. On the other hand, it is very undesirable in wet weather to have to take several hundred patients some distance to church. When possible it is best to erect it outside the main building, with a connecting corridor in addition to outside entrances, either of which may be used.

Separate blocks for nurses and attendants, containing sitting and club rooms, where they can associate when off duty, with bedrooms above for those who do not sleep in the wards, are very desirable adjuncts.

A dispensary is always required; and sometimes an operating room, with one or two sleeping rooms adjoining, is a great convenience, indeed, almost a necessity in a large asylum.

Workshops should also be provided on the men's side, with separate shops for different workers, the variety and size of these shops being governed by the number and class of patients; and, in country asylums, farm buildings in a convenient part of the estate.

An isolation hospital, a short distance from the main building, should be constructed for infectious cases; this should comprise an associated dormitory with one or more single rooms on each side, a kitchen, laundry with disinfecting stove, and other necessary adjuncts.

Mortuaries for both sexes, with *post mortem* room, should be in a separate block, away from the main building.

I have, I fear, already exhausted more than my allotted time, and I dare not trespass further on your patience by saying anything on details of construction or internal fittings, though very much of the success and comfort of an asylum depends on the consideration given to these details. Nor have I time to touch upon the subjects of drainage and disposal of sewage, water supply and service, lighting, by gas or electricity, all of which are matters of much interest, and with which the asylum architect must be well conversant. One further subject which I must refer to, is that of heating and ventilation, which is so all important a matter in asylum construction that my paper would be incomplete without it.

In my opinion any system for warming and ventilating should fulfil the following conditions:—

1st. It should offer the least risk of injury to patients by accident or danger to the building by fire.

2nd. It should be under the perfect control of the engineer, who should be able to raise or lower the temperature in any ward readily.

3rd. One system should combine the double duty of warming and ventilation.

4th. Ventilation should not be dependent on natural atmospheric action, which cannot always be relied upon to create a circulation of air.

5th, and lastly. It should be reasonably economical in working.

After long consideration, and some years of experience, I have come to the conclusion that the right system is one of air warmed over hot water or steam pipes, and propelled into the wards by a fan, through underground trunks, and vertical flues in the walls communicating with all the rooms, and a similar system of extraction flues, by which the vitiated air is expelled.

It must be understood that I do not advocate air warmed by fire heat, a method which may seriously deteriorate its quality, a result not to be feared by warming over steam batteries, which plan has the further advantage of allowing the temperature to be quickly raised or lowered in any particular ward by a simple arrangement of pipes and valves.

I cannot attempt to describe my system in detail, but will merely call attention to a few important points.

The air which is propelled into the building must be drawn from a situation untainted by obnoxious surroundings.

The trunks and flues must be carefully calculated in proportion to the size of each room. Many failures in ventilation are due to ignorance or neglect of this.

Separate trunks for day and night service should be arranged, with simple shutter valves for closing the one and opening the other at morning and night.

The extraction flues should communicate with upcast shafts of some height, say in towers, to carry well away the vitiated air.

The fresh warmed air should enter the rooms near the top, and the vitiated air be withdrawn near the floor; experience having taught us that this is right; for, if the positions of inlets and outlets were reversed, some deleterious gases would not readily ascend to escape at the top, while the warm air, entering at the bottom, would quickly ascend and pass out without mixing thoroughly with the surrounding atmosphere, as it must do if driven in at the top, and be allowed to spread over the whole surface of room, gradually falling as more air is forced in above it, and vitiated air extracted below.

When ventilation is required without heat, the fan may be used to drive in air at its normal temperature, the stagnant atmosphere in the rooms being of necessity displaced either through the extraction flues or the open windows.

One great advantage of this system is, that heat can only be obtained in conjunction with ventilation, which is not always the case with steam or hot water pipes in the wards, where a close stuffy heat is generally the result.

I cannot better illustrate the results of this system than by quoting from a recent report of the Superintendent of the Nottingham Borough Asylum, where I have lately introduced it in the new male annexe.

"So efficiently has the heating been done that a temperature of 60 degrees has been easily maintained throughout the wards without the aid of any fires, and this when the thermometer outside registered 10° of frost. The dormitories and single rooms are just as easily warmed at night.

"Those who are acquainted with the working of an asylum will readily imagine the immense comfort of being able to do without fires in the wards. There is no crowding round the fireplaces, and no quarrelling for the best seats, but the patients sit scattered about at the windows and at the tables, just as in summer. It was expected that there would be some grumbling at first at the absence of fires, but, strange to say, I don't think I heard a single complaint. Another great advantage this system of heating has over most others is, the entire absence from the rooms of all pipes and other heating surfaces.

