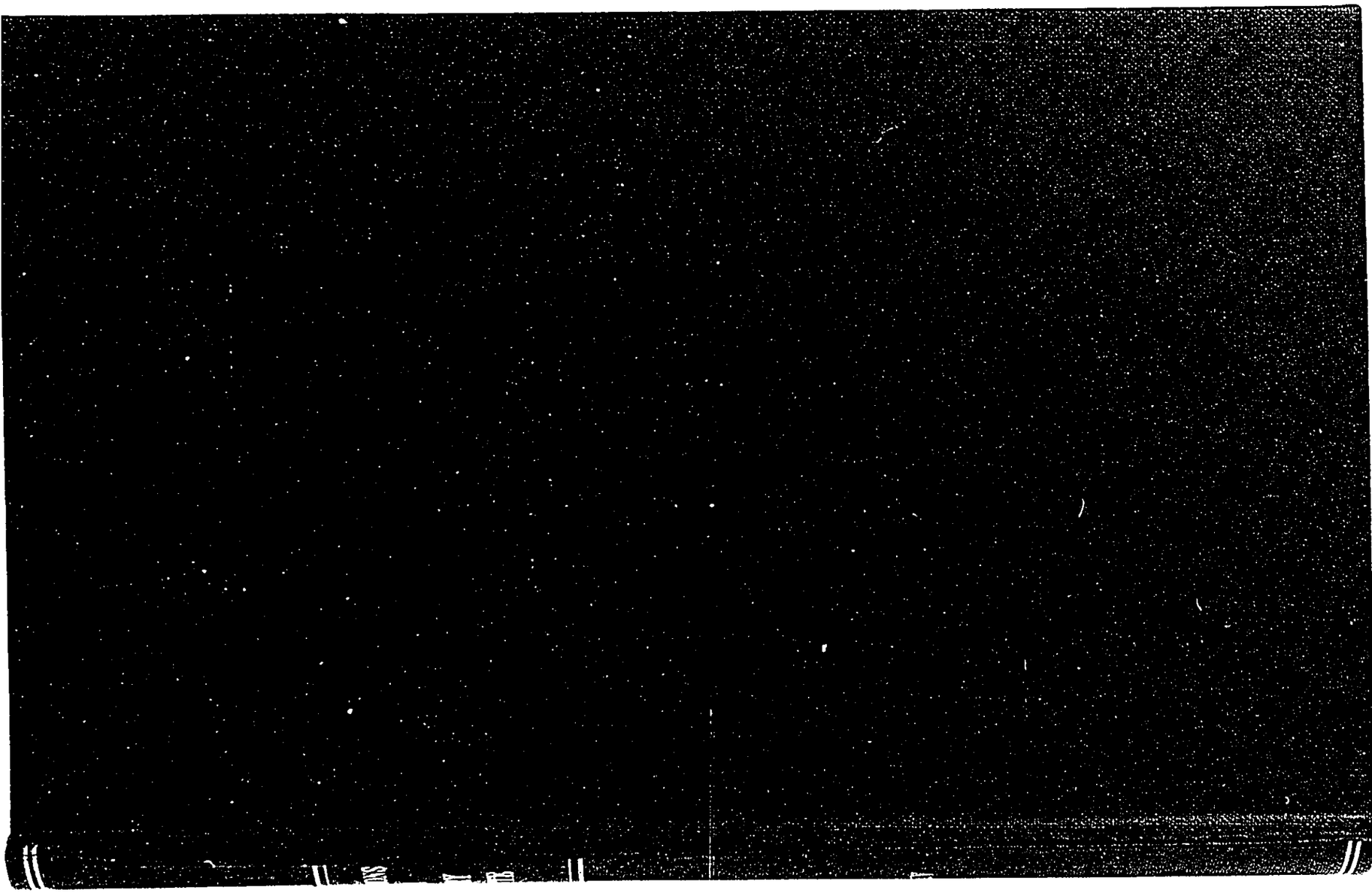


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1882–3.

TRANSACTIONS

OF THE

Sanitary Institute of Great Britain.

VOLUME IV.

CONGRESS AT NEWCASTLE-UPON-TYNE.

1882-3.

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Sanitary Institute of Great Britain.

FORMATION OF THE INSTITUTE.

THE increasing importance attached to Sanitary Science and the recognised position it was assuming in the public mind, appeared to the promoters of the Sanitary Institute fully to justify the formation of a National Society, the object of which should be to devote itself *exclusively* to the advancement of all subjects bearing upon Public Health, In furtherance of the object, a meeting was held at St. James's Hall, on the 13th of July, 1876, at which His Grace the Duke of Northumberland presided, when it was unanimously resolved:—

First—"That in the opinion of this meeting the sanitary condition of this country is still very unsatisfactory, and that further legislation is necessary with a view to its improvement; and that for the purpose of collecting and imparting information upon all matters connected with the subject of 'Public Health' a Society be now formed, to be styled 'The Sanitary Institute of Great Britain.'"

Second—"That the gentlemen whose names are appended be requested to act as a Committee (with power to add to their number) for the purpose of carrying out the previous resolution and of reporting to an adjourned public meeting to be held during the second week in October next."*

The Committee appointed to report upon the subject considered it would add greatly to the usefulness of the Institute if Mayors of Boroughs, Chairmen of Local Boards, Sanitary Authorities, Medical Officers of Health, and all who have to administer the Public Health Acts, would associate themselves with the Institute, either in their individual or corporate capacity, and take part in its proceedings. By thus bringing their united knowledge and experience to bear upon Sanitary matters, the laws relating to the same would become better known and be more efficiently administered.

BASIS OF THE CONSTITUTION OF THE INSTITUTE.

SECTION I.

Charter of Incorporation, Membership, and Government of the Institute.

As soon as practicable a Charter of Incorporation shall be obtained, as it will facilitate some portions of the work of the Institute, more

* An adjourned public meeting was held on the 14th of March, 1877, when the report was unanimously adopted and a Council subsequently appointed to carry it into effect.

especially the examinations as set forth in Section II. Until a Charter is obtained, the examinations shall be continued as heretofore, and a Register of persons certificated as competent to act as Local Surveyors and Inspectors of Nuisances shall be formed.

The Institute shall consist of Fellows, Members, Associates, and Subscribers.

Fellows shall be elected by ballot by the Council, and shall include scientific men of eminence, persons of distinction as Legislators or Administrators, and others, who have done noteworthy Sanitary work.

All Fellows (except those who have already become Life Members) shall pay a fee of Ten Guineas on taking up the Fellowship, and such fee shall entitle the Fellow to all the privileges and advantages of the Institute for life without further payment.

Any person proposed by three Fellows or Members, shall be eligible for election as a Member of the Institute.

Members shall be elected by ballot by the Council, and shall be eligible to serve on the Council, and to vote at all Elections and Meetings of the Institute. The admission Fee payable by a Member shall be Three Guineas, and the Annual Subscription Two Guineas.

Medical Officers of Health and Medical Men holding Certificates in Sanitary Science from any University or Medical Corporation shall be entitled to be enrolled as Members of the Institute without Admission Fee.

Members desirous of becoming Life Members may do so on payment of Ten Guineas in lieu of the Annual Subscription.

All persons who have passed the Examination and received the Certificate for Local Surveyor from the Institute, shall, by virtue of having so passed, become Members of the Institute upon the payment of Five Guineas (without Annual Subscription), in addition to the fee paid for the Examination.

Any one proposed by two persons, either Fellows, Members, or Associates of the Institute, shall be eligible to be elected as an Associate of the Institute, the election to be by ballot by the Council. The Admission Fee payable by Associates shall be Two Guineas, and the Annual Subscription One Guinea.

All persons who have passed the Examination and received the Certificate for Inspector of Nuisances from the Institute, shall, by virtue of having so passed, become Associates of the Institute upon the payment of Three Guineas (without Annual Subscription), in addition to the fee paid for the Examination.

Persons of either sex, interested in the advancement of Sanitary Science, shall be entitled to be enrolled as subscribers on payment of One Guinea annually. Annual Subscribers shall be entitled to attend and to take part in the discussions at all meetings and Congresses of the Institute, and shall have free admission to the Conversazioni and Exhibitions of Sanitary Appliances held in connection with the Institute, so long as they continue to pay their Subscription.

Donors of Ten Guineas and upwards shall be entitled to be enrolled as "Life Subscribers," with all the privileges and advantages of Annual Subscribers without further payment.

Subscribers of Half-a-Guinea to any Congress of the Institute shall be entitled to a card of admission to the Meetings, Addresses, Conversazioni, Excursions, and Exhibition held in connection with that Congress.

The Institute shall be governed by a President, Vice-Presidents, and a Council of Twenty-four, consisting of Fellows and Members of the Institute, of whom not less than two-thirds shall be Fellows. The Council shall be chosen by the Fellows and Members. One-fourth of the Council shall retire annually, and shall not be eligible for re-election for one year.

The first President of the Institute shall be His Grace the Duke of Northumberland. Future Presidents and Vice-Presidents shall be elected by the Council. The Council shall have the power of electing Honorary Members of the Institute, Honorary Foreign Associates, and Corresponding Members of the Council.

Section II.

Objects of the Institute.

To devote itself to the advancement of Sanitary Science and the diffusion of knowledge relating thereto.

To examine and to grant Certificates of Competence to Local Surveyors and Inspectors of Nuisances, and to persons desirous of becoming such or of obtaining the Certificate. The Examinations shall be held at such times and in such places as the Council may direct.

A Board of Examiners shall be appointed by the Council; such Board shall consist of gentlemen representing Medical, Chemical, and Sanitary Science, Engineering, Architecture, and Sanitary Jurisprudence.

The Examination for Local Surveyors shall include a competent knowledge of the Statute relating to Sanitary Authorities, of Sanitary Science and Construction, and of Engineering.

The Examination for Inspectors of Nuisances shall comprise the elements of Sanitary Science, together with Sanitary Construction, and the Statutes relating to the prevention of disease and the suppression of nuisances injurious to health.

Fees shall be charged for the Examinations, and a Certificate of Competence, signed by the Examiners, shall be granted to successful candidates, entitling them to be designated as "Certificated by the Sanitary Institute of Great Britain."

A Congress shall be held by the Institute for the consideration of subjects relating to Hygiene at such times and places as the Council may direct.

Exhibitions of Sanitary Apparatus and Appliances shall be held from time to time as the Council may direct.

Fellows, Members, Associates, and Subscribers shall have the right

of Free Admission to the Exhibitions of the Institute whenever they are open. All fees payable by Exhibitors and the Public shall be fixed by the Council and belong to the Institute.

A Catalogue shall be published under the direction of the Council as a permanent record of the Exhibitions.

The Institute shall take such steps as may be within its power to obtain a complete registration of sickness, especially of preventable diseases.

The Institute shall endeavour to secure the services of medical men and others specially qualified to give lectures on subjects relating to the prevention and spread of disease.

The Institute shall encourage the formation of classes for technical instruction in Sanitary Science in such a way as may seem advisable to the Council.

A Library shall be formed in connection with the Institute.

CONGRESSES AND OFFICERS.

TABLE showing the places at which the Congresses of the Sanitary Institute of Great Britain have been held; with Presidents, Presidents of Sections, and Honorary Local Secretaries and Treasurers.

Presidents.	Presidents of Sections.	Honorary Local Secretaries & Treasurers.
1877.–B. W. RICHARDSON, M.D., LL.D., F.R.S., Leamington, October.	EDWIN CHADWICK, C.B. GEORGE WILSON, M.A., M.D., F.C.S. BRUDENELL CARTER, F.R.C.S.	J. THOMPSON, M.D. JOSEPH. S. BALY, F.C.S. T. H. THORNE, J.P.
1878.—EDWIN CHADWICK, C.B., Stafford, October.	B. W. RICHARDSON, M.D., LL.D., F.R.S. HENRY DAY, M.D., F.R.C.S.	W. ELLIS CLENDINNEN. H. B. LIVINGSTON. THOMAS WOOD.
1879.–B. W. RICHARDSON, M.D., LL.D., F.R.S., Croydon, October.	ALFRED CARPENTER, M.D., S.SC.CERT.CAM. CAPTAIN DOUGLAS GALTON, R.E., C.B., D.C.L., F.R.S. G. J. SYMONS, F.R.S.	H. J. STRONG, M.D. ROBERT HALL. SAMUEL LEE RYMER.
1880.—The Right Hon. EARL FORTESCUE, Exeter, September.	PROF. DE CHAUMONT, M.D., F.R.S. R. RAWLINSON, C.E., C.B. SIR ANTONIO BRADY.	E. J. DOMVILLE, M.R.C.S.E. H. P. BULNOIS, M.INST.C.E. W. G. ROGERS.
1882.—CAPT. DOUGLAS GALTON, R.E., C.B., D.C.L., F.R.S., Newcastle-upon-Tyne, September.	DENNIS EMBLETON, M.D., F.R.C.S. H. LAW, M.INST.C.E. ARTHUR MITCHELL, M.A., M.D., LL.D., F.R.S.	H. E. ARMSTRONG M.R.C.S. J. H. AMOS.

The next Congress of the Institute will be held at Glasgow, September 25th to 29th, 1883.

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INTRODUCTION.

THE Fifth Congress of the Institute was held at Newcastle-upon-Tyne, by the invitation of the Mayor and Corporation, from September 26th to 30th, 1882. The Address of the President and the Lectures to the Congress were delivered in the Town Hall; the Sectional Meetings were held in the Lecture Room of the Free Library, New Bridge Street.

The Inaugural Address of the President, CAPTAIN DOUGLAS GALTON, was delivered on Tuesday evening, PROF. F. DE CHAUMONT taking the chair, in the unavoidable absence of Earl FORTESCUE, the President of the last Congress. A Lecture to the Congress was delivered by PROF. F. DE CHAUMONT on Thursday evening, and DR. B. W. RICHARDSON addressed the working classes on Saturday evening.

The meetings for the reading and discussion of Papers submitted to the Congress were as usual divided into three Sections, viz.: Section I., Sanitary Science and Preventive Medicine, under the Presidentship of DR. DENNIS EMBLETON. Section II., Engineering and Architecture, presided over by PROFESSOR H. ROBINSON, Vice-President of the Section, the President being detained in London by ill health. Section III., Chemistry, Meteorology and Geology, under the Presidentship of DR. ARTHUR MITCHELL: these meetings occupied the Wednesday, Thursday and Friday, one day being devoted to each Section.

A Public Luncheon was held on Tuesday afternoon. A Conversazione was given by the Town on Wednesday, and a Public Dinner on Friday evening.

Several Excursions were arranged during the intervals of business, viz., to Sir W. Armstrong's Works; to Messrs. Palmers' Iron Works; the Works of the Tyne Commissioners and the "Wellesley" Training Ship; to the Old Castle; and to the village homes at Whitley.

On Saturday the Duke of Northumberland invited the Members of the Congress to lunch at Alnwick Castle, and the Members were much interested in viewing the castle and grounds, under the guidance of Dr. Bruce.

The Exhibition was held at the Old Tyne Brewery Buildings, Bath Lane, and remained open from September 26th to October 21st.

The Exhibition was in many respects decidedly the best, although not quite the largest, that has been held by the Institute, and the Report of the Judges shows a very large number of awards.

The Congress this year will be held in Glasgow, an invitation from the Lord Provost and Town Council having been accepted during the Meeting at Newcastle. The Council have also accepted an invitation to hold a Congress at Cheltenham in 1884.

E. WHITE WALLIS.

Secretary.

March, 1883.

Congress at Newcastle-upon-Tyne, 1882.

INAUGURAL ADDRESS

By Douglas Galton, C.B., Hon. D.C.L., F.R.S., &c., &c.

President of the Congress.

In the name of the Sanitary Institute of Great Britain, I beg to thank you, Mr. Mayor, and the Corporation of Newcastle, for the invitation you have given us to visit this important industrial metropolis of the north of England—an invitation which is the more satisfactory to us because Newcastle is advancing in the van of sanitary improvement, and is thus proving the interest of this great city in a subject which is contributing so largely to the material and moral progress of the nation.

I venture to think that of all the definite questions which are made the subject of instruction by Congresses at the present time, there is scarcely one which deserves a greater share of attention than that which calls us together here to-day—I mean the subject of the Public Health.

Within the last half century the whole community has been gradually awakening to the importance of a knowledge of the laws of health; and the energies of some of the ablest intellects, both of this country and of the world, have been employed in investigating the causes of disease, and in endeavouring to solve the problem of the prevention of disease.

There is no doubt much that is still obscure in this very intricate problem, but the new light which is being thrown day by day upon the causes of disease by the careful and exact researches of the chemist and of the physiologist, is gradually tending to explain these causes and to raise the science of

hygiène, which may be translated into the science of the prevention of disease, out of the region of speculation, and thus enable it to take rank as one of the exact sciences.

The sanitarian has known long ago, by the careful observation of facts, that the preservation of health requires certain conditions to be observed in and around our dwellings—conditions which, when neglected, have led to outbreaks of epidemic disease, from the days of Moses to the present time. But whilst the results have long been patent, it is only in recent years that we have obtained a clue to some of the occult conditions in air and water which enable us to distinguish their comparative purity, and which exercise such a powerful influence upon our health.

The researches of Pasteur into the causes of certain forms of disease in French vineyards opened out a fruitful field of enquiry, in the cultivation of which many leading physiologists, chemists, and physicists, are now assiduously occupied; and we have to thank the theories of Dr. Bastian on spontaneous generation for the beautiful series of experiments on bacterian life devised and made by Dr. Tyndall.

In a lecture on fermentation delivered by him not many years ago, he remarked that the researches by means of which science has recently elucidated the causes of fermentation have raised the art of brewing from being an art founded on empirical observation, that is to say on the observation of facts apart from the principles which explain them, into what may be termed an exact science.

In like manner, if recent theories on the propagation of disease by germs, were proved to be correct, and if the laws which govern the propagation or destruction of those germs were known, the art of the physician would be raised from dependance on empirical observation into the position of an exact science.

A large band of the leading scientific men, both in this country and over the whole world, are devoting their energies to a knowledge of these questions; but as yet we stand barely on the threshold.

These researches have shewn us that putrefaction is only another form of organized life. If on a bright day the shutters of a room be closed, and a single ray of light be allowed to penetrate, the ray will reveal the presence in the air of moving particles of fine dust. Dr. Tyndall showed us that germs of the low forms of life, which cause putrefaction, are ever present in this dust; and that they are ready to spring into life and assume activity when a "nidus" is provided which is favourable to the development of the organism.

Lister has turned this knowledge to useful account. In the practice of surgery it was well known that if the skin were cut or broken and the injured tissues underneath exposed to the air, suppuration would ensue; but that when the injury to the tissues occurred under the skin, or if an operation were finished with rapidity, and the wound were sealed so that there could be no access to the air, the injury healed without suppuration.

Lister judged that the suppuration was due to the presence of germs in the air; and in his system of antiseptic treatment he provided for filtering the air through carbolic spray, in order to remove any germs or organisms from that portion of the air of his wards which came in contact with the wounds, and thus to prevent the germs from reaching the wounds, and from developing those organisms whose presence causes what we call suppuration or putrefaction. This treatment has obtained a large degree of success, and has had a very material influence on the art of surgery throughout the world.

The researches of the physiologist have further been directed to ascertaining whether there are not some diseases at least which arise from the presence of minute organisms in the blood. Pasteur has attributed to this cause a certain disease in silkworms. Dr. Davaine asserted that splenic fever in cattle is due to a similar cause. Dr. Klein alleged that pig typhoid arose from an organism which he succeeded in cultivating; and Mr. Toussaint has attributed fowl cholera to a similar cause. Professor Koch, from the light afforded by recent investigations, attributes tubercular disease to specific germs; and Dr. Vandyke Carter has endeavoured to establish the connection between the presence of bacillus spirillum and relapsing fever. Mr. Talamon claims to have discovered that diphtheria is due to an organism by means of which the virus can be conveyed from men to domestic animals, and *vice versâ*.

Drs. Klebs and Crudelli allege that malaria fever arises from germs present in the soil and which float in the air over marshes; and that by treating with water the soil of a fever-haunted marsh of the Campagna the germs of this organism could be washed out; and that the water containing the organisms thus obtained, introduced into the circulation of a dog, produced ague more or less rapidly and more or less violent according to the numbers in which the organisms were present in the water.

This theory no doubt agrees with certain well-known facts.

In a tropical climate, if soil which has been long undisturbed, or the soil of marshy ground, be turned up, intermittent fever is almost certain to ensue.

In illustration of this, I recollect that at Hong Kong the troops were unhealthy, and a beautiful position on a peninsula

exposed to the most favourable sea breezes was selected for a new encampment. The troops were encamped upon this spot for some time to test its healthiness, which was found to be all that could be desired. It was then resolved to build barracks—as soon as the foundations were dug, fever broke out.

As an instance of this nearer home I may mention that last winter at Cannes in the south of France, some extensive works adjacent to the town were begun, which required a large quantity of earth to be moved. The weather was exceptionally warm—an outbreak of fever occurred among the workmen, of whom fifteen died: this fever was attributed to the turning up of the soil.

If a strong solution of quinine be let fall in the water containing these organisms, they at once die: the efficacy of quinine as a preventive of this form of fever would therefore not be inconsistent with this theory.

Dr. Sternberg of the United States Army, who made experiments on the soil, water, and air of New Orleans, whilst he is unable to confirm the views of Professors Klebs and Crudelli, admits that there are many circumstances in favour of the hypothesis that the etiology of these fevers is connected, directly or indirectly, with the presence of these organisms or their germs in the air and water of malarial localities.

Sir Joseph Fayrer, whose large experience in India has given him exceptional knowledge of malarial fevers, in speaking of these researches of Klebs and Crudelli, says that the importance of such a discovery, if it were confirmed, could not be overrated; because if we take the world over, it is probable that some form of malaria is the most fruitful cause of disease; and that this theory offers an explanation which appears to correspond with what we know of the mode of operation of malaria:—First, that it occurs at certain heights, and that it is not necessarily connected with the presence of marshes, ponds, or rivers, nor with admixture of fresh or salt water, nor with the putrefaction of an organic substance. Second, that the production of malaria ceases when the air can no longer act on the soil; for the most pestilential marshes cease to be so when they are covered with water, or when the air is excluded by any interposing substance. Third, that a very moderate degree of humidity will produce malaria. Some malarial soils, innocuous during hot and dry weather, become dangerous after a shower, and so in the case of the upturning of new ground or the cutting down of jungle.

But he adds the following words of caution: "In our natural anxiety to find a particular origin for the poison or germ, we must not overlook the possibility that the results attributed to

the so-called malaria may be due to disturbance of the system caused by gaseous emanations or by some other agencies, in a body predisposed to be so deranged by peculiarity of constitution, climatic or other influence, of the nature of which we are ignorant, though it is conceivable by analogy."

In the case of certain of the diseases mentioned, some very curious and valuable results have been obtained—results analogous to that of vaccination in the case of small-pox.

If the point of a needle be dipped in the blood of a fowl suffering from chicken cholera, and then placed in a vessel containing pure chicken soup, from which care has been taken to exclude all contamination by air-borne germs, and a suitable temperature be maintained, the bacterium or microbe (as M. Pasteur terms it), and cognate organisms which are found in the blood of the diseased fowl, multiply and render the liquid turbid by their presence. If a drop of the contents of this vessel be transferred to another portion of similar chicken soup, it, too, speedily becomes permeated with the organism. The process may be repeated a hundred times; and the result inoculated upon fowls, or given them in their food, will produce the same fatal effects. But if the infected chicken soup be allowed to remain for a few weeks or months, the malignant powers diminish: it becomes, as Pasteur terms it, "attenuated." A given quantity of infected chicken broth, even at the hundredth rapid cultivation, inoculated upon twenty chickens, would probably prove fatal to eighteen of them. If the same infusion were allowed to remain exposed to the air for a month, it would be so far attenuated that it would only prove fatal, say, to ten. Exposure for another month would render it still less virulent, so that it would only prove fatal to two or three; while after exposure for six or eight months it would not prove fatal in a single instance. In its most attenuated form the infusion gives rise only to trifling local symptoms, not at first recognizable as bearing any affinity to the deadly fowl cholera, and consisting of a small local slough. But the valuable fact discovered by M. Pasteur is that the attenuated infusion works upon the system a change protective against subsequent attacks of fowl cholera, exactly similar to that which has been remarked to be enjoyed by fowl that had recovered from the virulent form of the disease. Similar results are obtained in the case of anthrax or splenic fever in cattle.

The practice of mitigating the severity of attacks of disease by producing voluntarily a milder form of the disease is not new. Inoculation for small-pox has been practised in various ways from the most ancient times; because it was known that the occurrence of the disease caused some change in the blood

or in the system of the person suffering from it which prevented the devolopment of the disease a second time, or mitigated the attack.

Jenner showed us that the milder disease of cow-pox caused a change in the system which produced a similar result.

With regard to more recent investigations, the most cautious observers are prepared to admit that in some diseases, such as anthrax, fowl cholera, and in some other diseases, it has been proved that there are certain organisms in the blood, or in the tissues, or in the morbid fluids in animals suffering from disease; that blood or fluids containing the organisms or their spores transmit the disease when inoculated; that when these organisms are absent or artificially separated, inoculation gives no such result; that the organisms can be cultivated outside the animal body, and after ten or fifteen generations the fluid which contains the cultivated organisms can reproduce the original disease when inoculated; and that the method of cultivation can modify or increase at will the virulence of the communicated disease.

There are some other diseases of the zymotic class besides those mentioned above, in which there is a probability that organisms may cause the disease; but experiments have not hitherto absolutely settled the question; and for the present our attitude must be one of reserve, much as we should wish it should prove all true.