"The ventilation is also equally successful. It is very observable in the dormitories and single rooms; the air in these appears to be almost as pure in the morning when the patients get up as in the evening when they go to bed."

In conclusion, I must express my regret at the time I have been compelled to take in order to describe, but briefly, the arrangement of an asylum. There are very many interesting points of detail and construction I should like to have referred to had it been possible. I hope, however, my shortcomings will be remedied by others present in the discussion which is to follow.

DISCUSSION.

Dr. Saunders (Medical Superintendent of the Sussex County Asylum, Hayward's Heath,) said that in the arrangements of asylums there was nothing more important than the water-supply. If the site was not good the water would often get polluted. The selection of a site was, therefore, also a most important matter.

Mr. Banister Fletcher (Professor of Architecture and Building Construction, King's College,) pointed out what seemed a little like a contradictory statement in Dr. Greene's paper. In one part of it, double-sash windows were condemned, while a little further on an opinion was recorded in favour of the double-hung sash principle. He wished to ask Dr. Greene whether the 12-in. pipe for air referred to in the paper was to be connected with the base of the chimney.

Mr. Rogers Field, M.I.C.E., said that mere design in the arrangements of an asylum was in the province of the architect rather than in that of the engineer; but the water-closets and the sanitary arrangements generally were matters for the engineer. The first question was, how were they going to treat the inmates of an asylum? Should they be treated as responsible persons, or were they to be treated as not rational beings? Were they to use a pull in the water-closets, or an automatic apparatus acted upon by the door or the seat? Were they to mistrust the patients, or were they to employ apparatus to be worked by the patients themselves? He agreed with Dr. Saunders in thinking that to treat the insane as irrational beings was not the right way. Two types of apparatus had been tried. Where the ordinary pull was employed, it had at first to be worked by the attendants, but after a time the patients learnt to work it perfectly. Everything he had seen in the last 10 years confirmed him in the opinion he had long ago formed, that patients in asylums might be trusted to use the ordinary apparatus. If the flush was automatic, working through the movement of the door or the seat, the apparatus was always getting out of order. He had been appointed to report upon the sanitary arrangements at a well-known asylum. In the examination he had made he found that three-fourths of the automatic flushing apparatus were not acting.

Mr. W. M. Mackison (City Engineer, Dundee,) preferred that the windows in asylums should have, not a southern, but a western exposure. As the prevailing winds were those blowing between east and west, the western aspect was the most salutary. He agreed with the author of the paper with regard to the tiling of walls. With respect to the ventilation of buildings, he had no faith in apparatus for extracting air, because they caused a draught, and a draught was always bad. In a hospital with which he was connected they took pure air from a high tower and admitted it into the wards through an inlet placed about 6 ft. above the patient's bed, and also by an inlet placed below the level of the bed. Fires were of no use except to give a cheerful aspect to the wards.

Sir Robert Rawlinson said that with regard to the position and arrangements for water-closets in asylums, there was necessarily a great difference in different asylums. In some the patients could be trusted, but in others not. Some patients would get their hands down into the pan if they could. Such patients should be specially provided for. With regard to earth-closets, which the Government wanted to see introduced, generally there was again trouble with the class of what were called "the dirty" patients, who smeared everything within their reach. They had tried railing round the seat, with a 10-ft. fall below, so that such patients could not get at the excreta, but they found that more water was wasted in cleansing and keeping clean the apparatus than flushing apparatus would have required. Many years ago at Wakefield Gaol, where the prisoners were treated on the separate and silent system, there was a great outbreak of typhoid fever. The result of an examination by medical experts was an utter condemnation of the whole building, root and branch. After a brief examination, he found on each side of one end of a dividing wall a pan-closet, each closet being connected with the sewer by a 4-in. pipe, running straight down the wall into the sewer, which was never cleansed nor flushed. The criminals found out that by lowering the trap or pan and holding their heads down over the container they could converse through the closets with the prisoners on the other side, but while doing so they were breathing the sewer-gas, and hence the outbreak of typhoid fever. He examined the drains, and directed a 4-in. pipe to be continued up to the eaves to carry up the foul air. He found that the drains could be kept clean by flushing. The governor of the gaol invented a pan which, by means of a 4-in. lip, rendered it impossible for a prisoner to get his hand down or to remove the trap. These alterations, though simple and inexpensive, were effective, the infection disappeared, and the authorities were spared the great expense of a new prison. The flushing tank was, he felt bound to say, one of the greatest inventions of modern sanitary science, and it owed its progress more to Mr. Rogers Field than to any other sanitarian. The fame of the invention would long outlive the inventor. The benefit of a circulation of air could not be over-estimated. At night his window was open (with Venetian blind down), and he thanked God that no window he ever knew of was air-tight. Windows with 6-in. beads at the bottom, so as to allow of being opened at the meeting-rail, were no danger even in winter. The air in rooms provided with them was always sweet.