When we consider the marvellous facility of reproduction of these various germs, shewn by these discoveries, we wonder how any higher form of life can exist subject to the possibility of invasion by such countless hosts of occult enemies.

But as we pursue the subject further, we find that the science of the prevention of disease, that is to say the science of hygiène, advances quite as rapidly as our knowledge of the causes of disease.

And even if the views of those who are prepared to accept the germ theory of disease to its fullest extent were shewn to be true, it seems also to be certain that if the invasion of these occult enemies present in the air is undertaken in insufficient force, or upon an animal in sufficiently robust health, they are refused a foothold and expelled; or if they have secured a lodgement in the tissues, they may be, so to speak, laid hold of and absorbed or digested by them. In corroboration of this view Professor Koch and others state that the micro-organisms of tubercular disease do not occur in the tissues of healthy bodies, and that when introduced into a living body their propagation and increase is greatly favoured by a low state of the general health.

The record of facts enunciated by the various scientific enquirers into the germ theory of disease affords an interesting contribution to the solution of etiological questions; but these enquirers have not yet given the sanitarian grounds of practical action: and for the present at least sanitary procedure is quite independent of them.

It has been long known, in many of those diseases which we term infectious or contagious, that by separating the individual attacked from the community, we may check the spread of the disease: and this practice has long prevailed.

The recent valuable and interesting report by your able medical officer of health, Dr. Armstrong, illustrates how the spread of scarlet fever and typhus have been checked in this city of Newcastle by the isolation of cases by removing them to hospitals: and how careful and systematic vaccination has secured immunity from the scourge of small-pox.

In some towns the local authorities have obtained power to compel the registration of all cases of infectious diseases within their jurisdiction. But it is very difficult effectively to isolate a patient in his own home; hence the further question arises as to what arrangements should be adopted for ensuring to the public the best means of isolation.

Special hospitals have been the panacea proposed; but a suspicion has recently arisen that if all cases of infectious diseases are concentrated in a special hospital in an inhabited district, this concentration of disease may have tended to intensify the disease and disseminate it in the neighbourhood.

Under the circumstances of the existing law we must mainly trust to voluntary effort to prevent the spread of infectious disease; and I may here quote the experience of a nurse of twenty years' experience in dealing with the most infectious and dangerous of these diseases, viz., scarlet fever. Her chief practice was the common one in respect to all cases of the various epidemics—to isolate the patient in a single room, the upper room if possible, and let no one else enter it; to so arrange as to keep the door and part of the window open in order to let a current of air pass through the room over the patient; to observe all the details of regulations as to the cleanliness of the patient and the articles of clothing and furniture, and the removal of excreta, &c.; and as to her own personal protection, never to drink out of the same vessel that had been used by the patient, and especially to wash from head to foot twice a day with tepid water, and to change her clothes each day: moreover she was careful never to serve in conditions of exhaustion with an empty stomach. With these precautions, she had

never had a single case of the spread of the disease to a member of the family or anyone else during the twenty years; nor had she once contracted the disease herself.

Notwithstanding the numerous experiments and the great efforts which have been made in recent times to endeavour to trace out the origin of disease, the sanitarian has not yet been able to lift up the veil which conceals the causes connected with the occurrence of epidemic diseases.

These diseases come in recurring periods, sometimes at longer, sometimes at shorter intervals. Animals, as well as the human race, are similarly affected by these diseases of periodical recurrence; but why they prevail more in one year than in another, we are entirely ignorant. They appear to be subject to certain aerial or climatic conditions. Cholera affords an illustration of this.

There is a part of India, low-lying, water-logged, near the mouth of the Ganges, where cholera may be said to be endemic. In certain years, but why we know not, it spreads out of this district, and moves westward over the country: the people are sedentary and seldom leave home, but the cholera travels on. At last it arrives on the borders of the desert, where there are no people, and no intercourse, no alvine secretions, and no sewers, yet the statistician sitting in Calcutta can tell almost the day on which the epidemic influence will have crossed the desert. But it exercises discrimination in its attacks. It will visit one town or village, and leave many others in the vicinity untouched. Similarly it will attack one house and leave another. But it has been generally found that the attacked house or village held out a special invitation from its insanitary condition. The same houses or the same localities will be revisited in recurring epidemics, because the conditions remain the same; remove those conditions, and at the next recurrence the locality will escape.

At Malta it was found that the same localities and houses which yielded the majority of plague deaths there in 1813, yielded the majority of the deaths in the cholera epidemics of 1839 and 1867; and that in the intervals the same localities yielded the majority of cases of small-pox, fever and of an anthrax, a very special eruptive epidemic attended by carbuncles.

Hence, whilst we are unable either to account for the cause or to prevent the periodic recurrence of epidemic diseases, the sanitarian has learned that it is possible to mitigate the severity of the visit; and that whether these diseases arise from the

occult causes to which I have alluded or from other causes, pure air and pure water afford almost absolute safeguards against most forms of zymotic disease.

Water has for many years been the subject of careful examination and analysis; indeed in the water supply for our large towns water examination may be said to be an ordinary branch of the service.

So long as the country was sparsely inhabited the question of the pollution of rivers was comparatively unimportant, because when sewage is discharged into running water, provided the primary dilution of the sewage with pure water be sufficient, the removal of the whole of the organic impurity will be effected after the run of a certain number of miles, the precise distance of travel being dependent on several conditions.

Perhaps the most beautiful instance of the self-cleansing power of a river is afforded by the Seine at Paris, where the river, which is black and foul when it leaves the town, becomes comparatively clear and full of water plants and fish at some ten or twelve miles lower down.

But the numerous centres of population in England, and the shortness of the rivers, leave them no time to exercise these self-cleansing processes; and some of the most important sanitary legislation in recent years has been devoted to the preservation of our rivers from pollution.

It is, however, shewn by Dr. Angus Smith's reports, under the Pollution of Rivers Acts, that either by the application of sewage to land, or by some of the methods of defecation which I will not further enter upon here, water from sewage may be so purified as to be placed in a flowing river without mischief.

And although there are many theories as to how far water which has once been contaminated by sewage may again after a time become fit to drink, I am disposed to think that there has never been a well-proved case of an outbreak of disease resulting from the use of drinking water, where the chemist would not unhesitatingly on analysis have condemned the water as an impure source; and it appears probable that, whatever may be the actual cause of certain diseases, *i.e.*, whether germs or chemical poisons, the materies morbi which finds its way into the river at the sewage outfall is destroyed, together with the organic impurity, after a certain length of flow.

Considering the density of population over the whole country, it is to be regretted that so much time has been lost in bringing these Acts into operation; and it is to be hoped that there will be no further delay in strictly enforcing the provisions of the Rivers Pollution Act.

With respect to air the question is somewhat different.

It is nearly fifty years ago since that able sanitarian, Mr. Chadwick, impressed on the community the evils which were caused by the impure condition of the air in our towns, owing to the retention of refuse round our houses.

In considering this question it is necessary to discriminate.

The gases which are the result of putrefaction are offensive to the smell, and some of them, as for instance sulphuretted hydrogen, are dangerous in that they may kill persons outright if they are present in undue proportions in the air; or if air containing smaller proportions of these gases be breathed for a long time the general tone of the individual inhaling them may be lowered, but they do not produce specific diseases. When, however, the putrefaction has gone on for some time, it may result in leading to the development of other conditions which may become the cause of disease, or death.

In connection with this question, M. Gustave Le Bon published recently in the *Comptes Rendus* some experiments relating to the properties and the influence of antiseptics on the volatile products of putrefaction.

He prepared a liquid made up of water and hashed meat. He placed a frog in an enclosure with some of the liquid. When putrefaction first set in, a very fetid odour was produced, and the liquid swarmed with bacteria, and he states that in this condition it is a very virulent poison if injected under the skin of an animal; but the frog merely breathing the effluvia, took no harm. After two months, the strong fetid odour had much diminished; the liquid had ceased to have virulent properties when injected under the skin, but the animal breathing its volatile products was rapidly killed by them. There is thus no parallelism between the virulent power of a substance in putrefaction, and the toxical power of the volatile compounds given off by it, indeed these powers seem to be in an inverse ratio. Moreover the older the putrefaction the weaker is the disinfectant power of any antiseptic over it.

These experiments are consistent with the observation that an offensive smell is often less injurious than the slighter fetid odour from an old drain, and that putrefying matter left for a long time in ashpits or manure heaps may be a source of danger: and it is also consistent with the observation that emanations from decomposing matter in the soil, such as refuse in old cesspools, or the stagnant deposit of sewage in badly constructed drains, may produce very dangerous results, although the odour is not strongly offensive; and they justify the established axiom that all refuse matter should be removed as rapidly as possible from the vicinity of dwellings.

There is no doubt that in the sewering of towns want of experience in the construction of the works has in some cases led to deposits in the sewers and to their failure to remove these dangerous gases, and that evil consequences have ensued; but it may be accepted as certain that in every case where the sewerage has been devised on sound principles, and where the works have been carried on under intelligent supervision, a largely reduced death-rate has invariably followed.

The records of your own city afford evidence of this fact.

The quinquennial period beginning in 1868 shewed a death-rate of 27·6, the quinquennial period ending in 1881 shewed a death-rate of 23; whilst the death-rate of 1881 was only 21·7.

At the recent Sanitary Congress at Vienna, some remarkable results of the effects of the sewerage of certain German towns were given, which are very striking.

Munich is the residence of one of the ablest sanitarians of Europe, viz., Dr. Pettenkofer. His admirable illustrations of the effect of the impurities which were accumulated in porous cesspits upon the air of the town and the death-rate of the population, form a text book of sanitary knowledge.

At Munich the enteric fever mortality per 1,000,000 of inhabitants for quinquennial periods was as under:—

1854 to 1859, when there were absolutely no regulations for keeping the soil clean	24·2
1860 to 1865, when reforms were begun by cementing the sides and bottoms of the porous cesspits ...	16·8
1866 to 1873, when there was partial sewerage ...	13·3
1876 to 1880, when the sewerage was complete ...	8·7

Similarly at Frankfort on the Main, the deaths from enteric fever per 10,000 were:—

1854 to 1859, when there was no sewerage	8·7
1875 to 1880, when the sewerage was complete ...	2·4

At Dantzig the figures present some more striking characteristics; the deaths from enteric fever per 100,000 living were as follows:—

1865 to 1869, when there was no sewerage and no proper water supply	108
1871 to 1875, after the introduction of water supply ...	90
1876 to 1880, after the introduction of sewerage ...	18

Hamburg has been drained by Mr. Lindley, and he has stated that in his plans he carefully followed the principles laid down by Mr. Chadwick.

In that town the deaths from enteric fever per 1000 of total deaths were from 1838 to 1844, before the commencement of the construction of any sewerage works ... ... 48·5

From 1871 to 1880, after the completion of the sewerage works ... ... 13·3

During the time that the works were in progress, viz., from 1872 to 1874, the mortality from enteric fever per 10,000 living was—

In the unsewered districts ... ... 40·0
In the districts for the most part sewered ... ... 32·0
And in the fully sewered districts ... ... 26·8

These results illustrate the effect of purifying the air of towns by the rapid abstraction of refuse matter, so as to prevent it from remaining and putrefying in and upon the ground.

But whilst the retention of refuse is probably the most fertile cause of mischief, there are other questions connected with the purity of air to which it is useful to direct our attention.

Dr. Angus Smith has given us very valuable information on this subject in his "*Contributions to the Beginnings of a Chemical Climatology*." He shews that the air in the middle of the Atlantic ocean, on the sea shore, and on uncontaminated open spaces, commands the greatest amount of oxygen; that at the tops of hills the air contains more oxygen than at the bottom; and that places where putrefaction may be supposed to exist are subject to a diminution of oxygen. For instance, a diminution of oxygen and an increase of carbonic acid is decidedly apparent in crowded rooms, theatres, cowhouses, and stables. It is well known that oxygen over putrid substances is absorbed, whilst carbonic acid and other gases take its place; and hence all places near or in our houses which contain impurities diminish the oxygen of the air.

Let me explain to you what this diminution of oxygen means.

The average quantity of oxygen in pure air amounts to 21 parts out of 100.

In impure places, such for instance, as in a sleeping room where the windows had been shut all night, or in a lecture theatre after a lecture, or in a close stable, the oxygen has been found to be reduced to as little as 20 parts in 100. That is to say, a man breathing pure air obtains, and he requires, 2,164 grains of oxygen per hour. In bad air he would, if breathing at the same rate, get little over 2,000 grains of oxygen an hour, that is a loss of about eight per cent.; and this diminished quantity of oxygen is replaced with other, and in almost all cases, pernicious matters.

The oxygen is the hard-working, active substance that keeps up the fire, cooks the food, and purifies the blood; and, of course, as the proportion of oxygen in the air breathed diminishes, the lungs must exert themselves more to obtain the necessary quantity of oxygen for carrying on the functions of

life. If the air is loaded with impurities, the lungs get clogged, and their power of absorbing the oxygen that is present in the air is diminished.

An individual breathing this impure air must therefore do less work; or, if he does the same amount of work, it is at a greater expense to his system.

In towns, the impurity of air arises chiefly from dust of refuse, mostly horse manure, as well as from smoke, and other products of combustion.

The influence of smoky town air on health is to some extent illustrated by the fact that the death-rate of twenty-three manufacturing towns, selected chiefly for their smoky character, averaged 21·9 per 1,000 in 1880; whilst the rural districts in the counties of Wilts, Dorset, and Devon, excluding large towns, averaged 17·7 per 1,000; and the deaths from the principal zymotic diseases in the towns were more than double those in the rural districts.

Mr. Aitken, of Edinburgh, has made some very interesting experiments, showing that visible fog is due to particles of foreign matter floating in the air. He showed that the vapour of water injected into air, from which particles had been strained out, was not visible; whereas, as soon as foreign matter, such as dust, or smoke, or fumes, and especially fumes of sulphur, were introduced, the aqueous vapour condensed on the particles, and became visible as fog.

He showed that some kinds of dust have such an affinity for water, that they determine the condensation of vapour in unsaturated air, whilst other kinds of dust only form nuclei when the air is supersaturated; and that dry fogs are produced by those dust particles whose affinity for water vapour enables them to condense vapour in unsaturated air. Amongst this class of dust may be instanced chloride of sodium or salt, which largely pervades the atmosphere, and is probably derived from sea spray; also ammonia, which is present in town air, and may be largely due to the manure. In towns where the streets are paved with stone, asphalte, or wood, and even where the surface is of macadam composed of granite, the chief part of the mud and dust consists of horse manure, which continually gives off the fumes of ammonia; and this substance when mixed with fumes of sulphur has a greater power of condensing aqueous vapour than the products of combustion of pure coal, and gives rise to a very fine textured dry fog.

The conclusions which may be drawn from these experiments are: 1st, That when water vapour condenses in the atmosphere, it always does so on some solid nucleus; 2nd, That the dust particles in the air form the nuclei on which it condenses; 3rd,

If there was no dust in the air there would be no fogs, no clouds, no mists, and probably no rain; but when the air got into the condition in which rain falls—that is, burdened with supersaturated vapour—it would convert everything on the surface of the earth into a condenser, on which it would deposit itself. Every blade of grass, and every branch of tree would drip with moisture deposited by the passing air; our dresses would become wet and dripping, and umbrellas useless; but our miseries would not end here. The inside of our houses would become wet; the walls and every object in the room would run with moisture.

Hence we have in this fine dust a most beautiful illustration of how the little things in this world work great and useful effects in virtue of their numbers.

This dust pervades the air everywhere. The haze in the air on a summer's day is caused by dust, which is probably largely composed of the pollen of flowers. This dust appears to occupy the lower strata of air, for in the valleys on the South or Italian side of the Alps a blue haze mellows the view; but this is passed through after a little hill-climbing, and the atmosphere becomes clearer.

The theory is not inconsistent with the formation of the loftiest clouds, because dust does not only pervade the lower region of the atmosphere.

Mr. Langley was making observations last autumn on the spectrum of the sun on Mount Whitney, which is within some 300 miles north of the Mexican frontier, and about 200 miles from the Pacific Ocean. When at a height of 13,000 feet above the sea, he observed dust in the atmosphere between him and the sun. He computed that this dust was at a height of from 1,000 to 1,500 feet above the elevation at which he was placed; that is to say, at a total height of from 14,000 to 15,000 feet above the sea. It has been suggested that this dust might have been carried by the prevailing winds from the plains composed of loess in China.

There is, however, another source whence dust in the air at higher altitudes may be derived; for recent investigations shew that appreciable quantities of meteoric dust are being constantly brought into our atmosphere from interplanetary space.

In our towns the dust is more plentiful, but there also it diminishes with elevation.

The clumsy and barbarous method which we adopt for burning coal in this country adds to the dust the fumes which necessarily result from combustion, as well as a quantity of soot and tarry matter from the imperfect combustion of coal.

Mr. Chandler Roberts, who made experiments on the question of the amount of soot from different forms of grates for the

Smoke Abatement Society, found the quantity of soot to vary from about one per cent. in most furnaces, to as much, in some instances, as three per cent. of the fuel consumed in domestic fire places; that is to say, the imperfect combustion causes from one to three cwt. of soot for every five tons of coal consumed.

This soot assists in forming the black canopy which it is fashion in England to consider the proper attribute of a large town.

Dr. Frankland and Dr. Russell have shewn that the tarry matter which arises from the combustion of coal, coats over the water resulting from the aqueous vapour thus condensed upon the particles of dust, and considerably delays their re-evaporation; consequently whilst the atmosphere of large towns is more favourable to the development of fog, the fogs prevailing over large towns are more persistent in their character than in the open country. Moreover, the fumes from combustion contain substances, and especially sulphur, which appear to be more favourable to the formation of fogs than any other form of dust; and, therefore, even if whilst continuing to burn coal in our towns we get rid of smoke, we should still have products of combustion, which would favour the occurrence of fogs; but they would be fogs of lighter colour and less persistency than our ordinary London smoke fog.

The conclusions at which Mr. Aitken has arrived from his experiments are well illustrated by a fact of every day experience. A heavy fall of rain washes the particles of dust out of the air, and after rain the fog is often removed, and the air of a town is much clearer.

But in addition to the chemical and inorganic constituents of air which have been generally taken as a measure of its purity, recent researches have divulged to us the character of some of its organic impurities.

Dr. Tyndall has shewn us, by passing a ray of light through a space otherwise dark, that all air is more or less filled with dust; that this dust is destroyed by incineration, and that it is therefore chiefly organic; and his experiments, made with infusions previously freed from all possibility of containing germs in the infusion, or as he terms it sterilized, demonstrated that this dust contains germs which are always ready to spring into life when a congenial medium for their development is at hand.

He shows that if the air of a room be left absolutely undisturbed for some time, this dust is more rapidly deposited than in moving air. Thus in a sheltered and quiescent position in a room, flasks filled with various infusions developed organisms more rapidly than those placed in the more open parts of the room.

Dr. Tyndall has also shewn by similar experiments that these sterilized infusions did not develop organisms when exposed to the clear mountain air on the Bel Alp in Switzerland, whilst the air of a hay-loft near the glacier developed organisms in 90 per cent. of the flasks containing sterilized infusions.

M. Marie Davy, of the Montsouris Observatory of Paris, tells us that the air near to the Hotel Dieu in the centre of Paris and near an opening to a sewer, is more prolific in causing the development of bacteria and similar organisms, in prepared sterilized infusions, than air in the more open space near the Montsouris Observatory; and that the latter is more prolific than air on the plateau of Gravelle near Paris.

M. Davy also tells us that the air in rainy weather is less prolific in producing bacteria; that it becomes more prolific during the drying up of the rain; but becomes less prolific again in drought and in sunshine. Similarly, the numbers of bacteria are very small in winter; they increase during the spring; attain their maximum in autumn; and then decrease with the rain and cold weather on the approach of winter. The cold of a Parisian winter is inimical to them, and so is dry hot weather, and especially sunshine.

It is not alleged that those various organisms are all productive of disease or injurious to the higher forms of life. Some are no doubt productive of what we term putrefaction; others may be productive of disease; but some may possibly afford nourishment.

It is, however, noteworthy that those observations which shew the presence and absence of organisms in certain localities and in certain conditions of the atmosphere, seem to present coincidences with other observations on the prevalence of certain diseases, which at least make it desirable that the enquiries should be further pursued.

For instance, in the Punjab the mortality from fever deaths in each of three consecutive years, 1872–73–74, when food was cheap and when there was no extraordinary occurrence to affect the ordinary relations between fever and rainfall, the fever deaths only began to rise after the rainfall had attained its maximum and had begun to decrease, and the deaths from fever attained their maximum soon after the rainy season came to an end, during the drying up of the ground, after which they decreased.

In Bombay the registered fever deaths on a mean of fourteen years shows a minimum of fever deaths during the hot, bright, and dry season.

It is also noteworthy, more especially in hot climates, that those rooms of a house into which sunshine can penetrate are

healthy, whereas rooms where no sunshine can penetrate are unhealthy.

In our present knowledge, it would be premature to draw any conclusions from these various researches; but they open out an interesting field of enquiry which it is not presumptuous to think may possibly have some bearing on the prevalence of disease.

But whatever may be the influence which such organisms or germs exert on the production of zymotic diseases, the sanitarian has attained to the absolute certainty that the number of persons who are attacked by this class of diseases can be increased or diminished in proportion to the defects or the excellence of the hygienic conditions under which they are living.

I have already mentioned to you the effects of sewerage on the mortality of towns.

On the general effect of sanitary conditions upon health, the experience of the Indian army is very striking.

Periodic fevers occur everywhere in India, and there arise extra vicissitudes of temperature and endemic causes of dangerous disease. Yet there, even under these circumstances, sanitary work, by removing preventible causes of disease, has reduced the death-rate of the European Army in India from 60 per 1,000 to 16 per 1,000, and is gradually diminishing the death-rate of the civil population.

Perhaps one of the most conclusive examples of the effect of sanitary observances is that furnished by fairs and religious festivals in India. These assemblies bring together many thousands of persons, sometimes even as many as 100,000 persons, together with numerous horses and cattle. They form a huge encampment lasting for many days, sometimes for weeks. A very few years ago there was no care taken to prevent the fouling of wells and water-courses, or to regulate the disposal of the refuse which was scattered all over the surface of the ground where this multitude encamped. These fairs and festivals were therefore almost invariably foci for the spread of cholera and other diseases. Now this is changed. Stringent regulations preserve the wells and water-courses from pollution, and compel the people to deposit all refuse in prepared places. All the rest of the ground in the vicinity of the encampment is kept scrupulously clean. Since this has been done, many festivals and fairs have been held in districts where cholera has been prevalent, but yet, owing to these stringent regulations, no cases of cholera have occurred amongst the persons attending the fairs and festivals.

We may find, perhaps, more striking results from the influence of sanitary work in India or in a tropical climate than

elsewhere; but still we are surrounded by numerous examples of the effect of sanitary work at home.

In the Foot Guards in London, the deaths from tubercular disease used to be 10 per 1,000—in fact equal in amount to the total deaths which now occur in the Army in peace time.

The improvements in the hygienic conditions under which soldiers live, which were introduced into the Army in consequence of the recommendation of the Royal Commission on the Sanitary State of the Army and the Barrack and Hospital Commission, have reduced this death-rate from tubercular disease to about 3 per 1,000. This is one of the diseases which it is now alleged can be or is propagated by germs; and it is to this point that I desire especially to call attention, viz., that whatever be the manner in which these zymotic diseases are propagated, the death-rate and consequent sickness may be diminished or increased according to the sanitary conditions in which a population lives.

In this city of Newcastle the number of deaths per 1,000 was 25·4 in 1870, 26·1 in 1875, 23·5 in 1879, 22·8 in 1880, and in 1881 it was 21·8 per 1,000.

We are accustomed to speak of a death-rate of so many per 1,000 in a great city—we ought at the same time to recollect that this death-rate is made up of many details. For instance, in 1875, the death-rate for the entire City of Newcastle was 26·1 per 1,000; but there was a group of buildings, called the old Pandon group, since pulled down, in which the death-rate was 40 per 1,000, and in parts of that group of buildings the death-rate amounted to 54 per 1,000.

It is very difficult to obtain the death-rate of a limited area; but I will give you some instances from districts in London where the figures have been stated in the evidence given to the Select Committee of the House of Commons on the Artizans' and Labourers' Dwellings Act.

These districts were condemned by the medical officers chiefly by reason of the closeness, narrowness, and bad arrangement of streets, courts, and alleys.

In Limehouse, whilst the average death-rate of the population of the district was 23·9, the death-rate of a special part of the district was 50 per 1,000. The population on this part of the district was 514 per acre.

In Whitechapel and Aldgate there was a district of six acres which had 625 persons per acre, the death-rate in that part being 50 per cent. above the death-rate of the district. In some parts of the area there were 1,423 persons per acre.

In St. Giles, whilst the death-rate of the Northern district was 21·82 per 1,000, that of the Southern portion was 33·16 per

1,000. In parts of this district the area was covered with very narrow courts and alleys, with badly ventilated and dilapidated houses, many of them without back yards, and the rears almost touching each other. In this area the death-rate was 40 per 1,000, as against 25 per 1,000 for the whole district, and 17 per 1,000 for St. George's, Bloomsbury, which is close by.

Parts of these districts have been cleared under the Artizans' and Labourers' Dwellings Act, and new dwellings have been constructed by the Peabody Trustees and by various Companies formed in London for providing improved dwellings.

These improved dwellings are built in several stories one above the other. They afford accommodation to a population per acre as dense as, and in most cases even denser than, that afforded by the buildings which they replaced.