Mr. H. H. Statham said he was glad to hear the remark with regard to the admission of air at the lower part of the room, and he rose to support it. In admitting air at the top they were opposing natural action, but in admitting it at the bottom natural action was helped. Fouled air always had a tendency to find its way to the top, and to bring the fresh air from the top was to bring it through the stratum of fouled air, some of which it would drag down with it.

Mr. Blair (Borough Surveyor of Bootle) said there were two well-known plans of ventilation, the first being that by which the air was extracted from the top; and the second that by which it was extracted from below. He had experience of two police-courts in which these plans had been respectively carried out. In the first case, where the air was extracted from the top, the result was good when the court was empty; in 12 minutes the air was entirely changed. But when the court was crowded the case was altered. The air very soon began to smell, even near the bench. In the other court, which was supplied with Tobin's tubes placed at the top, there was never a smell. The extraction of foul air from the floor was, in his opinion, the best plan.

Mr. Mackison (Dundee) added that he had been led to adopt a mixed system, combining the two principles. If he put in pure air, he was sure of obtaining an advantage, but if he extracted air, he might take out pure air with the impure.

Dr. Greene, in reply, said he agreed with Dr. Saunders as to the importance of a site which would afford the chance of a good water supply. In answer to Professor Banister Fletcher, he said double-sash windows were objectionable when blocks had to be used, but when the window itself was double there was no necessity to use blocks. The air-pipe referred to opened into the chimney at the base.

Mr. G. T. Hine, in replying, said two points which had been referred to ought to have a word in reply. When Mr. Mackison advocated wards with a western aspect rather than those facing the south, he probably had in mind a fever hospital. In building a hospital where the patients were always in bed, wind was a more necessary element than sun, but in lunatic asylums, sunshine was a necessity if a cure was to be effected. The patients would be up and about, and opportunities should be given for exercise at all hours of the day in the open air. In large buildings, such as the Claybury Asylum, they should be glad to get any outside aspect, east, south, or west, but if the principal front was to the south, they must have east or west as well. The other point had reference to the vexed question of how air ought to be admitted into a room. All depended upon the system adopted. If they trusted to nature, the proper point to extract from was the top of the room. He had studied the question for many years, and had made extensive experiments. When the question of inlet and outlet flues was first before him, he was as sceptical as a good many of those present. While building large board schools for 1,100 or 1,200 children, he had determined to try extraction from the top in one case, and extraction from the bottom in the other. He did not employ the Blackman fan, but something adapted to effect the same purpose. It was obvious that if mechanical power was employed to force air into a room, if the room were warmer than the surrounding atmosphere, the warm air would rise to the top of the room, and half of it might escape without mixing with the surrounding air, just as water might be forced through a lake, leaving the great mass of the water in the lake stagnant.

Sir Arthur Blomfield referred to a matter which had come before another Section, and which required to be dealt with at once. On the previous day a resolution had been proposed in the Section of State Hygiene which, in his opinion, more properly belonged to the Architectural Section. It was a question with regard to the education of architects. That section had passed a resolution in favour of the statutory examination and registration of architects. It appeared to him that such a resolution should have been at once referred to that Section.

Dr. Sykes then proposed the following *Resolution*, which was seconded by Mr. Ernest Turner, F.R.I.B.A., and supported by Mr. Rogers Field, C.E. :—

“The members of the Architectural Section desire to consider the resolution adopted by the Section of State Hygiene approving of the statutory examination and registration of architects, before the definite adoption of the resolution by the Congress. They are of opinion that this question should have been referred to Section VI., ‘Architecture in Relation to Hygiene.’”

The resolution was put, and carried unanimously.

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TRANSACTIONS

OF THE

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VOLUME VII.

SECTION VII.

ENGINEERING IN RELATION TO HYGIENE.



EDITED BY C. E. SHELLY, M.A., M.D.,
Assisted by the HONORARY SECRETARIES of the SECTION.

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