Within limits it is not the density of population which regulates the health. But if a dense population is spread over the surface, or close to the surface of the ground, by which means all movement of air is prevented, and if there are numerous corners in which refuse is accumulated, it will be difficult to prevent disease.

Dr. Angus Smith's experiments shew that whilst there is less oxygen and more carbonic acid in the eastern and in the more crowded parts of London, yet, that in open spaces the amount of oxygen rises and the carbonic acid diminishes very considerably; and that we are exposed to distinct currents of good air in the worst, and equally to currents of bad air in the best atmosphere, in towns like Manchester.

Dr. Tyndall shewed that where there is quiescence in the air the tendency of his sterilized infusions to produce organisms was increased.

The conclusion from all these experiments is to show the importance of laying out the general plan of dwellings in a town, so that currents of air shall be able to flow on all sides with as little impediment as possible, by which means the air will be continually liable to renewal by purer air.

The dwellings which have been constructed in the place of the very defective dwellings condemned by the Medical Officers of Health in various parts of London, specially illustrate the importance of this question of the circulation of air.

These dwellings replace those in which the normal mortality was as much as 33, 44, and 50 per 1,000.

But these improved dwellings provide ample space all round the blocks of building, so that air can flow round and through them in every direction, and so that there are no narrow courts and hidden corners for the accumulation of refuse. In some cases these dwellings accommodate above 1,100 persons per acre.

The mortality in the new dwellings is as low as 13 per 1,000 in some, and does not rise above 20 per 1,000 in any of them, and upon an average of years it may be taken at from 14 to 16 per 1,000.

It is to this point that I specially desire to draw your attention, viz.: that these facts prove the possibility of bringing down the death-rate of the class of population which inhabits this sort of accommodation to rates varying from 15 to 16 per 1,000. I say of the class of population because habits and mode of life have an important influence on health and on longevity.

Mr. Chadwick and Dr. Richardson obtained some statistics for Westminster, for the use of a Committee of the Society of Arts, which indicate the very different conditions of health to which the different classes of population are subject (Appendix A, p. 55). The divisions they adopted were as follows:—

First, the class of professional persons, or of those classed as gentry; secondly, the salaried classes, clerks and mechanics, and wholesale dealers; thirdly, the general classes of retail traders or shopkeepers; fourthly, the wage classes, artizans and labourers; and fifthly, domestic servants.

Each of these classes, it will be seen, represents very distinct sanitary conditions as to streets, houses, room space, overcrowding, and filth.

It appeared from these statistics that out of 100 deaths of the first class, or gentry, six were those of children in their first year, and nine of children within their fifth year; whilst out of 100 deaths of the wage classes 22 are those of children in their first year, and 39 within their fifth year.

If we take the average duration of life of all who have died of the first class, men, women, and children, we find that they have had an average of 55 years and 8 months of life; whilst of the wage classes they have had a mean of only 28 years and 9 months.

And if we take the average duration of life of those who have escaped the earlier ravages of death up to 20 years of age, the males who have died of the first class have had 61 years of life, whilst of the wage class the males have had only 47 years and 7 months. Moreover, of the first class in Westminster, the proportion who have attained to old age, and died of natural causes, is 3·27 per cent., but of the wage classes only a fraction, or $\frac{2}{3}$ per cent. did so.

I have obtained similar returns for this city (Appendix B, p. 56).

It was considered desirable, for the purpose of this return, to divide the population into the following five classes—

First, Gentry and Professional men; Second, Tradesmen and Shopkeepers; Third, Shipwrights, Chain and Anchor Smiths, Iron Forge Labourers, &c.; Fourth, Seamen, Watermen,

Fishermen, &c.; Fifth, Other Wage Classes and Artizans; and each of these classes represents distinct sanitary conditions and habits of life.

The healthiest class is that of the seamen, watermen, and fishermen. The mean age at death of all who died of that class, men, women, and children, is 37 years; as compared with 35 years for gentry and professional men; whilst the mean age of shipwrights, chain and anchor makers, and iron forge labourers, is only 22 years.

A further examination of this table shews that this great difference in the average length of life arises from the great excess of deaths in childhood of the wage classes above those of either the seamen and watermen class or the gentry and professional class; the proportion per cent. of deaths of children under five years of age to total deaths is in the class of shipwrights and iron forge labourers, &c., 47·96, in the wages classes 41·52, in the class of gentry and professional men 33·93, and in the fisherman class 26·77: and the mean duration of life of the males who had survived the period of youth, that is to say, of those above 20 years of age, was for the gentry class 53 years, for the tradesmen 54 years, for the seamen and fishermen class 52 years, for the shipwright class $46\frac{1}{2}$ years, and for the other wage classes 49·9 years.

I have also obtained for comparison returns from the borough of Dover (Appendix C, p. 57), which is a sea-port town with what may be called a favourable mortality, viz., an average death-rate of 16·7 per 1,000.

In that town the mean duration of life in the wage class, artizans, &c., of all who died, is $33\frac{1}{2}$ years; and of those who died over 20 it is 55 years; and the proportion of deaths of children under 5 years of age is 36 per cent. of the total deaths, instead of the 48 per cent. of deaths in the shipwright class in Newcastle.

As a contrast to the returns for the City of Newcastle, I have obtained information respecting certain rural parishes in Northumberland. These parishes are comprised in the registration districts of Bellingham and Rothbury, together with the sub-districts of Islandshire and Norhamshire, in the parish of Chatton (Appendix D, p. 58).

In this return the population is divided into the following classes:—First, Gentry, Professional men, &c.; Secondly, Farmers; Thirdly, Tradesmen, Shopkeepers, &c.; Fourthly, Wage Classes, Artizans, &c.; Fifthly, Agricultural Labourers.

Although the average mortality of the districts is 15·3 per 1,000, as compared with 21·8 per 1,000 for Newcastle, the proportion of zymotic diseases shews that these districts cannot be considered to be in very favourable conditions of health.

A comparison of these returns affords much food for reflection, and makes us regret that the returns of the Registrar-General do not afford us more information upon the relative health of the different classes of the community.

The mean duration of life of all who died was 42·3 years as compared with 29·4 years in Newcastle, and of those who had survived the period of youth and reached the age of 20, the mean age at death of the males was 60·9 years, as compared with 51·9 years in Newcastle. For the Wage and Artizans class in the rural parishes the mean age at death of all who died was 35·4 years, and for the Agricultural Labourers, &c., 42·2 years, as compared with 22·3 years for the Shipwrights, &c., class, and 27·0 years for the other wage classes in Newcastle; whilst for the males who had survived the period of youth and attained the age of 20, in the rural districts the mean age at death was 56·0 for the Wage and Artizans' class, and 63·7 for the Agricultural labourers, as compared with 46·6 for the Shipwrights, &c., class, and 49·9 for the other wage classes in Newcastle.

I may also instance the rural district of Uttoxeter, where the mean age at death of all who died of the wage class, including agricultural labourers, was 39 years, whilst that of the agricultural labourers alone was 40 years; and the mean age of those who died over 20 was 62 years; yet this is not a particularly healthy rural district, since the proportion of deaths from epidemic disease to the total deaths was 26·5.

Thus the parallel classes in the rural districts enjoy at least 10 years more life than those in Newcastle, and yet it will be observed that the proportion of deaths from the principal zymotic diseases (excluding diarrhœa) in the rural districts is less favourable than in Newcastle.

In contrast with these rural districts, and as an illustration of the effect of insanitary surroundings on health, it may be mentioned that on the experience of a decade in a district in Ireland, situated in Connaught, where there was a large proportion of mud hovels having only one room, the mean age of all who died was only 26·8 years as compared with 42·3 years in the rural districts of Northumberland; and the proportion of deaths from epidemic diseases to total deaths was 47·8 per cent. The occupiers were chiefly peasant proprietors.*

* It is interesting to mention, in connection with this question of the relative death-rate, that the wages of the agricultural labourers in the rural parishes of Northumberland may be assumed to be for the men from 18s. to 20s. a week; the wife or daughter may earn 7s. 6d. a week, and for about three weeks in harvest time probably 10s. 6d. per week extra, say from £46 to £65 a year. Mr. Murphy, Professor of Agriculture in Ireland, in a work on a Model Farm, estimates that the outcome in wages of the work of a peasant proprietor and his wife and child on his farm, of eight acres, is only £25 a year. Also Mr. Jenkins, the Secretary to the Royal Agricultural Society, states that he examined the outcome of the peasants' earnings in Belgium and France, and that he could not make out that the tenant's profit on ten acres came to more than £30 a year.

A low standard for the mean duration of life in the wage class is not a necessity. It is controllable by the surroundings in which they live; and the fact of how largely the death-rate is influenced by these surroundings is evidenced by the condition of health in Improved Industrial Dwellings.

Mr. Gatliff shews that the death-rate over a series of years in the buildings of the Metropolitan Association for Improving the Dwellings of the Labouring Classes, varied from 14 per 1,000 to 17 per 1,000; and in the buildings of the Improved Industrial Dwellings Company, under Sir Sydney Waterlow, the mortality during a period of over 16 years has been 16·2 per 1,000.

Similar results are obtained in the Improved Industrial Dwellings in Newcastle. The able manager of this property, Mr. Price, will, I believe, furnish a full account of these dwellings to the meeting. I would therefore only mention that Mr. Price informs me that in these dwellings are accommodated 108 families or 450 persons. The death-rate for the year ending June 30, 1882, has only been at the rate of 12 in the 1,000, whilst the rest of the city of Newcastle shews an average of 21·6. This result must be considered the more satisfactory when it is remembered that these buildings are tenanted by the lowest wage-earning class. Out of the 108 tenants there are only two who earn 30s. per week, the majority being labourers averaging 21s. per week, and several less than that sum.

The effect of the sanitary conditions under which people live is further well illustrated by comparing the condition of health enjoyed by those who may be assumed to have been removed from unhealthy influences in their ordinary life, and placed in healthy surroundings.

I have obtained, through the courtesy of Mr. Hardcastle, a return from the Prison at Newcastle-upon-Tyne, shewing the health condition of prisoners who entered the prison without any disease.

From this it appears that during the five years ended June, 1882, nearly 20,000 prisoners passed through the prison, and that during the whole of that time there was no death from zymotic disease in the prison, although during that period there were epidemics of Scarlatina, Typhus, and Small-pox in the

Borough. Moreover, during three of the five years, there were no deaths at all of prisoners admitted without previous disease; whilst in 1879 the deaths in this class amounted to ·027 per 1,000, and in 1881 to ·025 per 1,000.

After commenting upon the good sanitary state of the Prison, Mr. Hardcastle makes the following suggestive remark:—"There is not the slightest doubt that if my private patients lived under similar conditions they would enjoy better health."

In considering how far it can be hoped that the death-rate of the wage classes can be permanently reduced to that of the more fortunate classes, there have to be considered the questions of the occupation of the members of the classes when out of their homes.

If we take the professional and merchant class who attend at their offices during the day time, we may be sure that, as a rule, they are placed in unhealthy surroundings during that time, and in many cases have to breathe, during their hours of work, as bad an atmosphere as that in which the wage classes work.

The great mortality of the tradesmen class shewn in Mr. Chadwick's return for Westminster was explained by him to arise from the fact that the best rooms of the houses in which they live are let for lodgings, and that they often live in the basements or back premises, which are frequently unhealthy. Whilst we may anticipate great improvements in the health of the wage classes by the construction of improved dwellings, these must be supplemented by healthy arrangements in the pursuit of their daily avocations. Indeed in many cases education is required to teach workmen to attend to precautions devised for their health; they often look upon ill health as a matter of course.

The deaths of children, who are the most influenced by the conditions of air, and the least by occupations and by migration, especially those under one year, are regarded foremost exponents of sanitary conditions.

The tables in Appendix E and F (p. 59), shew the annual rate of mortality per 1,000 of population; the mean age at death; and the expectation of life, at several ages, for the City of Newcastle for 1881, and for Dover in 1880.

In the City of Newcastle, the annual rate of mortality per 1,000 for all ages was for males 23·15, and for females 20·13, whilst for children under five years it was 66·19 for males and 54·77 for females. In Dover, whilst the mortality per 1,000 of all classes was for males 18·13 and for females 15·37, it was for children under five years 62·61 for males and 44·47 for females.

The very marked difference, shewn in the returns I have spoken of, in the mean duration of life of the wage classes as

compared with the well to do class, is no doubt largely attributable to the deaths of the young.

The large death-rate of children and of young persons arises from a variety of causes which it may be difficult entirely to remove; it must, to some extent, be dependent on the health of the parents, but it is often the result of improper food.

An instance, from your own town, illustrates this point.

The Reverend Mr. Lintott, who manages the Northern Counties Orphan Institution, informs me that the children there have been singularly free, during the eighteen years the Institution has been in existence, from children's disorders.

Each child has a pint of new milk every day. Some years ago milk was very dear, and for three months the children received half the quantity, weak tea for the evening meal being substituted. During the latter part of that time, the number of the children who were unwell, from various causes, was greater than it had been for years; the milk was restored, and the Orphanage became as free as ever from the usual disorders of children.

But the condition of the surroundings, in which children are placed, also materially influences their death-rate. If the choice lay between giving young children plenty of food whilst they were exposed to bad air, or giving them little food whilst they were placed in pure air, it would be preferable for their health to select the latter alternative.

Some evidence of the effect of pure air on children is afforded by comparing the table of mortuary statistics of Newcastle with that of the rural parishes of Northumberland. The proportion per cent. of deaths of children under five years to total deaths in the class of tradesmen and shopkeepers in Newcastle is 37, as against 20·48 for the same class in the rural parishes; whilst for the shipwrights, smiths, and forge labourers class it is 47·96; and for the other wage and artizans class it is 41·52 in Newcastle, as compared with 28·72 for the wage and artizans class, and 22·59 for agricultural labourers in the rural parishes. On the other hand for the seamen and fishermen class in Newcastle, the proportion is 26·77. It would be interesting to trace out the reason why the proportion of children's deaths in this class differs so materially from that of the other wage classes in Newcastle, and so nearly coincides with that of the wage classes and agricultural labourers in the rural district.

In further evidence of the effect of the surroundings on the health of children, it may be mentioned that whilst the mortality of children under 10 in the Metropolis generally was 47·66 per 1,000, that of children in the Improved Dwellings was 24·04 per 1,000, or less than one half.

Moreover, in the buildings of the Improved Industrial Dwel-

lings Company, during a period of 16 years, the death-rate per 1,000 of persons over one year of age was only 10·35 in the Company's Dwellings, whilst it was 17 in the Metropolis.

The death-rate of infants under one year of age was even more favourable; for although the birth-rate was 5 in a 1,000 more in the Company's Dwellings than in the Metropolis generally, the death-rate of infants was only 1·7 higher in the Improved Dwellings than in the Metropolis, thus shewing that the conditions of occupancy in these dwellings are as favourable for infants as they are for persons of riper years.

The other Companies who have built improved dwellings can shew equally favourable results.

We have done much for the health of young people by the Factory Acts in regulating their labour; and we have made stringent rules to compel their attendance at School; but in these latter regulations it is to be feared that the health of the children has been too little considered.

Mr. Chadwick and Dr. Richardson have long pressed upon the consideration of the public the defects of the elementary school system, first as to the insanitary conditions of the rooms in which most of the school work is performed, and secondly as to the advantages which have been found to result from making physical training a portion of ordinary school work.

Dr. Richardson shews that the long hours spent in school do not produce results commensurate with their length. That is to say, he shews that in those schools where half the time is allotted to physical training, the children learn quite as much as in schools where the whole time is devoted to study; that the children are brighter, and that they are eventually turned out of the school better qualified to take up the avocations of daily life.

On the other hand, the condition of the children is an important factor in the ventilation of a school room. With children who are not washed all over daily, the skin and the clothes assist in producing a foul atmosphere; and the rooms crowded with children in that condition require special means of ventilation. Unless this is provided the atmosphere is injurious. But as a rule the children are not thoroughly washed every day, nor are exceptional means of ventilation provided.

From some recent statistics it appears that the death-rate of elementary school teachers amounts to as much as 20 per 1,000, which is more than double that of soldiers on home service, and about four times that of the police or of sailors, in which forces, apart from deaths from accident or violence incurred in their profession, it amounts to about 5 per 1,000. It is even from five, six, to seven times greater than that of those criminals who are imprisoned who have no specific disease, amongst whom, when they

enter a well-conditioned prison, the death-rate does not exceed 3 per 1,000. The sickness will be proportioned to the death-rates; and there can be no question but that the high death-rate is largely due to the unhealthy atmosphere in which their work is performed.

Dr. Carpenter says in his work on "Human Physiology," that the "purity of the atmosphere habitually respired is essential to the maintenance of that power of resisting disease which, even more than the ordinary state of health, is a measure of the real vigour of the system. For, owing to the extraordinary capability which the human body possesses of accommodating itself to circumstances, it not unfrequently happens that individuals continue for years to breathe a most unwholesome atmosphere without apparently suffering from it; and thus when they at last succumb to some epidemic disease their death is attributed solely to the latter, the previous preparation of their bodies for the reception and development of the zymotic poison being altogether overlooked."

It is not so many years ago that the death-rate of the Army at home nearly equalled that now prevailing among the elementary school teachers. The large army death-rate was shewn to arise from defective ventilation and want of other sanitary arrangements. These were remedied, and the Army death-rate was reduced to from 8 to 11 per 1,000; and there can be no doubt that if the same care were bestowed upon the purity of air in and around our schoolrooms as is bestowed upon our barrack rooms and prison cells, the health of school teachers and of the children would be materially benefited.

The following extract from a paper by Mr. Chadwick sums up this experience:—

"In one orphan institution the progress made by the application of sanitary factors was thus denoted. The death-rate amongst the children was twelve in a thousand. The impurity of the air was removed by better drainage, and the death-rate reduced to eight in a thousand. A further advance was made by regular head-to-foot ablutions of the children with tepid water, and a complete skin cleanliness maintained, when the death-rate was reduced to four in a thousand. In the district half-time schools near London, where the sanitation is the best advanced, they receive children of the lowest condition and type, and may be said to be children's hospitals; but of those who come in without any developed disease, the death-rates from disease of spontaneous origin do not exceed three in a thousand, or one-third of those of children in the Board or common schools. I deduce from experience that skin cleanliness and clothes cleanliness is a factor of prevention of the

common death-rates amongst dirty children in crowds or in schools by one-third."

Mr. Chadwick further dwells on the economy of cleanliness. He states that it has been ascertained that pigs that are washed put on one-fourth more flesh from the same quantity of food than do pigs that are unwashed. The food that would be required for four children that are unwashed would serve for five children that are washed. A general whose army was hemmed in and put upon short rations encouraged his men to bathe daily; he said that by that means he kept his men in as good condition and force as another division of the army that was on full rations but unwashed.

I am informed by colliery proprietors that horses in a colliery which are well groomed do more work and look better than badly groomed horses with an equal amount of food. And there is a German proverb which may be translated: "Well washed is half the feeding."

My object in presenting to you these facts is to show you that you must not be satisfied with an average death-rate in your towns of 21·8 per 1,000, but that you should investigate the death-rate in each part of your town, and in each class of your population at several ages, and ascertain where it is in excess and what are the causes of the excess, and then do your utmost to remove those causes.

For the death-rate is an indication of the degree of wasted force in the country.

Let us consider for a moment the losses to the country which are evidenced by a high death-rate.

Take a professional man who has accumulated a large amount of knowledge, and what is better, of experience; or take an artizan who is a skilful craftsman. They die in the prime of life when they are most fitted to use these qualities; the knowledge, experience, and skill, which have required many years and much labour and expense to accumulate, all go with them, before the crop of usefulness, in the cultivation of which so much has been expended, has ripened and been gathered.

But there is also to be considered the loss by sickness.

The death-rate affords to some extent an index of the disease rate in the community. It is, however, very difficult to ascertain with any degree of accuracy the disease rate of a community, as compared with the death-rate.

If we take the Army as a criterion, it would seem that there are more than 100 men admitted to hospital to one death, whilst the number constantly sick averages from four to six times the number of deaths. No doubt in the Army many an ailment has to be treated in hospital which in ordinary life would allow the sufferer still to pursue his avocations.

The sickness of the population is not registered, and it is very difficult to obtain any data respecting it. It has been generally stated that there are on an average 20 cases of sickness to one of death, of which 4 cases out of 5 are those of children. I find, however, from a return of an unsanitary district in St. George's-in-the-East, that with a death-rate of 31 per 1,000, the sickness rate was 270 per 1,000, or 9 cases of sickness to one death. But in the worst parts of the same district the sickness rate amounted to 620 per 1,000, which gives 20 cases of sickness to one death.

Mr. Neison, who has recently examined the records of the Ancient Order of Foresters, shews that at 35 years of age there are on an average 22 cases of sickness to one death, and that is in a body of men which it must be borne in mind are selected men so far as health is concerned. From the same record we find that at 20 years of age the loss of time from sickness amounts to 1·5 per cent. of the whole time; and at 40 years of age it amounts to 2·6 per cent.

The value of a single premium paid at 20 years old, (calculated on the 3 per cent. tables) to insure £1 a week during sickness, for the whole life, is £40.

I sought, but failed to obtain, definite statistics on this subject from some of those who are working amongst the poor, both in the east and west end of London.

An east-end clergyman remarked that "the poor go on *living* wonderfully in wretched places, but that they have so much *ill-health*. They are perpetually on the trudge to the Hospitals with their bad chests and bad legs, and get patched up again and again, and live on."

Our London Hospitals and Dispensaries cost, according to Mr. Burdett's statistics, nearly £600,000 annually to administer. The average number of out-patients treated at the various institutions in a year is about 1,000,000—that is to say, more than one out of every four inhabitants of the Metropolis becomes an out-patient in the course of the year.

This expenditure is incurred mainly for the purpose of patching up the wretched poor, who have been injured by bad drainage, want of ventilation, darkness, &c. Though drink may be one of the immediate causes of many hospital cases, yet the tendency to drink is created and fostered by the wretched dwellings of the very poor. But besides the time lost by the sickness itself, there is the large amount of time wasted by the poor in going to and waiting at hospitals, which would be spent by healthy poor in labour.

There is, moreover, the great amount of lassitude and idleness in the low-class poor, which Dr. Richardson traces to want of ventilation, in their own and former generations.

I think we may safely assume that if you can, by preventive arrangements, bring down the death-rate of the wage class to the standard afforded in good sanitation, you would reduce the sickness rate in a similar proportion at least. By means of this item alone the wage earning power of the industrious classes would be enlarged by some millions of pounds, and their comfort correspondingly increased.

You would effect, in addition to the savings under this head, certain other distinct economies. For instance, it is certain that the need for much of the accommodation in our prisons, reformatories, and workhouses arises from evils incident to unhealthy circumstances and crowded dwellings.

We shall probably be led to appreciate more fully the advantages of good sanitation if we can arrive at putting a money value upon some of the more direct results of sanitary improvements.

In the first place the community derives a direct advantage from adopting such a system for the removal of refuse as will enable it to be applied directly to improving the cultivation of land. For whilst on the one hand the rapid removal of refuse from the neighbourhood of dwellings by the efficient sewering of towns results in improved health, the application of sewage to land by the irrigation of growing crops affords both a means of fertilizing the land, and of cleansing the fluid, so as to place it in a fit condition to pass into the streams.

My friend Mr. Chadwick asserts that where the sewage is undiluted with rain-water, and where it is utilized at once, and carefully applied under favourable conditions, an acre of land ought to absorb the sewage of 100 persons, and that the crops on this area should feed five cows; or, if put in another way, that the produce of ordinary cultivation being represented by 1, and market garden produce by $3\frac{1}{2}$, the produce of sewage cultivation should be represented by 5.

I have obtained some recent facts on the direct application of sewage to land which, although they do not show such high results, deserve attention.

Mr. Brundell, who has the management of the Doncaster Sewage Farm, states that during nine years he has never applied any other manure than sewage. That this year the crops are the heaviest that have been produced, and the land remains just as capable of receiving the sewage as it ever was, and does not "tire." Mr. Collett, of the Bedford Farm, says that their produce is generally much above the average of the neighbourhood, and that the crops are as good or better than they were seven or eight years ago; and the land under sewage treatment has improved in quality.

Mr. Champion informs me that at Reading, with sewage irrigation, they cut the Italian rye grass six and seven times in the season, as compared with two crops without sewage; that mangolds grown with sewage produce from 15 to 20 tons per acre more than when grown in the usual way: that their oat crop this year yielded from 14 to 15 quarters per acre, the straw being from 7 to 8 feet high, and remarkably stout and stiff.

Colonel Jones, of Wrexham, tells me that "having farmed many hundred acres during the last three years for the landowners who had farms thrown on their hands, I have had some opportunity of comparing actual results of farming with and without the resource to be derived from a town sewer, and I have no hesitation in saying that produce may easily be doubled per acre by the proper use of sewage as regards *any crop*, and that four or five times the weight of grass is a certainty in any season; and it is simply a question of management and market whether or not a sewage farm can be made to pay."

There are occasionally, no doubt, difficulties to be overcome in the application of sewage to land, and some eminent advocates of the conversion of sewage into manure have said that if the sea is at hand it is better to throw sewage into the sea than to utilize it. But that is not the language used in speaking of the manure of an ordinary farm; yet the one is, in its way, and under its own conditions of use, as valuable for improving crops as the other. Farmers say that one of the best ways of obtaining manure for the land is not to buy artificial manure, but to buy oil cake or other suitable food, and to feed sheep and cattle upon that; and land is largely manured by means of oil cake and Indian corn imported from abroad as food for domestic animals. A recent investigation showed that one-third of the food which is consumed by the people of this country comes from abroad; and, therefore, if we applied the sewage of our population to our land, we should enrich the land by the millions of quarters of foreign corn and the thousands of tons of foreign meat which are imported and consumed in the country; and, so far from the land of England deteriorating under such conditions, it ought to become richer year by year by these enormous importations of food. Therefore, whatever may be the trouble and expense in individual cases of applying the sewage to the land, the application, so far as the interests of the community are concerned, must add to the stored-up wealth of the country.

In the next place the diminished death and sickness rates and the greater length of life entailed by good sanitation afford direct pecuniary advantages.

Let us apply this reasoning to the population of the Improved Artizans' Dwellings in London. These now accommodate about 11,000 families.

In many of the districts which are now covered by these improved dwellings, the death-rate in the wretched homes which have been removed varied, as I have told you, from 35 to 40 and even 50 per 1,000. Mr. Gatliff shews that there are nearly five in a family on an average in Model Lodging Houses. There has thus been a saving of life to the extent of at least 20 per 1,000, by the erection of these dwellings, on the 50,000 persons inhabiting them, or about 1000 deaths annually. And if we take the estimate of sickness which I arrived at above, there would be a reduction in the number of cases of sickness which occur in the population of these dwellings of at least from 15,000 to 20,000.

The cost of the Improved dwellings appears to have averaged a little over £170 each, or about £1,900,000 for the 11,000 families.

By the light of these various data we may obtain some idea of the actual pecuniary advantage to the community which results from the improved health of the occupants of such dwellings. The cost of funerals has been stated to average £5 apiece. Under this head, therefore, the saving may be taken to average £5,000 a year; the diminished loss of the sickness of the 11,000 heads of families alone may be assumed to average another £5,000 a year; and in addition to this there would be the saving in time and money, in seeking medical attendance, of the wives and children who make up the remaining population of the dwellings, as well as the increased power of earning wages afforded to the mothers of families from the diminished sickness of the children.

Hence the money benefit to the community thus made up, which is caused by the diminished death-rate and sickness-rate, would form an appreciable item in the percentage of interest paid on the £1,900,000 capital expended in the construction of the dwellings.

But there is another way in which we may estimate the economy to the community resulting from the increased health which has been obtained in these dwellings.

The analysis of the mortuary rates for Westminster shewed that the mean age at death of the males of the wage classes in Westminster, who had survived the period of youth, and died after 20 was 47·6 years.

The rate of mortality in the Improved Dwellings is from 14 to 16 per 1,000. The rate of mortality in the rural parishes of Northumberland above mentioned, in the years 1877-81, was 15·3 per 1,000; and in Dover in 1880, it was 16·7 per 1,000. It will not be unfair therefore to take the mean age at death of the males who died over 20 in the rural parishes of Northumberland and in Dover as a standard, which may be reasonably expected, for the duration of life of the males who die over 20 years of age in the Improved Dwellings. This was, for the rural parishes of Northumberland 60·9 years, and for Dover it was 57·8 years. That is to say, from 10·2 to 12·3 years, or a mean of 11 years additional duration of life may be expected for the heads of families occupying the Improved Dwellings, beyond that enjoyed by the wage classes who do not live in such favorable surroundings.

Therefore we may assume as a profit to the community the increased earning power of the occupants of these dwellings, due to this increased expectation of life. It would appear from Mr. Neissons tables that 6 per cent. would be a full average deduction for sick time between 47 and 58 years of age; and we may therefore safely take the increased earning power as that due to an additional 10·4 years of life.

If, in order to form a rough estimate of the money value of this, we assume that each of the heads of the 11,000 families receives as a present on his admission to the dwellings a grant of ten years more life, and calculate its money value on the earnings of only £1 a week, we find that upon a four per cent. table the present value of ten years of increased wage earning power at £1 per week would be for 11,000 heads of families £4,640,000, or nearly two and a half times the cost of the property.

By considering the question in this way, we arrive at an understanding of some of the direct pecuniary advantages which accrue to the nation from those sanitary improvements which lead to a decreased death-rate and sickness-rate; and we see that however large may be the cost of the removal of bad dwellings, and the substitution in their place of healthy well-planned dwellings, the actual money gain to the community far exceeds the expenditure in money.

But it is not as a money saving alone that the question must be considered. Its social and political bearings are even more important.

The nation is made up of individual items. The goodness and the happiness of the nation depend upon the individual. Well-regulated family life does more to make up individual happiness than any other form of life. But family life is impossible in the wretched homes which have been permitted to exist in most of our large towns, and many of our rural parishes. These wretched homes drive the population into the streets, and into the gin palaces, and into the public houses. They engender sickness, which entails poverty, and they foster crime.

The improved dwellings, on the other hand, ensure im-

proved health; and by thus affording a security for the more continuous earning of wages, create the possibility of a comfortable home. I was much struck, when in the United States of America, with the fact that the artizan and wage classes, in many manufacturing towns, lived in very comfortable houses, in which each family had their parlour with appropriate furniture, pictures, and often their piano. They had come to look upon these things as a necessity; and this is an evidence of the general civilization which pervades American society. By civilization I mean the education and the general well being of all classes.

In this country our most advanced sanitarians have long endeavoured to impress these doctrines on the public, and I am happy to think that at last they are beginning to bear some fruit; for in order to develop morality, contentment, and happiness among a people, it is essential that they should be provided with healthy and comfortable homes.

The Mayor said he was quite sure that the meeting would agree with him that the important, interesting, and useful address which had been delivered by Captain Galton deserved their most hearty thanks. People seemed to be living in a state of considerable ignorance as to what was necessary for the promotion of their health, and the information which had been given in the early part of Captain Galton's address should result in very great benefit to the public at large. The latter part of the address was full of very interesting facts which had rather an important relation to the health of the working classes. He hoped that the spirit of advancement which he believed had been going on for some time in connection with matters of general health would be accelerated by the address they had heard that night. He had great pleasure in asking them, without making any further remarks, to give Captain Galton a very hearty vote of thanks for the valuable and interesting address he had just read.

Mr. Alderman Wilson said he had great pleasure in seconding the proposal which the Mayor had made to them. It was undoubtedly a very valuable address, and he hoped that it would be profited by in every possible way. If at any future time it should occur that this valuable Institute should come among them again, he hoped that they would find that a very satisfactory state of things, in regard to the matter of health, existed in Newcastle-on-Tyne. They would find, at all events, that their death rate would be very much diminished. He had very great pleasure in seconding the motion.

Captain Douglas Galton said he was extremely obliged to those assembled for the extremely hearty manner in which they had carried the resolution. He had now formally to announce that the meeting was adjourned.

The meeting then adjourned.

APPENDIX A.—Table prepared under the Instructions of Edwin Chadwick, Esq., C.B., and Dr. Richardson, M.D., F.R.S., for a Committee of the Society of Arts, for the BOROUGH OF WESTMINSTER, 1878.

Classes of the Population.	Proportion per cent. of Total Deaths of each Class.	Diseases of the Respiratory Organs (including Phthisis).	Proportion of Deaths from the Undermentioned Causes to 100 Deaths from all Causes.						Mean Age at Death of all who died: men, women, and children.	Mean Age at Death of all who died above 20 years of age.
			Deaths from Zymotic Diseases.				Diseases of the Nervous System.	Bronchitis.		
			Enteric Fever.	Diarrhœa.	Other Zymotic Diseases.	Total per cent. of Deaths of each class of Zymotic Diseases, and Mean of all classes.				
Gentry, Professional Men, &c.:—										
Males	54·45	22·68	...	3·27	5·88	9·15	11·76	3·27	55·8	61·0
Females	45·55	25·78	0·78	1·56	1·56	3·80	10·41	3·91		65·0
Children under 1 year	6·41	11·11	...	27·78	5·56	33·34	11·11	...	...	...
Children under 5 years	9·96	10·71	...	17·86	7·14	25·00	10·71	...	...	...
Salaried Classes, Commercial Clerks, and Merchants:—										
Males	61·69	26·62	2·35	1·76	5·29	9·30	10·59	3·53	33·3	48·8
Females	38·31	30·91	2·83	3·77	6·60	13·20	8·49	1·89		50·6
Children under 1 year	15·94	18·18	...	11·96	9·09	20·45	15·91	...	...	...
Children under 5 years	27·54	21·05	...	9·21	10·74	28·95	9·21	...	...	...
Tradesmen, Shopkeepers, &c.:—										
Males	51·27	32·52	1·48	3·14	7·15	11·77	10·64	1·05	32·0	53·6
Females	48·73	33·39	0·73	2·75	9·36	12·84	10·55	2·66		58·3
Children under 1 year	21·90	24·49	0·20	0·59	9·59	10·38	11·84	...	...	...
Children under 5 years	38·44	26·98	0·35	6·63	18·95	25·93	10·23	...	...	...
Wage Classes—Artizans, &c.:—										
Males	54·94	26·42	1·25	3·06	6·85	10·96	9·26	0·72	28·9	47·9
Females	45·06	33·55	0·88	3·62	10·09	14·59	10·75	2·41		53·6
Children under 1 year	22·63	28·17	0·22	11·35	9·17	20·74	11·79	...	...	...
Children under 5 years	39·02	28·73	0·88	8·35	17·09	25·82	10·51	...	...	...
Domestic Servants, &c.:—										
Males	47·04	32·52	0·92	4·29	4·60	9·81	8·28	0·61	34·3	48·7
Females	52·96	32·15	2·46	14·95	3·54	10·95	9·64	4·09		53·4
Children under 1 year	20·35	21·99	...	5·69	7·80	23·49	10·84	...	...	...
Children under 5 years	30·88	25·70	0·93	12·62	10·28	23·83	10·64	...	...	...
							11·21	...	...	...
Mean of all Classes:—										
Males	52·77	29·29	1·34	3·16	6·19	10·69	9·90	1·13	32·4	51·2
Females	47·23	32·77	1·11	3·27	8·10	12·48	10·68	2·80		55·4
Children under 1 year	20·89	25·20	0·17	11·38	9·12	20·67	11·82	...	...	...
Children under 5 years	35·71	27·08	0·41	8·23	17·12	25·76	10·42	...	...	...

Note.—The figures in this Table refer to the three Registration districts of St. George, Hanover Square, Westminster, and the Strand; whose population is very nearly the same as that of Westminster Borough. Thus the population of the Borough in 1871 was 246,606, while the Registration district had a population of 248,456, or 1,850 in excess. Total deaths in 1878 in the three Registration districts—(Males, 2,908 Females, 2,603)—5,511. Proportion of deaths to the population, 22·7.

APPENDIX B.—CITY OF NEWCASTLE-UPON-TYNE, 1881.

Classes of the Population.	Proportion per cent. of Total Deaths of each Class.	Proportion of Deaths from the Undermentioned Causes to 100 Deaths from all Causes.						Mean Age at Death.	
		Diseases of the Respiratory Organs (including Phthisis).	Zymotic Diseases.			Diseases of the Nervous System.	Senectus.	Of all who died; Men, Women, and Children.	Of all who died above 20 years of age.
			Enteric Fever.	Diarrhœa.	Other principal Zymotic Diseases.				
All Classes:—									
Males	51·83	25·76	1·15	5·71	6·01	14·46	2·98	29·4	51·9
Females	48·17	23·53	1·37	4·44	7·06	14·38	5·36		55·1
Children under 1 year	25·62	12·65	0·12	10·93	4·55	19·78	...		...
Children under 5 years	39·26	16·76	0·24	9·06	11·71	17·80	...		...
1. Gentry, Professional Men, &c.:—									
Males	54·91	26·02	2·44	4·07	4·88	14·63	3·25	35·5	53·2
Females	45·09	15·84	...	3·96	6·93	14·85	3·96		57·1
Children under 1 year	23·66	5·66	...	11·32	1·89	18·87	...		...
Children under 5 years	33·93	11·84	...	7·90	11·84	14·47	...		...
2. Tradesmen, Shopkeepers, &c.:—									
Males	51·92	30·30	1·42	4·55	4·84	14·22	2·70	31·6	54·0
Females	48·08	26·27	1·38	3·69	6·30	16·44	6·30		56·9
Children under 1 year	22·82	15·53	0·32	9·39	2·27	18·12	...		...
Children under 5 years	37·00	19·96	0·60	6·79	11·38	17·76	...		...
3. Shipwrights, Chain and Anchor Smiths, Iron Forge Labourers, &c.:—									
Males	50·00	25·51	0·51	5·61	9·18	10·20	2·04	22·3	46·6
Females	50·00	16·33	1·02	6·63	3·57	9·69	3·57		50·9
Children under 1 year	32·40	8·66	...	11·02	6·30	20·47	...		...
Children under 5 years	47·96	14·89	...	10·64	9·57	15·96	...		...
4. Seamen, Watermen, Fishermen, &c.:—									
Males	55·12	21·43	...	7·14	2·86	12·86	2·86	37·1	52·4
Females	44·88	22·81	...	3·51	5·26	12·28	7·02		57·4
Children under 1 year	18·90	8·33	...	4·17	12·50	29·17	...		...
Children under 5 years	26·77	11·76	...	8·82	14·71	26·47	...		...
5. Other Wage Classes—Artizans, &c.:—									
Males	51·34	20·58	0·90	7·40	7·04	16·43	3·61	27·0	49·9
Females	48·66	21·38	1·90	4·76	9·52	13·72	4·95		53·4
Children under 1 year	27·90	12·96	...	12·96	5·98	20·60	...		...
Children under 5 years	41·52	15·18	...	11·16	12·72	18·53	...		...

Total Deaths in 1881 ..... 3,176 {Males ..... 1,646. Females ..... 1,530.

Estimated Population in middle of year ..... 145,811.
Mortality per 1,000 in year 1881 ..... 21·8.

APPENDIX C.—BOROUGH OF DOVER, 1880.

Classes of the Population.	Proportion per cent. of Total Deaths of each Class.	Proportion of Deaths from the Undermentioned Causes to 100 Deaths from all Causes.						Mean Age at Death.	
		Diseases of the Respiratory Organs (including Phthisis.	Zymotic Diseases.			Diseases of the Nervous System.	Senectus.	Of all who died; Men, Women, and Children.	Of all who died above 20 years of age.
			Enteric Fever.	Diarrhœa.	Other principal Zymotic Diseases.				
All Classes:—									
Males	52·43	30·74	0·74	7·76	1·85	11·85	7·41	34·1	57·8
Females	47·57	31·43	1·63	6·94	3·67	15·10	8·57		59·6
Children under 1 year	26·99	20·86	...	19·42	0·72	14·39	...		...
Children under 5 years	37·28	25·52	...	16·67	5·21	13·02	...		...
Gentry Professional Men, &c.:—									
Males	43·94	17·24	6·90	13·79	...	17·24	10·34	42·8	64·7
Females	56·06	21·62	8·11	5·41	5·40	18·92	16·22		64·9
Children under 1 year	13·64	11·11	...	55·56	...	11·11	...		...
Children under 5 years	25·76	17·65	...	29·41	5·88	17·65	...		...
Tradesmen, Shopkeepers, &c.:—									
Males	48·66	31·87	...	6·59	...	14·29	5·50	31·9	61·0
Females	51·34	33·33	...	7·29	6·25	16·67	4·17		53·4
Children under 1 year	27·27	19·61	...	17·65	1·96	17·65	...		...
Children under 5 years	40·64	23·68	...	14·47	7·89	15·79	...		...
Wage Classes—Artizans, &c.:—									
Males	58·04	34·62	...	7·69	3·85	9·23	8·46	33·6	55·0
Females	41·96	35·11	1·06	8·51	...	12·77	6·38		60·1
Children under 1 year	29·46	25·76	...	18·18	...	12·12	...		...
Children under 5 years	36·16	30·86	...	18·52	2·47	9·88	...		...
Seamen, Boatmen, Pilots, &c.:—									
Males	52·63	20·00	...	5·00	...	10·00	5·00	32·9	52·5
Females	47·37	22·22	...	...	5·56	11·11	27·78		78·0
Children under 1 year	34·21	7·69	...	7·69	...	15·38	...		...
Children under 5 years	47·37	16·67	...	5·56	5·56	11·11	...		...

Total Deaths ..... 515 {Males ..... 270. Females ..... 245.

Annual Rate of Mortality per 1,000 of Population in 1880 ..... 16·7.

APPENDIX D.—RURAL PARISHES OF NORTHUMBERLAND, 1877—81.

Deaths in the five years 1877—81, in parishes comprised in the Registration Districts of Bellingham and Rothbury, and in the Sub-districts of Islandshire and Norhamshire, in the parish of Chatton.

Classes of the Population.	Proportion per cent. of Total Deaths of each Class.	Proportion of Deaths from the Undermentioned Causes to 100 Deaths from all Causes.						Mean Age at Death.	
		Diseases of the Respiratory Organs (including Phthisis).	Principal Zymotic Diseases.			Diseases of the Nervous System.	Senectus.	Of all who died; Men, Women, and Children.	Of all who died above 20 years of age.
			Enteric Fever.	Diarrhœa.	Other principal Zymotic Diseases.				
All Classes:—									
Males	50·43	19·51	1·84	1·84	6·50	12·03	10·06	42.3	60.9
Females	49·57	23·35	1·50	2·25	7·62	12·61	9·61		59.9
Children under 1 year	15·72	13·78	...	5·12	6·69	6·30	...		...
Children under 5 years	22·46	13·22	0·55	4·13	16·53	6·61	...		...
Gentry, Professional Men, &c.:—									
Males	44·83	11·54	3·85	...	3·85	15·39	19·23	55.7	65.5
Females	55·17	25·00	...	...	...	18·75	12·50		70.8
Children under 1 year	8·62	40·00	...	...	20·00	...	...		...
Children under 5 years	10·34	33·33	...	...	16·67	...	...		...
Farmers, &c.:—									
Males	60·00	19·30	1·75	0·88	3·51	9·65	12·28	52.6	66.1
Females	40·00	23·68	1·32	2·63	5·26	10·53	14·47		66 8
Children under 1 year	10·00	15·79	...	...	5·26	5·26	...		...
Children under 5 years	14·74	17·86	...	3·57	10·71	3·57	...		...
Tradesmen, Shopkeepers, &c.:—									
Males	51·20	21·70	2·98	0·85	5·96	16·17	10·64	43.8	59 2
Females	48·80	21·43	...	1·34	10·71	15·63	7·14		60.4
Children under 1 year	13·67	13·33	...	1·67	13·33	11·67	...		...
Children under 5 years	20·48	11·70	...	1·06	24·47	10·64	...		...
Wage Classes—Artizans, &c.:—									
Males	46·49	19·11	0·89	3·56	7·56	11·11	4·89	35.4	56.0
Females	53·51	21·24	1·93	2·70	8·49	12·36	10·04		57.3
Children under 1 year	21·49	14·44	...	9·62	1·92	4·81	...		...
Children under 5 years	28·72	12·23	0·72	7·91	14·39	6·47	...		...
Agricultural Labourers, &c:—									
Males	50·59	18·60	1·40	1·86	7·91	9·30	12·56	42.2	63.7
Females	49·41	27·62	2·86	2·86	5·24	9·52	9·52		57.7
Children under 1 year	15·53	10·61	...	3·03	7·58	4·55	...		...
Children under 5 years	22·59	13·54	1·04	2·08	13·54	4·17	...		...

Gentry, &c. ..... 58 | Wage Classes 484
Farmers, &c. ..... 190 | Agricultural Labourers ... 425
Tradesmen, &c. 459

Total Deaths ... 1616 { 815 Males. 801 Females.

Population 1871 ... 23,139. Population 1881 ... 20,666.
Mortality per 1,000 calculated on deaths and estimated population in each year 1877-81 ... 14·0.

APPENDIX E.—Annual rate of mortality per 1,000 of population at several ages in the City of Newcastle-upon-Tyne during the year 1881, and in the Borough of Dover in the year 1880.

Ages.	Newcastle-upon-Tyne, 1881.		Dover, 1880.	
	Males.	Females.	Males.	Females.
All Ages.	23·15	20·60	18·13	15·37
0 — 5	66·19	54·77	62·64	44·43
5 — 10	8·84	7·36	3·38	1·80
10 — 15	4·35	3·79	7·06	2·68
15 — 20	5·08	5·10	4·09	4·08
20 — 25	6·00	6·82	6·07	4·98
25 — 35	10·67	8 95	6·20	5·07
35 — 45	17·71	14·88	9·42	10 07
45 — 55	27·11	17·05	12·11	10·02
55 — 65	44·89	32·81	31·91	25·41
65 — 75	88·97	80·72	53·31	42·11
75 — 85	206·01	177·48	183·65	117·72
85 and upwards.	276·90	215·83	430·63	190·89

NOTE.—The numbers of the population at the various ages, as enumerated at the Census of 1881, are not yet available. For the purposes of the above table it has been assumed that the distribution of the population over the several ages was relatively the same in 1881 as in 1871.

APPENDIX F.—Mean age at death and mean after life-time or expectation of life, at several ages, deduced from the estimated mortality of the City of Newcastle-upon-Tyne in the year 1881, and of the Borough of Dover in the year 1880. The expectation of life by the English Life Table is added for comparison.

Ages.	Newcastle-upon-Tyne, 1881.				Dover, 1880.				By the English Life Table.	
	Mean age at death.		Mean after life-time.		Mean age at death.		Mean after life-time.		Mean after life-time.	
	Males.	Females.	Male	Females	Males	Females.	Males.	Females.	Males	Females
0	39·1	43·7	39·1	43·7	44·5	52·1	44·5	52·1	39·9	41·9
5	52·6	55·9	47·6	50·9	59·9	63·9	54·9	58·9	49·7	50·3
10	54·7	57·8	44·7	47·8	60.8	64·5	50·8	54·5	47·1	47·7
15	55·6	58·6	40·6	43·6	62·6	65·2	47·6	50·2	43·2	43·9
20	56·6	59·7	36·6	39.7	63·5	66·1	43·5	46·1	39·5	40·3
25	57·6	61·0	32·6	36 0	64·8	67·2	39·8	42·2	36·1	37·0
35	60·7	63·9	25·7	28·9	67·0	69 2	32·0	34·2	29·7	30·6
45	64·8	67·7	19·8	22·7	69·7	72 3	24·7	27·3	22·8	24·1
55	69·3	71 0	14·3	16·0	72·2	74 6	17·2	19·6	16·5	17·4
65	74·6	75·3	9·6	10·3	76·8	78·9	11·8	13·9	10·8	11·5
75	81·3	81 8	6·3	6·8	81·6	83·5	6.6	8·5	6·5	6·9
85	90·5	90·1	5·5	5·1	90·1	91·5	5·1	6.5	3·7	4·0

SECTION I.

SANITARY SCIENCE & PREVENTIVE MEDICINE.

ADDRESS

By Dennis Embleton, M.D., F.R.C.P.,

PRESIDENT OF THE SECTION.

I have the honour and pleasure of offering to this Section of the Sanitary Institute of Great Britain, on its first visit to Newcastle-upon-Tyne, a hearty welcome.

We are assembled at an important station, which dates back from the times of Hadrian, and even from those of the Ancient Britons, and which has been celebrated more or less ever since in British history for its natural productions, its important and successful industry in various departments of the arts and sciences, its extensive commerce, its learning and its antiquities. It has passed successively under the appellations of Pons Ælii, Ad Murum, The New Castle on the Tyne, Novum Castrum super Tyna, and during the last month Her Gracious Majesty has distinguished it by the more elevated style and title of "The City and County of Newcastle-upon-Tyne." Lastly, it has been further dignified by having also about the same time been constituted the seat of a new Bishopric.

Its glories, so long ago as the time of the publication of Grey's "Chorographia," were summed up in the Latin distich:

> "*Portus, Castrum, Carbo, Salmo, Salina, Molaris.*
> *Murus, Pons, Templum, Schola, sunt Novi gloria Castri.*"

I have also the pleasing duty to perform of tendering to you my thanks for the honour you have conferred upon me by placing me in the high position of President of this Section of Sanitary Science and Preventive Medicine.

I fear that I have nothing new to offer you, and you know that "*Difficile est proprie communia dicere.*" So I must beg your indulgence in listening to that which I have to say.

The objects of the Sanitary Institute of Great Britain are, as I apprehend them, to increase, and to reduce to practical use, our knowledge of the best means of improving the sanitary condition of our dwellings in towns and in the country, of our men and women, poor and rich alike; to diffuse such knowledge broadcast over the land, so that every one who will may learn, and those who will not must follow in the wake of their wiser brethren, and be taught what are the best ways of living long and in health, that all being instructed and convinced may gladly assist in carrying out, for the public and private weal, those means which experience and science have proved to be the most advantageous. To enlighten sanitary authorities and aid them by advice; to examine and grant certificates of competence to Local Surveyors and Inspectors of Nuisances, and to those who may be candidates for these offices; to endeavour to obtain a complete registration of diseases, and particularly of those that are preventible.

The last of the objects of the Sanitary Institute is to hold a Congress from time to time, to allow of the consideration and discussion of subjects relating to Hygiene.

Wherever the Congress meets there is held an Exhibition of all manner of Sanitary apparatus and appliances for the instruction of all concerned—and who is not?—in the principles and practice of Hygiene.

In kindling and diffusing this light, it will readily be allowed that members of the medical profession have been prominently and honourably distinguished, and although in so doing they have not consulted their own worldly advantage, they have incurred no small amount of ill-will and obloquy from the blind and ignorant part of the public whose very interests they were promoting.

Sanitary improvements used formerly to be scouted as unnecessary, or stigmatized as positively injurious. Even now they are at first unpalatable, and even grievous to many, owing to the not unnatural tendency to a dislike to depart from old ideas and ways, and thereby incur increased expenditure of money; but once enforced, they are tacitly or grumblingly acquiesced in: after a while they are confessed to be unexpected blessings, by conferring or augmenting health, comfort, and convenience, and, lastly, the wonder grows that the improvements had not been enforced much earlier.

To become more healthy, men must be taught that it is necessary to sacrifice many little items of what they have been accus-

tomed to regard as their right—their personal liberty—for they are bound, both by human and Divine laws, to have regard to the health and comfort of their neighbours—the community—as well as to their own.

Private convenience must give way to public good.

Salus populi suprema lex! This apophthegm is as true now as when, in ancient Rome, it was enunciated; and its value, in those days clearly apprehended, ran great risk of being entirely lost to mankind in the wars, tumults, and confusions of the dark ages, and is only now, in this latter half of the nineteenth century, beginning to be re-appreciated and re-understood, and the important principles involved in it to be again carried into action.

The idea of the supreme importance of the health and safety of the people has not, as yet, penetrated so deeply into the public mind as to render the repetition of the above wise and terse dictum unnecessary; and perhaps even yet it has not been adequately studied and carried into act by those in authority.

It is true that during recent years considerable and increasing progress has been made; sanitary laws have been framed and extended; courses of study and examinations have been instituted by universities and medical schools, as well as by our Institute, and distinctions offered for proficience in state medicine or sanitary science; health authorities, health officers, and nuisance inspectors have for all urban and suburban districts been appointed;—and all are being instrumental in furthering the cause of sanitation. Valuable and regular reports are made of the condition of the districts, and these are compared, summarized, and tabulated by proper officers; and thus local authorities are enlightened as to their duties of caring for the health of the public.

Many prejudices, however, remain to be combatted, and many difficulties from previous faulty constructions and other causes to be surmounted.

In this city many great and beneficial alterations have of late years been effected by the abolition of groups of unhealthy houses, many of which were quite unfit for human beings to live in; by the regulation of lodging-houses and diminution of overcrowding; by the opening out of narrow lanes into spacious streets, by rectifying old streets, by forming new thoroughfares; by extended and improved sewerage; by an improved and increased supply of water and of gas; and by the formation of five parks at different parts of the circumference of the city for the recreation of the inhabitants.

Our population, which, in my boyish days, numbered about 35,000, has increased to close upon 150,000, and the death-rate

during the last 50 years has notably decreased: the latest return showing that the annual rate for 1881 was 21·8 per 1,000.

From the returns of the Registrar-General for 1881 we learn that the lowest mortality among 20 large towns was 19·0 per 1,000 at Brighton; the highest 26·7 per 1,000 at Liverpool. That in 50 other large towns represented by the entire registration districts or sub-districts most nearly corresponding with their boundaries, the death-rate last year averaged only 19·6 per 1,000, which was 2·1 below the average rate in the 20 larger towns. The lowest rate in these 50 towns was 14·2 at Reading, 14·3 at Maidstone; and the highest, 24·0 in Ashton-under-Lyne, and 24·6 in Merthyr Tydfil.

Our mortality last year, 21·8 was somewhat less than in any of the preceding five years, and yet 13 out of the 20 towns on the list of the Registrar-General had a lower death-rate than we had, and only 6 a higher rate. This is not an honourable position for us.

The 13 towns must have been improving in salubrity, and hence we may appear to have retrograded, whereas, as I have just said, our rate had diminished; we have been improving, but only less rapidly than the 13 other towns.

There is, therefore, room for further improvement in our sanitary condition, and that may be effected by the prevention or stamping out of zymotic diseases, by the total abolition of fever dens, the stricter regulation of houses liable to be overcrowded, by extended drainage of houses, and by the inculcation of sanitary knowledge among the people, and the preservation of the lives of young children, especially those under the tender age of five years.

Pure air, or air as pure as can be had, is essential to the health, cleanliness, and comfort of the inhabitants of all towns. The seats, however, of our great manufacturing industries suffer grievously at times from the plague of smoke. We know that the consumption of vast quantities of coal in various factories is an absolute necessity; but it is also well known that these valuable establishments can be carried on with a very great reduction of the amount of smoke at present produced, and that means exist whereby smoke from factories may practically be abolished.

This smoke, in certain localities, contains not merely the products of the combustion of coal—the valuable, unburnt, and therefore wasted carbon, the carbonic acid and oxide, and the sulphurous acid—but, moreover, the fumes of hydrochloric acid, of lead, copper, arsenic, and other unwelcome vapours.

An atmosphere charged with these malodorous and mephitic

additions cannot be supposed to be particularly salubrious; it certainly does not possess antiseptic qualities sufficient to ward off infectious or zymotic diseases; if it did it might be endured with some degree of patience and resignation, as it is it is a great evil and demands abatement. It blackens our streets and buildings, our faces, hands, and clothes, our books and silver-plate, it penetrates our air passages and lung cells, giving rise to feelings of choking and to sooty expectoration, it induces general depression and constipation, it injures and destroys our trees and damages our crops. It would be an immense benefit both to town and country if the smoke could by any means be reduced to the smallest amount compatible with the carrying on of profitable business. We have laws framed with the object of getting rid of smoke, but they seem inoperative. None but those whose necessities require it live in smoky towns, and these so soon as they have acquired a competency go to live and spend their money in more favoured and cleaner localities; even the denizens of a smoky town seize every opportunity to get into purer air, either at the sea-side or in the country.

Good water is almost as essential as good air, and great efforts have been made of late years to obtain it, for large towns, from the streams and lakes of mountain districts, since the rivers have become so polluted that their water is no longer potable.

The variety of artificial drinks—aqueous—goes on increasing, and when they are properly and conscientiously prepared, are good and wholesome.

The consumption of alcoholic drinks goes on diminishing, and with the quantity the quality of some is also reduced.

Intemperance in the use of these is on all hands, and justly, condemned, and considered the parent of poverty, vice and misery, bringing forth quarrels among friends, violence, insanity, suicide, and various forms of disease, and in this way the lives of thousands are embittered and cut short, long before even the term assigned by the Psalmist has been attained. It would be well if the smoking of tobacco were restricted to men and women above the age when the body is fully formed.

A supply of pure milk is essential to the welfare of every modern community, and especially of young children, but it is now so dear that poor folk's children are obliged to be brought up without its healthy nutriment.

The inspection of dairies ought to be constantly and carefully performed, for it is well known that from carelessness and want of cleanliness during the transit of milk from the cow to the consumer the seeds of disease have found their way into the wholesome nutriment, and been sown far and wide through families,

whose darlings have thereby been cut off on the threshold of life. Milk being already a watery fluid, no additional water should be allowed to be mixed with it by the vendor, as the consumer can easily do that if he considers it requisite.

Meat—animal and vegetable—is as necessary as drink, and temperance in its use is also as requisite. Inspection of both kinds, and analyses in many cases, ought to be in constant operation. Medicines also require to be tested in the interest of the sick and of the medical attendant.

The *auri sacra fames* has led to the systematic adulteration of various kinds of food and of medicines, and the adulterators deserve to be fed on their own cheap and nasty compounds.

Cookery, properly so called, is the art of preparing food so as to render it at once easily digestible and agreeable to the tongue. The cookery of the plain cook does not commonly aim at these desirable ends, but is often the art of getting over the preparation of the meal with the smallest amount of trouble to the cook. Most houses are in need of lessons of sanitary cookery. The disturbing influences of bad cooking and the habit of bolting food tend to dyspepsia and to shorten life, whilst good cookery and thorough mastication of food are among the agencies that tend to prolong existence.

Cleanliness of person and purity in the house, thorough sewerage of towns, and perfect drainage of houses, are absolutely necessary for health. The sewers and drains must be thoroughly ventilated, and the products of the ventilation carried away to the most elevated situations outside the towns and houses, and should never be permitted to escape by open grates in the streets in the midst of the moving population, whose health it is the object of sanitary authorities to protect and promote. It is true that it is better for the foul gases to pass out into the streets than into the houses, but if they exude into the thoroughfares the air in them can never be pure.

Every one will agree that if infectious disease of any kind makes its appearance, means should be at once adopted and energetically followed out, to limit its spread and to stamp it out at the earliest possible period.

Not long since the notification to the authorities of the breaking out of infectious disease was considered impracticable and absurd, now, however, it is looked upon, and very properly, as not only feasible, but absolutely necessary, and a fit subject for imperial legislation.

On the subject of the compulsory notification of infectious diseases it is a question whether the master or occupier of the house, the head of the family, or the medical attendant, if there be one, should notify to the sanitary authorities the occurrence

of such disease. It seems only in accordance with reason that the person in whose house the disease may have appeared should in the first instance be obliged to notify the fact if he is aware of it, for such person is most directly and seriously concerned, and he and his family are the most likely to suffer from infection; besides he is bound in duty to his neighbours and to the community to take the best measures to prevent the disease spreading to them.

If a medical man called in finds an infectious disease present he must inform the master of the house that such exists, and direct him how and when to make the necessary notifications; if he is requested by the master of the house to notify for him the medical man cannot well refuse to do so; if the master of the house refuses to notify, or to allow the medical attendant to do so for him, then the onus must fall upon such master after he has been told what his plain duty is.

If no medical man is sent for or allowed to attend, then the master of the house is clearly responsible, and must abide the consequences of his neglect if he does not at once notify the existence of infectious disease in his house to the proper authority.

Those who unfortunately happen to have any infectious disease in their houses ought to be very thankful to a medical man who will notify for them, instead of placing obstacles in his way.

It is most important that children having an infectious disease should not be allowed to go to school, nor should those from any house in which such disease exists be allowed to go to any school. The disease should be limited to as small a space as possible, not brought among circumstances which would be most favourable for its spreading through a community; adults going about with infectious diseases upon them are liable to punishment.

Vaccination should be repeated every 7 or 10 years to ensure immunity, and the greatest care taken to obtain the vaccine matter at the proper time, and from a healthy subject belonging to a healthy family.

With regard to female attire—the vagaries of fashion are not easy to be controlled, some of them, however, are so very absurd, ridiculous, and withal so injurious to health and destructive of elegance of form that they deserve to be on all occasions held up to public derision and reprobation. I allude to the tight lacing of the waist with stays, and the wearing of high-heeled boots and shoes as practised by some ladies.

The spider, or the wasp, or the hour-glass, is not a fit model for the human form, and moreover the spider-waisted girl or woman is certain to have all her internal organs displaced or

compressed and deformed, and she thereby becomes unfitted for the duties of a mother. The high-heeled boot is not an imitation of anything in nature, it is an absurdity *sui generis*, a revival of an old fashioned folly of a century ago: it deforms and injures the foot, and spoils the beauty and usefulness of the leg. These two absurdities render impossible that free exercise of the body, which is so essential to health; they sap the health, undermine the constitution, and tend to bring on premature age.

The question, what is the natural term of life of man? is one that naturally occurs, and is of deep interest to the student of Sanitary Science and Preventive Medicine. What is the philosophic estimate of the normal length of his life? How long does he actually live under the most favourable circumstances at the present day?

With respect to the former of these questions the answers we get from high authorities on this subject present some variety; but those we obtain to the latter question show a greater and more reliable consensus.

Buffon, from the physiological knowledge of his day, concluded that the duration of life may be estimated to a certain degree by that of the duration of an animal's growth, "Man, who takes 30 years to grow, lives 90 or 100 years; the full development in size of all the parts of his body is not completed till the 30th year—his life, therefore, is the period of his growth multiplied by $3\frac{1}{3}$."

The ages of the dog, horse and stag may be computed by taking the years of their attaining maturity, and multiplying them by 4, 5, 6, or 7 respectively.

Flourens, following in the footsteps of the great naturalist just named, but with a more advanced physiology, gives us more and more accurate information: he informs us that the ages of Mammalian animals at which they die a natural death from decay may be computed by ascertaining the time at which they arrive at perfect maturity and multiplying their age at that time by five. According to this rule, the illustrious Professor Owen has ascertained, as related by my friend the benevolent and eloquent Dr. B. W. Richardson at the Croydon Congress, the natural age of a number of wild and of domesticated animals, as the Elephant, the Horse, the Lion, the Ox, the Camel, and so on.

The same rule was applied to man, whose full maturity and full age may, Dr. Richardson tells us, be calculated with equal precision. His maturity, *perhaps not quite the full maturity*, is twenty years. His full age, therefore, is 100 years. "This," he goes on to say, "is the anatomical estimate of human life, the surest, and by far the best of all that can be supplied, since it defines a law irrespective of, and overriding all those acci-

dental circumstances of social and physical storm and strife which may interpose, and indeed do interfere, with every estimate based on the career of life itself, as it is shown in the ephemera by and through whom it is phenomenally demonstrated."

"This lesson told with singular felicity of language from two masters of science—for Owen never forgot Flourens—struck Mr. Chadwick and myself with singular force. On a surer basis than we had ever trod, it corroborated a view we had ourselves promulgated from entirely different standpoints, and it further corroborated a similar view which had been advanced by our eminent friend Dr. William Farr. The constant of human life is naturally one hundred years. The constant was before us in all its truthfulness. But more remains."

"Because the fulness of age is one hundred years, it is not an essential that death shall immediately crown the advent of that fulness. To certain parts of the scheme of natural life there is a boundary. The period of maturity of development has its boundary of twenty years; when the body, as Flourens says, ceases to grow, it does not cease to increase; its nutrition improves and perfects for twenty years more at least, and then has only reached its completed physical condition. It should never during that period gain in weight, and for a long time it should not lose. It goes on now through a third period, which Flourens admirably calls the period of invigoration, during which all its parts become firmer, all its functions more certain, all its organisation more perfect; and this period covers thirty years. At seventy years old age begins; the *first* old age in which naturally the fruits of wisdom are most bountifully developed, and which lasts from fifteen years to twenty, to mellow down to a period of ripe old age, commencing at eighty-five years, and lasting fifteen years more, *i.e.*, until the constant is attained."

"And yet there need not yet be death. The kind of half life consisting of forces *in action*, without any *in posse*, has continued unquestionably many years beyond the fulness of age, both in man and lower animals, and to give it twenty years beyond the natural hundred is to be just without being in any extreme sense generous."

It is not for me to enter the lists against the high authorities whose names I have taken the liberty of mentioning, but it is to be observed that the theory of Professor Flourens of completed animal growth is founded on the union of the epiphyses of the bones to their shafts, in other words, "the determination of natural old age is calculated on the basis of *perfected maturity*. The skeleton is *perfected* when the epiphyses or loose terminal parts of long bones are firmly united with the shaft of the bone."

Now on reference to our latest standard works on human anatomy we find it laid down distinctly that the perfected maturity of the skeleton of man as regards *the length* of bones is not arrived at till the age of 25 years.

In the last edition of Quain's Anatomy, in 1878, we are told that the long bones of the extremities, which are always the last to terminate their ossification, are not completed, that is, their epiphyses are not thoroughly consolidated with their shafts, before the age, in woman of 23 or 24 years, and in man of 25 years.

In the *Traité d'Anatomie descriptive, &c., Ph. C. Sappey, 2nd Edit. Vol. I.* p. 112, *Paris*, are the following passages:—

"*La réunion des épiphyses a lieu un peu plus tôt chez la femme que chez l'homme. Chez la première toutes sont soudées à vingt-deux ans. Chez le second les dernières ne se soudent quelque fois qu'à vingt-trois, vingt-quatre et même vingt-cinq ans.*

"*Après la soudure des épiphyses la longueur des os n'augmente plus. Or, cette soudure est complète à vingt-cinq ans, et la stature cependant continue à croître jusqu'à vingt-huit ou trente.*

"*Comment s'opère cet accroissement auquel le système osseux ne peut plus contribuer? On ne saurait invoquer ici que les cartilages articulaires et les disques intervértebraux; ces derniers surtout, dont l'evolution sans doute est plus tardive que celle des os, et qui augmente encore d'epaisseur lorsque ceux-ci ont déjà acquis leur longueur définitive.*"

At p. 113:—

"*Ainsi se produisent et s'agrandissent ces canaux (médullaires), ainsi s'accroît le diamètre des os longs. Cet accroissement ne se termine qu'à vingt-huit ou trente ans, chez la femme; a trente-cinq ou quarante ans chez l'homme. Les os par conséquent continuent à croître en grosseur longtemps encore après qu'ils ont cessé de croître en longueur.*"

If these data be correct and man does not come to full maturity, as regards the length of the long bones and the consolidation of their epiphysis, until the age of 25 years, and we apply the rule of Professor Flourens, multiplying 25 by 5, we get the result that the constant of the length of human life should be 125 instead of 100 years.

Again, if we take the period at which the bones of the skeleton have arrived at their full development of thickness and strength, as well as of length, when, in fact, they are entirely and finally perfected, that is at 40 years, and apply the above rule to this number, we should find that the constant of the age of man ought to be extended to 200 years, and we might add, with Dr. Richardson, that if at the expiration of that lengthened period "there be sufficient vital force in action," man may live 25 or 30 years longer, and die at possibly 230 years.

If, however, the rule of Professor Flourens as applied to man be altered slightly, and the multiplicator be, in his case, made 4 instead of 5, we should then have the constant, so called, of the life of man 100 years, a number which appears to be a favourite with many philosophers.

Hufeland has laid down the rule, that an animal lives eight times as long as it is in growing. Man in a natural state requires, he states, quite 25 years to attain his full and complete growth and conformation (agreeing in this with Quain and Sappey) and this proportion will give him an absolute age of 200 years—an age exceeding that of the chief Hebrew Patriarchs, who lived from 110 to 180 years.

Dr. Latham, in his Dictionary, quoting Calmet, states that by some of the ancients, a generation was fixed at 100 years, by others again at 33, 30, 25, and 20 years. But we do not know on what these conclusions were arrived at. Dr. Farr says that the natural life of man is a century, and that the Etruscans made 100 years their sæculum.

Now although the term of 100 years be the favourite constant of human life, there are some who question the correctness of this conclusion. I will quote one.

Mr. G. H. Lewes, in his "Physiology of Common Life," Vol. II., p. 438, says on this subject—

"And here it may be as well to point out a common error in works that treat of longevity, and one which is explicitly stated by Prof. Flourens, the latest writer on that subject. It is that of supposing the duration of life to be measurable by beats of the pendulum. We are told that the normal length of life for a human being is one hundred years; and that if the majority of men die earlier, it is because accident, disease, or imprudent habits, have shortened the term.

"The argument rests on the fallacy that because some men reach the age of one hundred all men would reach it were there not disturbing causes; but inasmuch as these disturbing causes are part of the conditions of human life, inasmuch as man is dependent on the atmosphere, on climate, and on food, and cannot escape their variations, to say that he would live a century were it not for the disturbing influences, is to say that he would enjoy a longer life if life were otherwise ordained. One man lives faster than another; he lives more in the same period. If he live imprudently at the same time he may hasten the changes which will bring about death. But the utmost prudence will not shield him entirely against external conditions; nor will the wisest care do more than modify the hereditary disposition which he brought with him into the world, and which will make him short lived or long lived." In another page he

says (p. 439), "The prolongation of human life has been one of the dreams of the speculative, and its essential error has been seldom perceived."

Having now seen what, according to our highest authorities on longevity, the length of human life ought to be, free from accidents and the various other disturbing influences, let us try to ascertain what it really has been, and is now, in the midst of the wear and tear of the world.

The estimate of a generation arrived at by the ancient Egyptians is recorded by Herodotus in chapter 142 of the 2nd Book (Enterpe) of History (Cary's Translation). "Thus much of the account the Egyptians and their priests related, showing that from the first king to this priest of Vulcan who last reigned, were three hundred and forty and one generations of men; and during these generations there were the same number of chief priests and kings. Now three hundred generations are equal to ten thousand years, for three generations of men are one hundred years."

If the information received by Herodotus was correct, the computation of a generation of $33\frac{1}{3}$ years must have been nothing new at the time, but had been familiar to the Egyptian priests for ages previous, so that the mean age of the highest class of Egyptian Society was $33\frac{1}{3}$ years: what was the corresponding age of the lower classes we know not, but it must have been considerably below that of the kingly and priestly castes.

The estimate of the Psalmist is above that of the Egyptians, but below that of modern philosophers, when he says "The days of our years are three score years and ten; and if by reason of strength they be four score years, yet is their strength labour and sorrow; for it is soon cut off and we fly away."

Men in his day evidently did not arrive at the modern constant of human life, 100 years.

To come to modern times and our own country. In a little work, entitled "Statistics of Families in the Upper and Professional Classes of the National Life Assurance Company," kindly sent to me by Mr. Charles Ansell, Jun., Actuary, dated 1874, I find the following: "The length of a generation in the sense here intended is the mean period that elapses between the births of parents and the births of their children, or, in other words, the number of years that persons are, on the average, younger than their fathers and mothers." From Mr. Ansell's tables it results that "the average intervals between the births of fathers and mothers and the births of their children are 36·66 years for fathers, and 32·30 years for mothers respectively. The mean of these intervals is 34·48 years.

For all practical purposes, therefore, it may be considered

that the average length of a generation among the upper and professional classes, in this country was, in 1874, 34½ years."

It is not a little remarkable that there should be found so close an agreement between the estimate reported by the father of history, in B.C. 450, and possibly arrived at ages before, and that made only eight years ago by the actuary of an English life assurance society. The ancient Egyptian priests, giving 33⅓ years as the length of a generation by the banks of the Nile, and the modern actuary assigning 34½ years as the length of the same in the upper and professional classes of England.

It may be objected that the Egyptian estimate relates, not to a generation as defined by Mr. Ansell, but to the mean duration of human life; but it is curious to observe how closely the length of a generation, as given by this gentleman, agrees with the mean duration of human life in England as recorded by our authorities, in short, it seems identical with it. Again, in Lardner's "Museum of Science and Art," vol. viii., 1854, it is stated that the mean duration of human life in England and Wales, during the forty years ending with the year 1840, varied from 31 to 37 years, the variation, however, not being regular, its mean value being 34 years. Further, Dr. Farr, in the Sixteenth Annual Report of the Registrar-General, 1833, says, "The natural term of human life appears to be a hundred years: and out of the annual generations successively born in England and Wales, a few solitary individuals attain that limiting age, the rest dropping off year by year as age advances, so that the mean life time is at present only 41 years."

In his Thirty-fourth Annual Report, that for 1871, Dr. Farr gives the mean age at death of persons born in England at 40·86 years.

In the supplement to his Thirty-fifth Annual Report he states: "There is finally a relation betwixt death and the mean life time of man; if a life passing through a given time is represented by a line, death is the point of termination, as birth is the point of origin."

"And a generation of men born together is represented by an indefinite number of such lines of life. The natural lifetime of man is a century; that age, under ordinary conditions, is, as the Etruscans remarked, attained by at least *one* in every considerable generation, and they made it their sæculum; as in that time are passed through all the phases of childhood, youth, manhood, maturity, and monumental age."

"The mean life-time in the healthiest districts of England, and in the healthiest ranks is 49 years, and we have no evidence that under the most favourable conditions it exceeds 50 years."

I may, however, be permitted to show that under peculiarly

favourable circumstances the average mean duration of life, in certain classes of our population, may be considerably higher than that given by the Registrar-General; and I am enabled, through the kindness of John Anderson, Esq., the Resident Secretary, in this city, of the Scottish Widows' Fund Life Assurance Society of Edinburgh, to give the following particulars.

It appears, from reports specially drawn out by the chief medical officer of the society in Edinburgh, that during the sixty-six years of the operations of the society, that is, from 1815 to 1880, there had occurred 8,305 deaths, the ages of twenty-eight of which, dying between the years 1815 to 1852, were not given. Of the 8,277 deaths remaining of those assured, we find the average age to be 57·176.

"This appears high," Mr. Anderson says; "but of course they are all selected adult lives, and the average must of necessity be higher than that of the general population, having the infantile mortality to weigh it down. I observe, and it may be interesting for you, under the circumstances, to notice it, that the per centage of deaths from epidemic, endemic, and contagious diseases, has been gradually decreasing."

The details of the above reports also show that the mean duration of the lives of the assured has, during the sixty-six years above mentioned, notably increased.

These reports show that the limit assigned by the Registrar-General to the actual mean duration of the life of persons of the whole population has, in this particular instance of selected adult lives, been exceeded by seven or eight per 1,000.

The persons assured in this office belong to the upper, and upper middle classes of England and Scotland. The above results testify to the prudence and caution of the officers of the Scottish Widows' Fund Society.

The actual average duration of man's life, though here at least it shows a gradual and slow increase, comes up to only about one half of the estimate of our physiologists, the disturbing agencies of the world acting with fatal certainty on the thread of human life.

It is true that every now and then some individual, male or female of unusual strength of constitution—perhaps hereditary, arrives at the estimated century, and even goes beyond it.

The Yorkshireman, Henry Jenkins, is said, and it is generally believed, to have been 162 or 163 years old, and Old Parr 152; and lists have been drawn up of persons whose ages have extended up to 185 years, and one is stated to have had the more than patriarchal age of 207 years, surpassing even the estimate of Hufeland, but it may fairly be doubted that these last have been sufficiently authenticated.

Now if the constant of human life be 100 years, how does it happen that the actual mean life time does not come up to near the Psalmist's report, and is only, under the most favourable circumstances, equal to a litttle more than the constant—that the half of the thread of life is prematurely cut off, that the golden bowl is broken before it has been half filled at the cistern of life?

The answer is not only that man does not live aright, but also that adverse circumstances, as those of air and water, climate and food, are against him, and he cannot altogether escape accidents and diseases.

Man is careless, self-confident, headstrong, slow and unwilling to learn, and intemperate in all his enjoyments; the consequence is that he renders himself much more easily assailable by the opposing and adverse circumstances by which he is constantly surrounded, and from which even a prudent man cannot entirely escape.

With the present habits and propensities of man in general it will require a long period of time before, even in England, one of the most healthy countries, we arrive at the age when "There shall be no more thence an infant of days, nor an old man that hath not filled his days: for the child shall die an hundred years old." The blessings of Salutland are yet a long way off.

Man is greatly, but not entirely, to blame for his short existence here. He ought to be taught to reflect and see in his own mind and conscience that he does not live his proper span, and that it is very greatly his own fault, and that he cannot too soon amend his ways.

Every man and woman is so occupied and absorbed in his or her own pursuits that both confess to "having no time" to attend to sanitary science—there are men appointed for the purpose and whose time is occupied as health officers and inspectors, let them attend to sanitation! This is a great mistake, every man and woman is bound to acquire sufficient sanitary lore to enable them to decide whether their house is in a healthy state or not.

The sanitary authorities everywhere ought especially to be thoroughly posted up in sanitary matters, and should not allow of the existence within their spheres of any fever dens or overcrowded houses; no unpaved or undrained streets, no improperly drained houses, or houses undrained, no dirty streets or alleys, no foul air or clouds of noxious smoke, no bad food, drink, or medicine, and no bad water should be allowed.

It is, as has been already said, the purpose and object of this Congress to stir us all up, for we are all—governed and governors, to blame for the prevalent shortness of human life, and for the existence of preventible diseases which destroy so many before their allotted span of life has been fulfilled.

To these Congresses of the Sanitary Institute and the other agencies engaged in sanitary work, we look for better health and longer life for our people.

Let us indulge the hope that, when this Congress shall have been dissolved, and shall have left us all the instruction it has had in its power and kindness to impart, a new departure in sanitary science and practice will be taken by our worthy authorities, and that the city of Newcastle-upon-Tyne may in future years be as celebrated for its salubrity and the health and longevity of Novocastrians as the town was in times, now long past, remarkable for standing low in the scale of health.

May the new city act up, under sanitary auspices, to the old town's motto, *Fortiter Defendit Triumphans*, and be as triumphant over disease as in ancient times the old town was in its defence against its northern human foes—foes, happily now, no longer!

Captain Douglas Galton, C.B., said he rose to request the Section to give a hearty vote of thanks to Dr. Embleton for his most interesting address, and he did so confident that all present would feel that full justice had been done to the subject which Dr. Embleton had taken up. No doubt the question as to the length of life was one which all would like to be solved, and would wish it could be solved in the way Dr. Embleton had suggested in the latter part of his address. He was sure that they would feel, with Dr. Embleton, however, that the accidents, which always occurred in life, and the difficulties of our modes of life, would most likely prevent any of them ever attaining that very great old age which had been so temptingly held out as a prospect to them. He thought, in the face of the large amount of work the Section had before it, that it would be undesirable to detain them longer, and he would, therefore, only beg that they would give a very hearty vote of thanks to Dr. Embleton.

Mr. G. J. Symons, F.R.S., seconded the motion, and, speaking as a member of the Institute, said that he thought they had been extremely fortunate in finding in Newcastle a gentleman so eminently adapted for presiding over the section as Dr. Embleton. He could not help adding that he should be extremely glad if it were possible that in some way or another the sanitary truths of which they talked so much, and for the promotion of which they were all so anxious, could be brought more to the knowledge of the younger members of the community. In our early days, we learned a great deal about the

geography of uninhabited islands, and other equally unimportant matters, but the necessities for the proper conduct of our bodies and our houses were not, in his opinion, sufficiently impressed upon juvenile minds. He had great pleasure in seconding the motion.

The motion was then put to the meeting, and carried unanimously.

Dr. EMBLETON, in reply, thanked the section for the vote they had accorded him, and for the hearty manner in which it had been carried.

On "Sketch of the Sanitary History of Newcastle-upon-Tyne," by HENRY E. ARMSTRONG, Medical Officer of Health.

BELIEVING that the hygienic records of the different places in which this learned association holds its annual assemblies are likely to have, temporarily at least, a special interest to the members, I have chosen for my theme the sanitary history of Newcastle, in the hope that such information as I have been able to collect may not prove unacceptable to the distinguished visitors who honour us by their presence here to-day.

Except for dismal accounts of plague and pestilence, the past of Newcastle, as with other cities and towns, prior to very modern times, is in many sanitary respects practically prehistoric; the material at command, even to so recent a period as last decade, being meagre in comparison with that available since the passing of the Public Health Act, 1872; and since that date sanitary activity throughout the country has been so general that much of the progress here is but the parallel of what has occurred elsewhere. Our city nevertheless presents many hygienic features worthy of general note. One of these is the characteristic of age—a quality, from a sanitary point of view, not always regarded as honourable. Several times has she changed her name before finally settling down to that by which she has now for 800 years been known. Pons Ælii, Monkchester, and perhaps also Ad Murum—titles she has successively borne before the Norman conquest, carry her back so far into the remote past as almost to justify the statement of an old local worthy that "Newcastle *always was* an ancient town."

At the door of antiquity, and various degrees of time minor to it, lies most of the impediment to the improvement of the

health of towns. With cities as with men, the surroundings of birth, infancy and youth mould the growing form and impress on it or develope in it properties, principles and peculiarities characteristic in after life. The circumstances giving rise to the origin, or deciding the site of a town; the nature of its successive populations, their social condition, occupations, and environments; the purposes intended to be served by its various buildings; and last but not least the principles and aims of its different builders, are so many factors, all widely varying in degree in different cases, and each powerful for good or evil on its ultimate hygienic development.

Newcastle is to be considered from such standpoints as these if her sanitary condition at the present day is to be properly appreciated and understood.

It has frequently been observed that the founders of the town had sanitary objects, among others, in view in selecting the site. This may be seen in a glance at the map which I have prepared so as to shew in blue tint the ancient water-courses crossing it. No less than five of these Burns—as they are termed in the north of England and in Scotland (though for what reason I cannot say unless on the principle of *lucus a non lucendo*)—with their tributaries, drain the central half of the city and empty themselves into the Tyne within a length of little over a mile. These are, Skinner Burn, Lorke or Lort Burn, Erick Burn, Pandon Burn, and Ouse Burn. With the exception of the last-named all are now covered in and converted into main sewers, terminating below tidal reach. The principal streets were arranged so as to get the sanitary benefit of these streams: thus Pilgrim Street, one of the oldest, stands on the long ridge of land between the Erick and Lorke Burns, each side of the street draining at its back into a different Burn.

The general aspect of the ground on which Newcastle stands is toward the south, and the surface inclines gradually but steeply to the river. The altitude above sea-level (high water mark) toward the north-west, ranges from 12 feet at the Quay to 355 feet at the Union Workhouse—in a distance of about a mile and a half. The rise from the river to Byker Hill, the highest point at the eastern side of the city, is 180 feet in about three quarters of a mile. There are, therefore, excellent facilities for drainage.

The subsoil consists chiefly of clay with, at intervals, irregular beds of sand containing springs of water near the surface, originally pure, from which the inhabitants at one time drew largely—by means of private wells or public fountains. One only of the latter, supplied with spring water, remains, viz.: that at the entrance to the Leazes, near St. Thomas' Street.

Originally founded by the Romans for the stern purposes of war; afterwards adopted under a different name as the abode of peaceful Saxon monks, with whom in their forty religious houses—in the words of the historian Bourne, "the business of religion went briskly on"; again fortified by Norman Conquerors, surrounded by walls, and crowded with dwellings,—our good old town has known many vicissitudes. In the words of Dr. Bruce, our reverend historian (one of the Vice-Presidents of this Congress). "Many times has the besom of destruction swept over Newcastle. Sometimes in the name of improvement, sometimes in the form of calamity, but most frequently from a love of change, that which our fathers have reared has been removed to make way for our own handiwork." These vicissitudes have not been without effect on the health of the inhabitants from time to time. For example, the huddling together of habitations within the walls, especially in certain localities, was doubtless a great cause of the spread of the pestilence so prevalent here in past ages; and to-day the old and narrow streets of the central districts, insalubrious relics of the past, are a source of continual trouble to the Sanitary Authority.

The records, such as they are, of the state of Newcastle from the building of the Town Wall until 1762, when the first part of it was taken down—the happy Union of England and her hereditary foe rendering them no longer necessary—are full of sanitary import. The Wall, said to have been first built by William Rufus, and afterwards gradually extended, was in 1745, 2 miles and 239 yards in circuit, 8 feet thick, and 12 feet high. Its course, indicated by the red margin on the plan, corresponds pretty nearly to the following modern streets:—Beginning near the Guildhall, it extended down the Quayside to the Milk Market, up Causey Bank, thence crossed the foot of Pandon Bank, turned to the north-west, passed between Trafalgar Street and the Prison, up Croft Street to the Public Library; thence by New Bridge, Blackett and High Friar Streets, round St. Andrew's Church, between Stowell Street and the Fever Hospital, (where the Wall with one of its Towers is still in good condition); it then crossed Westgate Road, passed down Pink Lane, across Neville Street and the Central Station to the Postern, behind and parallel to Orchard Street, across Hanover Street and the Close, to the River.

Of the seven gates of the Wall, one only still stands; and except the portion between the Railway Station and St. Andrew's Church—most of which is in good preservation—very little else of it remains.

The wall enclosed an area of 164 acres. (The area of the city of to-day is 5,371 acres). From the records of the Collection of

the Poll Tax in 1377, it appears that Newcastle had then a population of 3,970—being twelfth in the list of principal towns, several now smaller, such as Lincoln, Salisbury, Lynn, Colchester, Beverley, being then larger. This population is at the rate of about 24 persons per acre.

The prosperity of the town in the past has fluctuated considerably. In the year 1400 Newcastle was made a town and county of itself. According to the historian Brand, "Edward 1st appears to have had his mints and to have coined money at Newcastle." A Mint was established here by Henry II. The coal trade of the district was opened out in the reign of Henry III.; and under the first three Edwards, as Dr. Bruce informs us, Newcastle became the principal rendezvous for the vast armaments mustered for expeditions against Scotland;—we have it on the authority of Brand, that Edward VI. "on the dissolution of the Bishoprick of Durham, * * * * proposed to have erected a Bishoprick at Newcastle out of part of the revenues of the dissolved See, but these purposes were defeated by the death of the King." In the latter end of the reign of Queen Elizabeth the duty on coals brought £10,000 a year to the Corporation; in 1622 there were vended by the Society of Hostmen of Newcastle 14,420 tons of coal; and in 1703 the Trinity House of Newcastle informed the House of Commons, "that six hundred ships, one with another, each of eighty Newcastle chaldrons, with four thousand five hundred men were requisite for the "carrying on" of the coal trade. These facts indicate a wealthy condition. But the sun of prosperity did not always shine. At other times the substance of Newcastle was wasted by misfortunes. In the year of the Great Plague we read that "the Corporate funds were reduced to so low an ebb that recourse was had to neighbouring gentry for aid—and loans or gifts thankfully received of sums often so small as ten or five pounds are recorded. The wars with Scotland harrassed the town, and famine pressed her so sore that parents were driven to eat their own offspring.

Whilst the population was having its vital powers severely tested by the social changes to which it was exposed, the condition of the town itself in these, the dark ages of sanitation, must indeed have been deplorable. The evidence on this point, though not much, is strong. There was an almost general absence of domestic "conveniences." Public places were defiled with filth and refuse of every description. By the records of various incorporated companies it appears that trades, offensive and other, were carried on in the open street:—butchers, tripe preparers, &c., habitually threw their refuse into the channel. In 1640 eighteen cartloads of dung had been allowed to accu-

mulate against the walls of the Trinity House Chapel! It is recorded by Bourne in his history of the town, that in the reign of James I., the dunghill within the bounds of the Castle, "had increased to such a size and bigness that it was in length 98 yards, the depth of it was 10 yards, and the breadth of it 32 yards." The weight of this immense mass of refuse (probably about 27,000 tons, or two-thirds of the present annual output of the ash-pits of the city!) had thrown down part of the Castle Wall. The plan attached to the work just quoted shews a "Miding" on the "Key-Side," and there were others in different parts of the town. It is needless to say that in those good old times the indignant ratepayer did not vent his grievances in the newspapers on the subject of his privy neglected by the Scavenger or the noisy Corporation cart,—because, as the song says, "they weren't invented yet."

It is on record, however, that spasmodic attempts were occasionally made for "getting away the muck," as scavenging was then pithily termed. In those days the streets were narrow, but to the credit of the town be it spoken—well paved, and Sir William Brereton in 1639 writes that "in every street he had seen there were the daintiest flagged channels." The houses of former times were commonly built of wood. None of these remain to the present day. *Periunt etiam ruinæ.* A few made of more durable material, and therefore presumably originally intended for habitation by the better classes, remain. Such are the Castle Garth, Pandon, Blythe Neuk, one side of Sandgate—celebrated in local song—now, apart from the matter of mere decay, types of all that is insanitary. The ground was densely packed with such dwellings. The local word "Chare"—so frequent in the old parts of the town—of Saxon derivation, and meaning a narrow winding street, is a proof of this. In the time of Brand (a hundred years ago) there were no less than twenty of these "Chares" from the Butcher Bank, Pandon, &c., leading to the "Key-Side," and several still remain. From opposite windows of the chare you could shake hands—if you wanted. One was appropriately named the "Dark Chare,"—another, still remaining, is the "Pudding Chare." The word "Entry" (probably also local) is very common in old Newcastle, and applies to passages and courts and blind alleys still narrower than chares, and often branching off from them.

Some idea of the magnitude of this sanitary evil may be formed from the Government Report of the Inquiry into the Cholera Outbreak of 1853, where it is stated (p. viii.) that the aggregate length of the narrow lanes and entries of Sandgate "exceeds a mile, while their average breadth at the bottom but

rarely exceeds four feet; the upper storeys of the houses, many of which are lofty, often projecting over the lower ones so as to leave at the top nothing but a mere chink or rift for light and air to make their way through."

Water Supply.—The water of the various "burns," by which as we have seen the town is intersected, would not long continue fit for drinking purposes when the population began to increase on their banks. Wells and springs were doubtless the principal sources of supply for centuries. The earliest project for bringing water to the town appears to have been in 1349, but whether the scheme was large or small, and whether ever carried out, is uncertain. There had been, time out of mind, a conduit of water in the Warden's Close (corresponding to the present site of the Fever Hospital and land between it and Oystershell Lane), respecting which Brand quaintly records the simple method adopted 200 years ago to determine the quality—"Certain referees were appointed to take some washers with them to view the water and report." The monasteries frequently had cisterns—one at least of which helped to supply the town. One interesting feature of Old Newcastle at a later date was the "pants," *i.e.*, public drinking fountains and horsetroughs combined. The word "pant" is I believe local, and is probably of Anglo-Saxon origin. In 1693, water for the supply of beerhouses, victualling houses, &c., was pumped from the river near Sandgate. This scheme which, as may be supposed, did not answer, was known as "The Folly." Water was then brought to the pants from a cistern erected at the Castle Leazes Pond. The first project of any magnitude for providing the inhabitants with water was that of Yarnold in 1700, who erected works at the springs near the village of Coxlodge. This supply, sufficient in Winter was defective in Summer, and was afterwards for some time supplemented by water drawn from the river by the "Folly" works before mentioned, and by other water brought on horses and in carts, and from various springs in the neighbourhood.

We have now traced the water supply of Newcastle up to the time of the first removal of part of the town wall, and will there leave it for the present. Meanwhile let us turn to the subject of the prevalent diseases by which the population of Newcastle was afflicted in its mural period.

In the absence of any regular system of registration of sickness or mortality it may be assumed that, of the epidemic outbreaks among the inhabitants, the severe ones only have been put on record; it may also be taken for granted that of the accounts of these, some are doubtless erroneous from over—and others from under—estimation of magnitude. All such out-

breaks are confounded under the common terms "Plague" and "Pestilence." Two great epidemics are known to have occurred in Newcastle during the 13th century, of which one lasted three years; in the 14th century there were three, one occurring about the time of the "Black Death," and continuing two years: two epidemics are recorded as having occurred in the 15th century, and six in the 16th; in one of these (A.D. 1579) 2,000 persons were carried off between May and Michaelmas, and ships were warned by the authorities against coming to the port as usual for coal. Ten years later the mortality attained similar proportions, and still nearer the close of the century the town suffered from a visitation of plague of three years duration. In the 17th century there were no less than eleven epidemics, including the Great Plague of Newcastle in 1636, in which about 7,000 persons are said to have died in a population of probably less than 20,000.

The town at this time is described by a writer of the period as having become almost desolate, the streets grown green with grass, her treasury wasted, and her trade departed.

Preventive Measures.—If, in these days of Sanitary legislation, Sanitary Science and Sanitary Congresses, we should be inclined to pride ourselves, as we are apt to do, on our advancement and superiority over our predecessors as regards the prevention of the spread of infection, let us first inquire what preventive measures our predecessors really did adopt.

It may be a salutary lesson to learn that in all or most of our boasted methods of stamping out disease—the Novocastrians centuries ago have been beforehand with us. We read that the sick poor were sent out of the town and encamped on the waste ground without the walls; that others who did not leave their houses had their doors sparred up, and their food provided at the cost of the town, hoisted up to them by the Corporate Officers; that huts for the sick were provided at Arthur's Hill, and in the Warden's Close; that in some cases chapels and other buildings were utilised for this purpose; that sick nurses were engaged; that there were officers termed "Clensors," and others appointed to fumigate infected places, &c., with pitch, resin, frankincense, and vinegar; that officers were appointed having the duty of killing with a flail all stray poultry, dogs, and swine in the view that they aided in conveying contagion; that suspected ships were visited; that sweet scented herbs were strewn about; that the expense of burials was borne by the town; that in time of sickness new comers into the town were warned by the bellman "to avoide;" that the Barber-Chirurgeons held meetings on the outbreak of disease, and were in fact a Board of Health; and that in the latter half of the 17th century there was a

public officer named the "Town's Physician," the prototype of the modern Medical Officer of Health. It was well said, "There is nothing new under the Sun!"

Nineteen years after the first part of the walls were taken down, that is to say in 1781, there were, according to Mackenzie the historian, 2,389 houses in Newcastle, inhabited by a population estimated at about 30,000, or an average rate of above twelve persons to a house, and about 183 to an acre—numbers decidedly high compared with those of the present day (probably about 7·5 persons to a house, and 27·5 to an acre of the entire city, including the Moor and Leases, or 36 persons to an acre excluding these large open spaces).

The Plan of the Town at the time shews that about one-third of the ground within the walls was unbuilt on. Much of this ground, now covered with dwellings—many of them of no very high character for sanitary qualities—then consisted of meadows, gardens and pleasant places, one of which, Pandon Dean, was so delightful as to give rise to the following verses, published in the *Newcastle Weekly Magazine* in 1777:—

PANDON DEAN.

When cooling zephyrs wanton play,
Then oft in Pandon Dean I stray;
When sore depressed with grief and woe,
Then from a busy world I go;
My mind is calm and soul serene
Beneath the bank in Pandon Dean.
The feathered race around me sing,
They make the hills and valleys ring;
My sorrow flies, my grief is gone,
I warble with the tuneful throng;
All, all things wear a pleasing mien
Beneath the bank in Pandon Dean.

* * * * *

Above me stand the towering trees,
And here I feel the gentle breeze;
The water flows by chance around,
And green enamels all the ground,
Which gives new splendour to the scene,
And adds a grace to Pandon Dean.

* * * * *

The young lady who penned those lines little thought that in the course of a century this lovely spot would be the subject of my official representation under the Artizans and Labourers Dwellings Act, at the Local Government Inquiry into which

the following unpoetical evidence was given. The *New Pandon Group* (built on the sides and bottom of what was formerly Pandon Dean) "consists of 239 tenement dwellings, occupied at the time of inspection (Nov., 1875) by 958 persons; of these dwellings no less than 179 consist of one room, 57 of two rooms, and three only of three rooms each * * * Including the streetway the group covers 1·66 acres, and is populated at the rate of 646 persons per acre * * * The Group is much enclosed on every side * * * *."

Then follows a detailed description of such a mass of defects in the New Pandon Group as plainly to account for its death-rate of 47·7 per 1,000, and to justify the conclusion that from sanitary and building imperfections, from sickness and mortality, situation and surroundings, it was the very worst of the tenemented property of Newcastle.

The hollow in which the New Pandon Group stood a few years ago is now filled up.

The year in which the foregoing verses saw the light (1777) witnessed also the foundation of the Newcastle Dispensary, the second institution of the kind in the provinces. In the annual reports of this institution appeared the first systematic returns of the sickness of the Borough. These returns shew the extent to which diseases prevailed among the working classes. In a review of the statistics of the Dispensary during one hundred years, published in 1877 by the then Medical Officer, Dr. Monteith, it appears that in the first twenty-five years of the institution, "fever" was greatly on the increase, 786 cases having been admitted during the first quinquenniad of the period, and in the last 1,143. During the first four years of the present century the "fever" cases in the Dispensary averaged 370 per annum, the population of the town being a little over 28,000. The wretched sanitary condition of the habitations of the poor at that time may be gathered from the following quotations from a pamphlet published in 1804 by "A Member of the College of Surgeons." The writer says: "It is impossible to give a proper representation of the wretched state of many of the habitations of the indigent, situated in the confined lanes from the Quay-side, Castle Garth, and Sandgate, which are kept in a most filthy state, and, to a stranger, would appear inimical to the existence of human beings; where each small unventilated apartment of the house contains a family, with lodgers, in number from five to seven, and seldom more than two beds for the whole.

"The want of convenient offices in the neighbourhood is attended with many very unpleasant circumstances, as it induces the lazy inmates to make use of the chamber utensils, which are suffered to remain in the most offensive state for several days,

and are then emptied out of the windows; the consequence of which may be readily conceived."

The pamphlet goes on to say:—

"The writer, a short time ago, had occasion to visit a soldier ill of the fever: his lodgings were in the garret of a miserable house situated in the very filthiest part of the Castle Garth. It was divided into six small apartments, and occupied by different families, to the number of twenty-six persons in all. The garret contained three very wretched beds, with two persons sleeping in each. It measured about twelve feet in length and seven in breadth, and its greatest height would not admit of a person to stand erect; it received light from a small window, the sash of which was fixed; two of the number lay ill of the fever, and the rest appeared afraid of admission of pure air, having carefully closed up the broken panes of glass with plugs of old linen. The garret on the opposite side was occupied by a woman and her five children." At this time the prevalence of fever in Newcastle extended to the better classes, and gave rise to most alarming reports, as the following passage from the same pamphlet shows:—

"'*The bad fever*' was talked of in all the coffee-houses in London; post letters underwent fumigation; intercourse with the town was considered dangerous; many travellers left Newcastle out in their journey; and others, in confidence of some charm, ventured to gallop through the town, highly perfumed with camphor, musk, and frankincense. The rumours even reached the Baltic, and ships from the port of Newcastle were obliged to perform quarantine."

This spread of febrile contagious diseases in the homes of the poor led to the foundation of the "Institution for the Prevention and Cure of Contagious Fever," which was opened in the year 1804.

During the second quarter of a century of Dispensary life the admissions from fever were comparatively few (2,812); but in the third there was a very large increase (7,141), extending, more or less, over the whole period, but most marked during the eleven years ended 1848, when the yearly average was 401 cases.

A seven years lull was followed by a term of six years (ending 1862) yielding each an average of 232 cases of fever. From that date until the centenary of the institution fever has decreased in prevalence, so that during the past ten years the average yearly admissions were a little over 106, as compared with 370 at the beginning of the century, when the population of Newcastle was only one-fifth what it is now.

The pamphlet already quoted shews that of all diseases liable

to fluctuation, "fever" has been the most prevalent. The statistics of these diseases are summarised in order as follows:—

NEWCASTLE DISPENSARY.—Admissions and deaths during one hundred years, ended A.D. 1877:—

	Admissions.	Deaths.
"Fever"	18,084	833
Diarrhœa	13,033	469
"Consumption"	10,616	3,492
Scarlet fever	6,665	725
Measles	4,730	244
Whooping cough	2,924	398
Small-pox	2,616	428
Cholera	928	155

It should be observed that the mortality of "fever" to admissions is misleading, since a large proportion of the cases were afterwards removed to hospital. The admissions under the head of "consumption" are in reality an overstatement, each "admission" representing a fresh Dispensary letter presented by the patient, who requires several of these in the course of a lingering disease.

Fever in the course of a century has been, according to the foregoing statistics, twenty times as prevalent as Cholera. The former has never been entirely absent, the latter has appeared only as a very rare visitant. And yet there are persons of intelligence and endowed with education, who fail to grasp the importance of, and need of provision against, the former, whilst the mere mention of the latter is enough to fill them with dread. Time after time during the past hundred years has our poorer population been ravaged by epidemic after epidemic of typhus, but the general public is content to have things as they are; and there are some among us who seek to maintain that Newcastle with its 150,000 inhabitants has sufficient accommodation for infectious diseases in the venerable old Fever Hospital, erected when the population was about one-fifth of what it is at present, and that all epidemics may be met by other "resources of science!"

About forty years ago began what may be termed the dawn of sanitation in Great Britain. The country then awoke to the necessity of permanent measures of public hygiene in lieu of the spasmodic efforts formerly made only during the immediate influence of panic.

Sanitary Associations began to spring up, and Royal Commissions were instituted to look after the health of towns, one of which towns was Newcastle. An able report by Dr. D. B. Reid, one of Her Majesty's Commissioners (and including other reports by the Chairmen of Local Committees expressly formed to assist Dr. Reid's inquiry, among whom were Mr. Thos. Sopwith and Mr. Thomas Dunn, formerly Mayor, Chairman of the Cleansing and Nuisance Committee of the Corporation), was published in 1845. This report gives an exhaustive account of the hygiene of Newcastle and other places at the time. We gather from it that there were then thirty-three streets in the town, many of them very old, without drains or sewers; that there were no regulations for street formation; that the new streets were planned in such a desultory manner as to prevent proper drains being made; that builders were under no restrictions as to drains; that the open sewers and ditches were very offensive; that the parts of the town beyond the limits of the ancient parliamentary borough were in an extremely neglected state; that many new streets were unpaved and dangerous; that such private drains as existed in houses of the middle and higher classes were generally defective and offensive; that the dwellings of the poor were very deficient in all conveniences and necessaries; that there were no regulations for cleansing courts and alleys; that there were large public refuse depôts in objectionable places; that there were many nuisances against which the inhabitants had no remedy except by indictment; that the authorities had no control over the refuse of ashpits, &c., unless complained of as a nuisance; that among the poorer classes, offensive refuse was deposited in lanes and vacant corners; that many old dwellings situated in narrow ill-ventilated courts, occupied by the poorer classes, and built against the sides of steep hills, were constantly damp and unhealthy, seldom with water introduced, and overcrowded.

The same report gives a list of the streets then considered most injurious to health, many of which are to-day in fair sanitary condition, though many others, it must be admitted, are now in even a worse state than then. This very interesting report, which contains also a special one on the water supply, terminates with an account of the open spaces of the town, coupled with the earnest recommendation "that additional pieces of land be obtained and set apart for the public use for ever, both at the eastern and western extremities of the town." How this excellent advice has, after the lapse of some thirty years, been acted on to the full, will be afterwards shown.

A few years after the issue of this report, the town was visited by the severest epidemic of Asiatic cholera on record.

It is not improbable that some of the early visitations of "pestilence" may have been Asiatic cholera. The only outbreaks of that disease, described as such, in Newcastle are three in number. The first occurred in 1831-2, causing 1,039 cases and 322 deaths; the second, in 1848-9, is described as having been "light and mild;" the third, in 1853, caused 1,533 deaths in about nine weeks. The last, and by far the greatest, was, it cannot be denied, to a considerable extent due to the insanitary condition of things as above described. There was, however, another important factor, to which we will now turn, clearly and intimately associated with the course of this epidemic.

We have traced the water supply till toward the close of last century. As it continued unsatisfactory, the Common Council in 1770 granted a long lease of a piece of ground on the Town Moor for a reservoir for water from Coxlodge. This was soon afterwards augmented by a supply brought into the town by aqueduct from Spring Gardens, and we learn from a pamphlet published by the late secretary of the present water company, that in 1805 additional water was obtained by the then water company by sinking a shaft in a field near the north end of the Moor; and from these different sources the town was served for about twenty-five years on the intermittent system, the water being laid on three days a week. In 1831 (the cholera year) the supply ran out. In the extremity water was pumped from the river and distributed in carts.

In the following year an opposition water company obtained an Act to supply the town; and in the competition which ensued the old company finally succumbed. The surviving company drew water from the Tyne at Elswick, filtered it, and pumped it up to a reservoir at Arthur's Hill, whence it was delivered to the inhabitants by gravitation. This river water gave rise to great disatisfaction, and led to the projection of a newer company, who went so far as to get an Act of Parliament in 1840, but did nothing more. The former water company, to meet increasing demands, sought for legal power to pump from the river at a higher point (Newburn), but were unsuccessful.

From the Report of the Health of Towns Commission in 1845, by Dr. Reid—already quoted—it appears that at this time the water was principally drawn from the river. Other sources of supply were a spring at Carr's Hill (Gateshead); the spring at Coxlodge, aided by day water from an old pit-working; drainage and surface-water of the Town Moor; wells in private houses; rain-water from roofs, &c. The Corporation had erected standpipes or fountains, always open to the public, in different parts of the town, viz., one each in Gallowgate, Percy

Street, Darn Crook (now, the more's the pity, modernized into St. Andrew's Street), High Friar Street, Newgate Street, Bigg Market, High Bridge, Head of the Side,* Westgate Street (known as the Vicar's pump), foot of Pilgrim Street, Manor Street, Sandgate (West and East), St. Ann's Row, East Ballast Hills, St. Lawrence, the New Green Market, and the Leazes, and one was in course of erection in the Close at the date of the report. The Company's water was supplied to the tenants on three days of the week. The poor paid one farthing for a tub or large pailful—four or five times the charge to tenants.

Soon after the issue of the Health of Towns Report, the "Whittle Dean Water Company" came into existence, with the laudable object of providing a constant service from water collected and stored a dozen miles or more from the town. Their works were completed in 1848, and included reservoirs capable of holding 215,000,000 gallons, or what was considered a ten months' supply. By 1850 the number of consumers had increased beyond previous calculations, and the reservoirs were found to be able to hold enough water for six months only, instead of ten. To make matters worse, that year was one of drought, and the supply ran short. The company then began to pump from the Tyne, amid loud complaints from the inhabitants. After this they increased the capacity of the reservoirs by one-half the former amount, extended their gathering grounds, and took means to draw, if found necessary, from the small river Pont, in the neighbourhood of the reservoirs. But they also extended their range of supply down the river. This last named extension began in May, 1853. Within six weeks afterwards there was a water famine: the Tyne was resorted to: Cholera followed.

Whatever may be urged in defence of the water supply in relation to this outbreak (as, *e.g.*, that river-water had on former occasions been consumed by the inhabitants without ill effect), it cannot but be admitted that there was a remarkable coincidence, as appears by the evidence given, between the turning off of the Tyne portion of it and the decline of the epidemic. After the experience of 1853 the company went further afield for water, and since then have again increased their gathering grounds and means of storage. They still retain the power of drawing from the river, and have two pumping stations (one at Wylam and the other at Newburn), but state that in the event of having ever again to recur to that source, they will do so for

* Apropos of this quaint old local name, a friend once remarkd to me that people often talked of the side of the head, but never until he came to Newcastle, had he heard any one speak of the "Head of the Side."

manufacturing purposes only, with which object they laid a special line of pipes about four years ago.

Our present water supply is good in quality; it is filtered before delivery, and is always at full pressure. The reservoirs are capable of holding 1,827 million gallons, and on the 6th of the present month (Sept. 1882) contained 1,120 million gallons, or about one hundred days' supply.

By the Newcastle Improvement Act 1865 the Corporation obtained various important sanitary powers, which since that time have not been allowed to lie dormant.

Two years after the passing of the Act, several important sanitary reports were presented to the Town Council. From one of these—the work of a committee under the presidency of Ald. Wilson, the chairman of the present Sanitary Committee—it is evident that energetic action was then taken to put in force the different provisions obtained for the protection of the public health. Thus—under the powers enabling the Corporation to raise in advance the moneys required for paving, sewerage, &c.—a large number of previously defective streets were put in good order; the sanitary staff was permanently increased, active steps were taken to prevent overcrowding; upwards of 500 unhealthy dwellings were closed in less than two years, and to meet the difficulty of the persons removed from their homes, rooms were provided elsewhere by the Committee; about a tenth of the most unhealthy of the dwellings before mentioned were purchased and pulled down; a temporary hospital, in anticipation of cholera was erected on the Town Moor, and a disused Chapel in Forster Street, fitted up with beds for the same purpose was soon afterwards successfully employed for the reception of cases of scarlet fever. A large special staff was also organized and engaged for a considerable period under the extensive provisions of the Sanitary Act of 1866, the town being divided into districts for the purpose. The ashpits, previously cleansed at the expense of the owners, were now cleansed out of the rates; vigorous measures were taken to purify tenement and other property, &c., &c.

The report shews that at that time upwards of 23,000 rooms, representing the dwellings of 55,060 persons, or half the population, were inspected—of which one-eighth were found to be without the means of good ventilation; the same proportion were without water, one-fifth were without privy accommodation; two-thirds only of the houses had good drainage, and one-eighth had none at all; nearly 8,000 persons lived in rooms yielding less than 300 cubic feet per person. The Committee, among other conclusions, expressed their conviction that for the cure of many of the sanitary evils of habitations of the lower classes,

one remedy only would be effectual, namely, the provision of other accommodation, the opening out of thoroughfares and the demolition of habitations incapable of being put into proper sanitary condition. This opinion was given eight years before the passing of the Artizans and Labourers' Dwellings Act of 1875—of which it is the foreshadow.

At the time of the report referred to the annual death-rate of Newcastle was 32-3 per 1,000. It has since fallen gradually to 21·7 last year.

Five years after this saw the birth of the Public Health Act of 1872, and in the following year Newcastle, in common with other Urban and Rural Districts throughout the country, had a Medical Officer of Health. Of the doings of this functionary it becomes not me to speak. The proceedings, since his appointment, for the improvement of the dwellings of the poor, the prevention of disease and the sanitary benefit of the inhabitants in general—are they not written in his nine Annual Reports?

Among matters of importance in relation to the hygienic condition of Newcastle of to-day, not the least is the amount of recreation ground open to the public. Including the Town Moor and Leazes (lands in grass, but not laid out ornamentally) and the Armstrong, Brandling, Elswick, and Leazes ornamental Parks—the exercise ground to which the inhabitants have right of free access comprises a total area of 1,268 acres, being almost one-fourth of the entire city, and at the rate of one acre to every 114 persons, an amount probably unequalled in any other large city or town. (These spaces are shewn coloured green on the plan accompanying my later Annual Reports.)

An official representation under the Artizans and Labourers' Dwellings Improvement Act, 1875, was made to the Corporation as the Local Authority in 1876. The areas specified in the representation were those of the New and Old Pandon Groups—the former of which has already been referred to. In support of this representation, the Sanitary Committee recommended the purchase of the property of the New Pandon Group, at a cost of £26,000, for demolition of the houses thereon and the erection of new dwellings elsewhere. The buildings were ultimately acquired and demolished under the provisions of a local Act, and as already stated the hollow in which they stood is now filled up. A large proportion of the property in the Old Pandon Group has also been dealt with under the same power.

Since the passing of the Newcastle-upon-Tyne Improvement Act, 1865, the cost of the different sanitary works executed by

the borough engineer has amounted to upwards of half a million sterling, and included the following:—*

Sewering†	£74,583
Flagging and paving	172,370
Street watering	14,349
Scavenging	102,839
Ashpit cleansing	104,460
Other sanitary works	52,895
Total	£521,496

The powers with respect to the notification of infectious disease and other sanitary matters—acquired by the Corporation under the Improvement Act of the present year—are fresh in the memory of this association.

The necessity for the provision of a new sanitary hospital to meet the requirements of this populous city, in place of our ancient fever house, has for years been strongly represented by the Sanitary Committee, and, in the abstract, is pretty generally admitted by all. But the mere indication of a *site* for such a purpose—and many sites have, one after the other, been proposed—has invariably met with very great opposition.

The foregoing very imperfect sketch, though in many respects an exhibition of the dark side of the picture, as is, alas! too often unavoidable in treating of the sanitation of the past, shows the magnitude and difficulty of the task bequeathed to the sanitary authority, and the willingness with which they have addressed themselves to it. The reduction of the yearly death-rate per 1,000 of the population by ten in as many years, and the diminution of typhus in the same time to one-fifth its prevalence in the corresponding period immediately before, are tangible results of their more than herculean labours.

Mr. T. P. Barkas moved a vote of thanks to Mr. H. E. Armstrong, and said he did so with very great pleasure, because the paper had brought before them a great number of interesting facts in relation to Newcastle. Mr. Armstrong had referred to a pernicious midden in Sandgate about 100 years ago, but he might have told them that up to a few years ago there were a great number of similar middens.

* From information kindly supplied by the City Engineer, Mr. W. George Laws.

† The construction of mains (other than in new streets) and maintenance of public sewers.

Owing to the activity of the sanitary engineer the contents of these middens were removed from each house daily, and this, he contended, was a step in the right direction. He agreed with the reader of the paper as to the very excellent supply of water the inhabitants of Newcastle had at the present time. The quantity was good, and the quality, he had heard from the medical officer, was good also. There was one matter to which the reader of the paper had not called attention, and that was with regard to the wells they had in Newcastle some twenty or thirty years since. There were very few houses at that time which had not got wells. He had had a well in his own house, but it was now filled up. The sewage of the town now reached the water of the wells which thus became undrinkable, and he was glad to say that they were now supplied with very good water by the Water Company. Mr. Armstrong alluded to a very extensive report in 1868, when the mortality went up to 33 or 34 per thousand,—a very serious and a steady mortality—and he had said that at that time very great interest was taken in the sanitary condition of the town. That report was certainly one of the most exhaustive reports—he would not say ever written, but ever submitted to the inhabitants of the town of Newcastle-on-Tyne. Mr. Armstrong had also referred to a very important question,—namely, the establishment of a hospital for the treatment of patients suffering from infectious diseases. There had been, he might say, a very considerable diversity of opinion in the Town Council upon that subject. Some members were not very desirous of having a hospital. Mr. Armstrong and the Chairman of the Sanitary Committee were, however, with others, very anxious to spend a considerable sum of money in erecting a new hospital. However, the whole matter would come up for re-consideration, and he trusted that whatever was to be done—whether the hospital were to remain at Bath Lane, or go elsewhere—the better course would be adopted by the Corporation. He said he had great pleasure in moving that the thanks of the meeting should be given to Mr. Armstrong for his paper, and he trusted that it would be the means of inaugurating a general movement in the direction of sanitary reform in Newcastle-on-Tyne.

Mr. W. S. Daglish (Town Clerk of Jarrow), seconded the motion, remarking upon the compulsory notification of infectious diseases, he said, he thought that if this were necessary in one part of the country it was necessary in another. If it were necessary in any particular part of England, he could not see why it was to be neglected in Newcastle. He said he could not see, with reference to the Artizans' Dwellings Act, that the Corporation of Newcastle had taken any steps at all in the matter, and he thought that when so much had been done in the town, this matter should not have been neglected. The Corporation, in his opinion, ought to have erected artizans' dwellings when they pulled down so many houses in Pandon. They were very glad to hear that the death-rate was low, for this was a very satisfactory matter. He had great pleasure in seconding the motion.

Captain Douglas Galton, R.E., C.B., F.R.S., said, he certainly thought that members of the Sanitary Congress who were strangers in the town of Newcastle, and who wished to see very good models for reports of towns, should certainly look at Mr. H. E. Armstrong's reports, as they were most exhaustive and interesting in every particular. He did not know whether the compulsory isolation of diseases would be brought before the Congress that day, although it was not actually in the proceedings of that Section. It was one of the burning questions of the day, and it would be very interesting, he thought, if members would, upon this paper of Mr. H. E. Armstrong's, address themselves somewhat to that question. There was no doubt that in the bad dwellings in which the poorer classes lived, it was of the utmost importance in cases of infectious disease, that those who were suffering should be removed from these close dwellings; but they could not, of course, make a law which was to be observed only by one class, and, therefore, amongst those persons who had more accomodation in their houses, and who would willingly devote themselves to the duty of nursing the sick members of their family, very great opposition would arise if people were to be compulsorily moved from their homes when suffering from infectious disease. At the same time, he thought it was one of those questions which must come before Parliament sooner or later, and it would be as well to get the opinions of various members of the Sanitary Institute upon it.

Professor F. de Chaumont, M.D., F.R.S., remarked that he should like to say a few words upon the paper they had heard read. The return of admissions and deaths in the Newcastle Dispensary which Mr. H. E. Armstrong had put before the Section should receive the attention of all persons who were interested in Sanitary Science. The numbers, perhaps, did not seem to be very large, but if they bore in mind the varying population and the large numbers reached at the present time, the number was very considerable. But what was more important to discuss, was the proportion between the number of deaths and the number of patients admitted. He had just taken out the proportions with regard to the mortality, and in the course of a few remarks, he referred to the enormous amount of deaths from consumption, which he said was a disease unfortunately too prevalent in this country. The death rate was enormous; for the proportion of deaths to admissions was 1 in 3, and he was afraid that many of those who were discharged died afterwards of the disease. The figures which were represented on the map before them showed that 1 in 22 died of fever; of diarrhœa, 1 in 28; consumption, 1 in 3; scarlet fever, 1 in 9; measles, 1 in 20; hooping-cough, 1 in $7\frac{1}{2}$, or 2 in 15; small-pox, 1 in 6; and cholera, 1 in 6. These figures bore out what he had remarked about consumption, and he remarked that people were too apt to come to the conclusion that consumption could not be avoided, and must be endured. He did not think that medical men should look at the matter from that point of view, but that they should try to do all they could to prevent the disease. He was

of opinion that a plentiful supply of pure air and good food would certainly diminish this terrible disease. It was quite true that when consumption had been established in a family, a certain tendency to the disease probably always existed in the members of the family, and if circumstances arose, which were favourable to the development of the disease, no doubt it would soon show itself. The same, however, must be said with regard to other diseases, and when the doctor knew that the disease existed in the mother, it was his duty to try and prevent its existence in the child. They had a striking proof, last year, of what the President had said in his address, that certain sanitary measures diminished, if it did not abolish, this disease.

Touching upon the question of Artizans' Dwellings, he said it was extremely hard that a labouring man should have his house pulled down, and his goods turned out, and then no other place provided for him. If bad houses were simply pulled down, the inhabitants turned out, and no other habitations provided, those who did this simply left the people to go to neighbouring districts to increase the population there, and to increase also misery there, in precisely the same manner as they had done in the place they had just left. With regard to compulsory vaccination, he said the amount of mortality, from small-pox, had lately become very great, and the death-rate high. He had no doubt, he said, that the disease would disappear altogether from our midst if vaccination became thoroughly general. There were very strong proofs, of the efficacy of vaccination, to be produced. In the first place he would point out that in the German Army, where vaccination and re-vaccination were compulsory, no cases of small-pox occurred, and the disease was absolutely unknown. On the other hand, the French Army during 1870–1, where re-vaccination was impossible at the time, and when many, probably, had not even been vaccinated in childhood, small-pox had been most disastrous. Coming to our own Army, where every man was vaccinated, small-pox never occurred, or cases were very exceptional indeed. He thought that these facts were sufficiently pregnant for his purpose, which was to show that, by the use of proper vaccination, all over the country, the disease might be completely stamped out. As to the notification of disease, he said that one difficult question, and one which was always started, was who was to give the notification? Some urged that both the householder and the medical man should give the notice (as is the case in Holland), while on the other hand it was argued that it was hardly necessary for the medical man to do it, and that all that was necessary was for him to communicate with the householder, and warn him, as to his duty, to give the notice. He concluded by heartily supporting the motion for the vote of thanks.

Mr. E. C. Robins, F.S.A., said the great advantage of the law for the notification of infectious diseases would be the great degree of isolation which would be obtained as a necessary consequence of the announcement. He referred to a statement which he had heard made that people were allowed to visit their friends, who were

patients with infectious diseases, in public hospitals, and he urged that this should not be allowed, and that great care should be taken in this matter.

Dr. SERGEANT expressed his satisfaction at being able to see the results of one hundred years' work of the Infirmary. In his town (Bolton) it was stated that the mortality they had had in every disease had been excessively great. He thought that the real truth was that they only had the worst cases reported, and he believed that a very large proportion of the fever cases which occurred in his town were privately treated at their own homes. In his opinion, direct notification from the medical attendant was the only efficient system. He thought that if the information were voluntary it would not be satisfactory, for many cases of infectious disease endangering the public safety would never be notified, and, moreover, the medical attendant might be placed in a more awkward position than if the responsibility rested on the householder as well. If the certificate of the medical man had to be sent to the sanitary authority through the householder, delay might be caused, and the certificate would run more chance of being destroyed or lost. The public did not object to the notification of infectious disease so much as the medical profession. To his knowledge medical assistance had in no case been delayed from fear of notification. He concluded by expressing his pleasure at the paper which they had just heard, and which was extremely valuable and instructive.

Mr. DAGLISH remarked that compulsory notification was found to work well in Jarrow, and there had been no complaint.

It was suggested, in a further short discussion, that the report to which reference had been made should be supplied to the Members of the Congress.

The motion for the vote of thanks was then put and carried.

Mr. H. E. ARMSTRONG, M.R.C.S., in replying, expressed his obligations for the kind remarks which had been made with reference to his paper. It was not very exhaustive, and, had time allowed, he could have given much more information in it. As to the establishment of a permanent fever hospital, the authorities had done their best to find a site; but the difficulties they had met with seemed almost insurmountable; they had recently been obliged to begin to build a temporary hospital. With regard to other points which had been raised during the discussion, he said he thought that as a general rule public law must depend upon private experience. Notification of infectious diseases would be of little value if the medical man was not bound to notify. He thanked them for the vote they had passed.

"*The Sanitary Aspect of Dress*," by ALFRED CARPENTER, M.D., S.Sc., Vice-Chairman of the Council.

THE field which rightly belongs to the Sanitary Institute embraces everything which has reference to the house we live in as well as its surroundings. This field should be surveyed in its social as well as its sanitary aspect, and includes a consideration of our clothing, as well as of the bricks and mortar in which we live. The conditions which belong to the "*corpus*," vile though it may be considered by some, are necessarily a part of sanitary work, the surroundings of that "*corpus*" must not be limited to the material house or the municipal conditions under which its inhabitants and their fellows are lodged. Muncipal laws are made binding by Act of Parliament, and laws which are called sanitary, having received the assent of the Queen and of the Lords and Commons, are or ought to be rigorously carried out by those whose duty it is to see to their proper observance.

But there is a field in which the Queen has comparatively little power, and Parliament none at all, but in which the Sanitary Institute may fairly lay claim to some authority, and should undoubtedly attempt to exert it. If Parliament were to rule that chimney-pot hats should not be worn, and if it enacted that their wearers should go to prison for that offence against parliamentary law, the prisons at present in operation in this country would be totally insufficient to contain those who would suffer martyrdom rather than give up the use of the tall hat. In their heart they would not care a jot for chimney-pots, but for Parliament to declare them illegal would be subversive of all freedom of action, and Britons would be pleased to go to prison in defence of the use of chimney-pots rather than submit to the serfdom which is indicated in the refusal of the liberty to wear anything they choose, however insanitary or however contrary to the lines or beauty. If the Crown were to be of opinion that tall hats might be worn, in opposition to the views of Parliament, there would be a return to the days which followed Cromwell, or to the condition which held when a red or a white rose was a telling symbol. Fortunately such days are gone by, and the liberty of the subject is secure in all those matters on which opinions may differ, provided that such liberty is not enjoyed to the injury of our neighbour's health or property. I have said that even the Queen has little power in the matter of clothing, though fashion is supposed to emanate from the Court. There is a power which is greater than even that of the Court, and that is society, and the fashion which is outside Court influence,

and which permeates all classes. So long as society tolerates and fashion encourages tall hats, the institution will flourish and the custom of wearing them continue; but some day the chimney-pot will disappear even from the Preparatory School at Brighton, where it is still looked upon as indicating the march of intellect, and separating the *men* of those particular schools from those of an inferior rank. It is considered snobbish not to wear a tall hat at a Brighton preparatory school, and the so-called men at those schools are very particular on this point, a part of the subject which I wish to bring to the notice of the Sanitary Institute, viz., the subject of dress. Sumptuary laws cannot now be enacted by Parliament, because the age has become too sensible to interfere in such matters, but they exist in our schools. The Eton boy's jacket and the Stock Exchange dress are prescribed by custom, and none dare depart from the rule of the house, though that rule is unwritten. Custom and fashion may be insanitary, but their votaries do not know it, and there is no school to teach them what is sanitary or insanitary as regards dress, except the common sense which the rulers of fashion too often ignore.

Why should not the Sanitary Institute have a word to say about it, and try to influence public opinion, and through public opinion society and fashion, against some of the barbarous customs which still continue to flourish amongst us, and to bear fruit in a thousand different ways, producing an immense amount of disease and misery among those who are scarcely aware of the mischief they have brought upon themselves or caused other people to suffer? I ask the attention of the Congress to a few points upon which it is necessary to speak out in a way which may catch the attention of the sensible among us, and so help to diminish the evils which folly and fashion are ever ready to foist upon us, teaching their votaries that discomfort and uneasiness have only to be endured for a season for them to become evidences of the *Beautiful*, even if they diminish the privileges of the *useful*.

But was ever term so missapplied as that of the Beautiful in dress? Can anything be more hideous than some of the customs which fashion introduces among us? I should like to see the Council organise an exhibition of the hideous articles which fashion seems to compel people to wear, and even to consider becoming. A cultivation of right principles of beauty belongs to the region of art rather than sanitary science; but they meet on the confines of dress, and I commend this meeting-point to the attention of our cousins of the Social Science Association as one which they may very well cultivate in connection with art.

I will especially direct attention to the *foot*. Let anyone examine a few dozen feet, let us say, of the first hundred persons who may be met with upon the pavements of Newcastle, or of any other large town, and what shall we find? not one half of that number will have natural feet. The toes will be twisted out of shape in some way or other, certainly not in any way which can be said to be beautiful, which term may be truly applied to a well-formed foot. If the shoes are looked at it will be seen that they are distorted likewise. If the feet are those of young children, the cause of this distortion is not far to seek. Parents are forgetful of the fact that children's feet have a tendency to grow larger, and when people get boots for their children's feet this growth is not provided for. The boot-maker is expected to make the boot fit the foot as it is, not as it will be two or three months hence. The result of this custom is that the foot is cramped in its new home, and is not allowed to grow in its proper direction; the muscles are pressed upon, they cannot develope aright, and, as a result, there is wasting of flesh, loss of muscular power, and distortion of toes, which, when adult life is reached, produce the misshapen feet now so common, and so little thought of among those who are victims to this mistake. They hobble along in anything but a graceful and easy manner, but they do as others do, and that is enough. This error is not limited to the rich and well-to-do. The feet of the poor are treated quite as badly, for the boot-maker fits the foot, or rather forces the foot to fit the boot, as if the feet were intended to grow to the shape of the boot, and not *vice versâ*. It is inconvenient even to make any difference in the form for either foot, and the difference in shape of right and left is too often ignored. The poor little thing is compelled to bear the forced imprisonment of the flesh and bone until the foot is kneaded into shape, and made to fit the article which the parent has purchased. It would be far better for children to be brought up without wearing any kind of boot at all, than to have the muscles wasted, the bones distorted, and the joints perverted in their action, in the way in which it is the custom to do now, among the high and low, rich and poor. If they never wore boots and shoes at all until they ceased to attend school, it would be very much better for the health and the correctness of the shape of the foot, as well as the fleetness of the owner, whilst it would be a great gain to the poor themselves in the way of expense. It may be said that such a course is impossible in this changeable climate. I contend that it is not; that it is the custom in many parts of the United Kingdom colder and more bleak than our English towns, and that it is only a question of habit, not of necessity, which leads to the use

of shoes and stockings at all for children; for those who do not wear such things are like sailors who never trouble about them.

But what shall I say of high heels and pointed toes, as worn by the lady who aspires to be considered as "a queen of society," who wishes to make a sensation among her fellows? Surely it argues a low taste—a very weakness of intellect—among our fashionable ladies, that such a thing is possible.

The injury which the health receives from high heels and pointed toes must be great. If our girls would be natural, if they would develope their muscles as nature intended, high heels and pointed toes would be impossibilities. Fortunately lawn tennis has done something to prevent the complete triumph of high heels, for tennis shoes allow full play to the foot, if the wearer intends to play the game as if she desired to win it. Lawn tennis players, and the lovers of cricket and football, if they wish to distinguish themselves must give the muscles and joints of the foot full play or they will certainly be beaten by others who have been brought up more sensibly on this point. High heels and pointed toes must interfere with exercise, must make the wearers suffer from want of muscular exertion, and therefore lay the foundation for all those diseases which spring from dyspepsia and its allies. The foot must have full play for the use of its numerous muscles, and for the proper action of its joints, as well as room to grow. Who can count the evils which spring from tight boots, the mischief which corns have produced in the world, the miseries which have resulted from the harsh words caused by the blister or the bunion. Many a duel has been fought in consequence; perhaps the irritability produced by the tight boot has led to bloodshed on a larger scale, whilst the number of marriages which would have taken place but for this cause is beyond calculation, and all because a foot has been ligatured.

It is this tendency to ligature other parts of the body as well as the foot which so often renders human nature ridiculous, and sets up suffering of the most serious kind. The good sense of the English matron is banishing stays from the list of articles which young girls wear, but they are sadly too much used, even now. Health is sacrificed to figure, the viscera of the body are displaced in the most extraordinary manner from the position which they should occupy, because it is thought by some that a "slim waist is a thing of beauty." Look at the wasp, it is thin, but it stings, and the man who marries a wife with such a waist will probably be stung in more ways than one, for wasted muscles and distorted viscera will produce that acidity of temper which destroys the comfort of a home, and makes a household the centre of discord, instead of that peace and happiness which should be the desire of every domesticated Englishman and woman. There are a great many points connected with my subject which might be considered. A whole session could be devoted to it, if it were canvassed in all its aspects. Consider the way in which our infants are clothed and ligatured to their fatal injury, the materials in which they are enveloped, too thin in cold weather, too thick and heavy in hot seasons, impervious to moisture when they ought to be ventilating, making the body perspire at the wrong time and in the wrong way. Then again the nature of the materials we put on could be discussed, their relative capacity to retain warmth, and keep out cold, their endurance under wear and tear, and above all the manner in which they retain the germs of infectious disease, and the way in which such germs could be destroyed without injuring the texture of the clothing. There are also the different ways in which health is affected by the mode of manufacture. Textile fabrics are loaded with poisonous articles, for the sake of appearance. Health is sacrificed to gain. The maker as well as the wearer is damaged, too often without the source of damage being suspected. The use of arsenic, antimony, and lead as colouring materials, or for the purpose of rendering the article heavy in the weighing scales, and the manner in which linens are dressed for the market, and woollens made to appear what they are not, are subjects of great importance to the health of the community. The neglect of the laws of morality, of the lines of true beauty, and of correct sanitary principles in the matter of dress is sufficient to justify my short paper, and to give me a reason for calling the attention of the Congress to some of the causes of continued ill health among the community. That which Parliament dare not do, and which the Queen and her Court are unable to effect, will not be produced by the Sanitary Institute; but, though Parliament has ceased to enact sumptuary laws, because real knowledge and good sense are opposed to such enactments, the Sanitary Institute, by promulgating sound information upon the matters in question, may influence public opinion, and assist in bringing good sense into power, even among the votaries of fashion and the followers of custom. This may in time effect the object desired, even more certainly than could be done by Queen, Lords, and Commons combined, or by compulsion in any form.

Alderman WILSON proposed a vote of thanks to Dr. Carpenter for the paper, and to Mr. Symons for reading it.

Mr. E. C. ROBINS, F.S.A., seconded the motion.

Captain Douglas Galton, C.B., said that most of them knew instances of very great evils which resulted from high-heeled boots. He had tried to induce the members of his own family to give up high heels, and he could only say it was absolutely impossible to get a young lady to wear anything which was not in fashion. He was afraid that even were the Sanitary Institute to hold a congress upon the subject they would scarcely be able to convince the people.

The motion was agreed to.

Mr. G. J. Symons, F.R.S., in acknowledging the vote of thanks, said that the writer of the paper commenced by condemning the chimney-pot hats. The members of the section must not be led away to blame only ladies for wearing high-heeled boots. It would be easy to prove that a chimney-pot hat was a bad thing, and he would like to throw his chimney-pot hat overboard altogether, but custom would not allow it. He remarked that it was rather hard to single out the ladies for blame, and not say a word about gentlemen's boots, which were open to all the objections mentioned by Dr. Carpenter. Great benefit would result if they could get common sense introduced in connection with their clothing.

"*Influence on Sanitary Progress which medical men might exercise in their private practice*," *by* R. T. Hildyard, Captain late Royal Engineers, Engineering Inspector Local Government Board.

I shall begin what I have to say with the assumption, which is, I fear, not likely to be disputed, that the advance in sanitation has not been as rapid as might have been hoped. Though large works have been carried out by some sanitary authorities, still the public at large, including all classes—the educated and the uneducated—show great apathy in sanitary questions, and do not, as individuals, take those steps which are necessary to insure to them in their own homes the benefits they should derive from the large public works carried out. Old houses are left as they are; and there are daily springing up new ones built in defiance of all the simple rules which now receive universal assent. We have this Sanitary Institute doing a great work: we have sanitary associations, sanitary engineers, sanitary journals, sanitary legislation,—and yet sanitation makes but slow progress. Apparently, there is no excuse for ignorance or for indifference; but yet the fact remains, that 999 persons out of a 1,000 go into a new house without any sufficient guarantee

that it is a healthy one. It has been pretty generally admitted that it is no use thinking of legislating people into sanitation; and it seems that, unless we can infuse some new life into the work, we shall soon have to come to the conclusion that it is no use offering people facilities for voluntary action. The horse may be brought to the water: in this case, indeed, the water has been brought to the horse; but the public declines to drink.

Much good has, doubtless, been done by the great sanitary movement which has been going on of late years, but that good has been done among the professional men dealing with sanitary matters. Architects, engineers, surveyors—thoroughly conversant with all the details of house sanitation—are forth-coming, and vast improvements have been made in the manufacture of the various details; but unfortunately this progress only touches the skirts of the difficulty.

If the great stupid public were impressed with the importance of sound advice and sound work, if all houses were built under the supervision of an architect, we should have good grounds for congratulation. But it is not so. The vast majority of houses are built by speculative builders, who know nothing and care as little for sanitary matters, who set all laws of health at defiance, and constantly from sheer ignorance put in inferior fittings when superior ones could be had at a less cost. The only check on this evil must be a demand for improvement, coming from the public, from those who are to occupy the houses. As yet this public has not been touched. It appears that men of science, reformers, professional men, may strive in vain, unless they can reach some key which has not yet been tried. The men of science are too scientific, they shoot over people's heads; the reformer is too enthusiastic, his condemnation is so sweeping that people feel safety in numbers; professional men are open to the accusation of self-interestedness.

There is nothing attractive in the subject; indeed, many of its details are naturally repulsive. And here I would touch on what has been, I would submit, a mistake in the sanitary movement generally. This Institute has specially devoted itself to the elevation of the professional classes, but it has been a common theory that every man should look after his own house.

There are two great objections to this: first, that it is contrary to the natural instincts of our present stage of civilisation; and, secondly, because the householder cannot possibly be so well fitted for the task as those properly trained to the work. I once complimented a drainer on the neatness of some spade work he was doing. "Eh, sir," he said, fondly patting the side of the dyke with his spade, "I think a well cut drain be the most beautiful of all God's works." This principle, which in

other words, is that of taking an interest in the task to which it has pleased God to call a man, is really at the bottom of all good work, and we can hardly expect to find it in an amateur. The only reason for this suggestion of superseding the professional man is, that in the past he has failed to rise to the requirements of his position. But on this account to throw the whole responsibility on the householder is about as wise as to recommend him to undertake the doctoring of his family. Let the householder by all means feel the importance of having his house in proper order, but this should lead him not to try amateur plumbing, but to employ the best skilled assistance he can find. If there is a demand for good thorough work, it will soon be forthcoming according to the common economical law of supply and demand.

But whatever view we may hold on this point, there is evidently required some powerful influence to start the whole train of machinery: and I believe there exists such an influence which has not up to the present been brought into full play. I allude to the medical man in his private capacity, not as a reformer, as a legislator, or as a man of abstract science, but as the familiar family doctor. In the former rôles, medical men have fully taken the prominent place which might be expected. In the latter rôle, I do not believe they have exerted the full influence of which they are capable, and it is in this rôle that they appear to offer the very factor we are in want of.

Here we have a scientific man, the natural successor of the present, ephemeral class of reformers: a man, whose study in life is the improvement of the health of the community: a man who bridges over the gap between abstract science and its application to the details of life: a man who is daily gaining practical experience of the conditions in which families actually live, and who is continually turning on these conditions the new rays of light diffused by pure science: he is, too, something far more than a scientific man, he is brought more than any other man, in daily contact with his fellow-men: it is a part of his daily work to study the feelings, even the idiosyncrasies of his patients. Ailments are often influenced as much by mental as by physical conditions, and a medical man to be successful must obtain a moral influence over his patients. Here, then, is the very man to have weight. Again, the family doctor is essentially our friend in time of sickness, when we are nervous as to ourselves, or about those we love; when we are peculiarly open to advice—we all know the old proverb: "the devil was ill a saint the devil would be; the devil was well but devil a saint was he." The doctor is on the spot, ready to strike just when the iron is hot; and people are not likely to treat his warnings

lightly. Nothing perhaps shows better the power medical men exercise than the sufferings people with small incomes constantly go through at their bidding. A child is sick; it is ordered to the sea. The father's work is in some big inland town: he cannot leave it. The difficulties in the way appears insuperable, but still the doctor looks grave: the home is broken up; the father shifts for himself; the mother with a string of children of ages various, drags off with a heavy heart, but yet the sick child gets sea air, and benefits, or not, as the case may be. It may, perhaps, be said that the doctor in one case can give a definite opinion, while in the other he can only speak on a general suspicion.

This, to some extent, may be true; but, on the other hand, has a doctor any right to give a decided opinion as to the benefits of change of air, if he is ignorant whether the air his patient breathes, or the air he orders him to, is contaminated or not? It is not enough to say, "Really, we must be allowed to assume that people can take some care of themselves." There is no more reason for allowing the assumption in this case than in the case of diet or exercise. It would be very undesirable that the doctor should be turned into a sanitary engineer; we do not wish him to lay down the law as to what is to be done, or to force people to any considerable outlay; all that is necessary is that, where he is not satisfied that a house is safe, he should force people to get a sound opinion on the matter, There can be little difficulty in a doctor, a scientific man. arriving at a reasonable suspicion in such matters; and it cannot be too strongly urged that it is one of his first duties to do so. In these days, when physic is so rapidly giving ground before attention to diet and surroundings, the purity of air and water must hold a place of increased importance. If a patient were questioned, as to the absence of danger in these essentials to health, as carefully as he is as to his diet, the doctor would be able to form as definite an opinion in the one case as in the other, provided always that it be accepted as a dictum that it is the duty of a householder to know, either of his own knowledge or on competent authority, that his air and water are, as far as human foresight can make them, free from danger. Ignorance on this point should be taken as sufficient to show the necessity for investigation. In some cases, no doubt, doctors will find their advice unpalatable; but so are their physics and their dietaries; and, if the importance of pure air and pure water be consistently urged, there is no reason to suppose that doctors will lose influence with their patients. Till now, I have been speaking of cases where doctors are called in, and have, from the symptoms of the case, no special cause to suspect the

presence of impure air or water. Often, however, the symptoms do point directly to the presumption that these are the source of the evil, or, at least, an aggravating factor in the case. Here, for a medical man to prescribe for the particular ailment, and merely to suggest that it would be well to have sanitary arrangements looked to, is a positive waste of his powers for good. People do not act on a mere suggestion of this sort, any more than they would act on a mere suggestion that they should break up their homes and go for change of air. If the medical man feels the importance of sanitary arrangements, he must impress it also on his patients. To cure the symptoms, and yet leave the deep-seated cause untouched, is like re-papering a damp wall. It may be thought that I am speaking platitudes —probably, as regards most of those present, I am doing so— but I urge further action on the part of medical men, because, in the course of a wandering life about the country, I have become very strongly impressed with the fact that there is room for it.

The other day I looked over a high-class London house, and found every sanitary arrangement defective; indeed, the sewage was merely soaking away through the soil beneath the basement. In that house there had just been a case of bad throat, turning to erysipelas; yet two doctors attending the patient had drawn no particular attention to sanitary matters. I have lately seen a good deal of our South Coast watering places, the health resorts to which invalids are ordered by London doctors, with a recommendation as to the resident doctor they had better consult—places where people are, as it were, met by the doctor on their arrival.

Yet in house after house it is the old story: water-closets and drinking water connected; open channels for sewer gas by cistern overflows, sinks and baths, unsafe traps, damp walls, and damp basements. Surely if medical men used the undoubted influence they possess, and insisted on people paying attention to such matters, things would be very different. Let a doctor say, "I cannot be responsible for the consequences if you persist in neglecting my advice as to these sanitary arrangements," and the indifference to the public must soon disappear. Again, doctors are daily consulted as to suitable places of residences: one place is pronounced too bracing, another is too relaxing; but sufficient stress is not laid on the importance of a patient going to a really healthy house. What is the use of a naturally bracing air, if it is fouled by the stupidity of man? What is the advantage of a gravel soil, if it is soaked with sewage? If medical men paid more attention to these matters house-agents' particulars would include something more than the occasional

bald statement—drainage and water supply good. If sanitation is not attended to in health resorts, where people are entirely in the hands of the doctors, what can we expect elsewhere? And yet I do not think that any one concerned with the public health should feel satisfied until it is the universal rule that no house should receive fresh tenants without a full and sufficient guarantee that it is in a satisfactory sanitary condition.

Once a house is occupied, the difficulty of remedying matters is vastly increased. The occupier may have a remedy against the owner at common law; but the processes of this law are slow and costly, and its results are not always satisfactory to those who appeal to it. But in these days of constant locomotion and constant change, a vast amount of good would be done if it were only possible to prevent people going into unhealthy houses. Any attempt to effect this must result in some system of reliable certificates or of registration. I will not pretend to enter into the details of any such systems, but will urge, that to command the confidence of the public they must have the sanction of the medical profession; and, that to ensure their general utility, they must also have their active support. It is for medical men to aid the efforts of the sanitary reformers, by associating themselves everywhere throughout the country with these sanitary movements, which are now struggling into existence. There is, perhaps, a natural reluctance on the part of residents, medical men, and others to agitate publicly as to the condition of the place they live in. They are anxious to maintain its good name for healthiness, and any movement they may originate to improve this, is likely to be taken hold of by rivals as a peg for adverse and, perhaps, damaging criticism. This, however, is not a feeling which will bear analysis: it smacks too much of a leaning to the screened existence, rather than to the absence of evil. But I do not even ask medical men to agitate in this manner. Let them encourage, and lend their names to local associations, where they are deserving, as a guarantee to the public, and let them, in the course of their daily practice, do the great work by instilling into their patients the principles and the importance of sanitation. The policy of inaction on the part of residents, is evidently a short-sighted one. The name of a place cannot be kept up for ever, unless it rests on solid grounds; and the best way in the long run, to maintain the character of a place, is to render it worthy of it. Our great watering places have, of late years, spent thousands on systems of main sewerage, in some cases I truly believe, to draw visitors, in the belief that health must be good where such large sums have been spent. But as time goes on, it will prove

that these sums have been wasted as regards all those houses, which have not done their part in the great work of sanitary reform.

Sewers are of little or no value unless they are properly used, good water becomes foul if improperly stored, gas vitiates the atmosphere unless ventilation is provided. For the ratepayers to spend large sums on public works, and yet as individuals to do nothing to enable them to profit by those works, is about as stupid as if we were now to be content with the old pack horse, which was in use before McAdam transformed quaggy tracks into our present highways. Individuals as well as public bodies must move with the times.

I will now go one step further, and even ask medical men to trench somewhat on the sphere of the professional sanitarian, whose assistance I have said they should urge on their patients. I look upon the doctor as the friend of the family, and I cannot imagine a more friendly act than helping a family to realise the danger they may be in. There is one simple test which may at once disclose so many hidden dangers, that in my opinion it cannot be too widely known, and it is one which the householder, with a few common sense directions, can carry out for himself. I refer to what is called the peppermint test, which consists merely in pouring an ounce of the pungent oil of peppermint into any one part of a system of house drains, and noting any points where the odour appears to gain entrance into the dwelling. The cost is about 4s., and I have seen it produce more effect than hours of argument. It is not generally known that the most dangerous sewer gases are often inoderous, and the effect of finding the strong fumes of peppermint mounting through the house is most convincing as to the certainty of sewer gases following the same course. I see no reason why a medical man should not put down on a sheet of paper directions as to this or any other simple test he may prefer, just as he would write a prescription, and should not further ask for full information as to the results arrived at. It is not wise to urge that these results should be taken as an actual basis for the work which may be necessary; in practice errors are apt to arise with inexperienced operators, but the test nevertheless is an admirably simple means of arousing a householder from the slumbers of a false security, from a fool's paradise, and of establishing the evident necessity of calling in skilled assistance.

It will be seen that I do not advise an interference with the duties of any other class of professional men. If the medical man gets his patient to try the peppermint or any other test he will in a vast number of cases be practically passing him on to the sanitary engineer, just as he might pass him on to the

dentist if he found the case was rather in the province of the latter than in his own. There would be no jealousy, nothing but friendly co-operation which would have very good results for all, and especially for the patient. It may be said that to rely on the medical man, when called in in time of sickness, to arouse people to the importance of sanitary precautions, is to shut the door only when the horse is stolen, but the analogy will not hold good. There are few houses where the doctor does not enter once a year, and if in the course of twelve months, we could get a tenth of the present defects taken in hand, there would be more work than all the plumbers in the kingdom could get through. In conclusion, I will express the hope that medical men will not consider that I am speaking in any unfriendly spirit. There is nothing more marked of late years than the increased attention paid by the profession, to what often appears petty details, and I feel sure that all who have been brought much in contact with them can bear witness to their unwearied kindness in helping those in charge of their patients.

Again, all know the position taken by the profession in the great sanitary movement. If, as I believe, medical men do not exercise the influence they might in sanitary matters, it cannot be from any thought of shirking trouble or from any want of scientific acquaintance with the subject. It would seem that there is at work some subtle influence which escapes ordinary observation, and with which I must leave them to deal.

Captain Douglas Galton, C.B., moved a vote of thanks to the author of the paper, and, in doing so, remarked that he thought, after an experience of twenty-five or thirty years, that medical men had been the originators of all improvements in sanitary matters throughout the country. They might not have devised the various means of effecting them, but they certainly had been the motive power which pushed forward engineers, architects, and surveyors, in the direction of the improvements.

Professor F. de Chaumont, F.R.S., seconded the motion.

Mr. T. P. Barkas contended that architects and engineers were not sufficiently acquainted with the laws of sanitation, or under their authority certain houses would not have been allowed to be erected. Intelligent working men were as well acquainted with the laws of sanitation as some of our scientific men. He advocated popular lectures.

Mr. H. E. Armstrong, M.R.C.S., endorsed the remarks of the last speaker with regard to the value of popular lectures. He said it was

very important that the members of the medical profession should be trained in regard to public health; but there was already too much for the medical student to do in the four years of his ordinary curriculum, and to add a little more work would be to place almost the last straw upon the camel's back. In connection with sanitary matters the public did not get the support from medical men which they ought to receive. Forty-six medical men in Newcastle signed a petition against the Newcastle Improvement Bill, without knowing what the Bill actually contained. He had always maintained that the mode of remunerating medical men was wrong; a medical man was now always paid in accordance with the length of time he attends a patient. He believed every average medical man to be a humane man, but he was so paid as if it were his interest to keep patients as long on his books as possible. If the medical man were paid by stipend he would become an aid to the sanitary authority. He urged the importance of medical men being granted a degree after examination in sanitary knowledge.

Mr. BARKAS said the compulsory removal clauses were taken out of the Newcastle Improvement Bill, but the notification clauses remained.

Mr. H. E. ARMSTRONG said that at the time the petition was forwarded he believed the medical men did not really know what was in the Bill.

Mr. C. S. SMITH urged the necessity of Parliament granting further powers to local bodies in connection with sanitary matters and new buildings.

Mr. S. DIXON and Dr. A. E. HARRIS also spoke upon the subject.

The vote of thanks was then passed unanimously, and Captain HILDYARD briefly replied to the discussion.

"*Arsenic in Domestic Fabrics*," *by* HENRY A. LEDIARD, M.D. Edin., F.R.C.S. Eng., Surgeon to the Cumberland Infirmary, Carlisle.

THIS subject has engaged the attention of a certain number of medical men and chemists for many years, and the details are so well thrashed out and the facts so well demonstrated and admitted, that it seems almost superfluous to endeavour to add more to what has already been written, but inasmuch as arsenic

is still present to an injurious extent in many domestic fabrics, and the general public so little cognizant of it, there can be no apology needed for glancing over on an occasion like the present the work done in past years and thinking over what may be done in the future as a remedy for the evil.

It appears that attention was drawn to this subject in the year 1857, when Dr. Halley proved the presence of arsenic in the atmosphere of a room in which he worked, the walls of which were covered with an arsenical paper; his deductions were, however, questioned by others who failed to confirm what he had observed. It was stated that arsenic was not capable of volatization except at a heat beyond human endurance, and another explanation was sought for, to account for the separation of arsenic from the paper. Dr. Hinds, about the same time, proved his illness to be occasioned in the same manner; since then much evidence has been accumulating, facts as to sickness gathered from medical men, facts from chemists as to the extent of the presence of arsenic in wall-papers, dress materials, &c., &c., and lastly much important evidence has been obtained by Mr. Henry Carr, from those engaged in the manufacture of wall-papers, and others.

The outcry of exaggeration was raised by those who feared perhaps that their interests might be injured by any attempt to check the use of arsenic; but notwithstanding the absence of prohibition it is a fact that less arsenical paper is in use at the present time. Manufacturers of wall-papers have been found to make attractive paper which they guarantee to be free from arsenic, and this is no small gain.

How comes it, I would ask, that other countries have stringent laws in existence against the use of poisonous substances in general, arsenic in particular, in the manufacture of various domestic articles, if the knowledge of their injurious effect did not exist? Mr. Heisch has given a translation of the Swedish restrictions. In Germany still more stringent laws exist. In France, also, the same prohibition is found to hold. It seems strange that England should be slow to recognise the necessity of legislation also. Up to 1871 no facts were before the public proving arsenic to be present apart from a green colour, and at this time arsenic was proved to exist in papers dark brown, buff, white, blue, and various shades of gray, drab, and mauve; these facts, well known to experts, are entirely new, even now, to the general public, who continue to avoid the bright green in some measure, but accept all other papers with confidence. Dr. Bartlett and Mr. Lakeman have pointed out the dangerous nature of the process of dusting on poisonous dry colours by hand, and manufacturers will be found who have, of their own

accord, given up the use of such colours, on account of illness amongst their workpeople. Why arsenic has been used has been pointed out by Mr. H. Carr in his little work on poisons in domestic fabrics, and it is a fact of common knowledge that brilliancy and permanency are effects of the use of arsenic in wall-papers; it is even admitted that anyone who could produce a colour similar in brilliancy to arsenite of copper, without arsenic, would make a valuable discovery. To what extent arsenic has been and is used there is abundance of evidence—a firm of paper-stainers having stated that they used thirty tons of emerald green per annum, and have now partially discarded it, and used eleven and a-half tons only. Another firm of chemical manufacturers advise all wall-paper to be sized and varnished to prevent dust; and this, no doubt, would be an excellent method, if it could be proved to be sufficient; and this leads to a brief reference to the manner in which arsenic acts injuriously in a room. Dust was examined by Dr. Alfred Taylor in 1858 and found to be arsenical; there was an unglazed arsenical paper in the room. In this instance the green colour of the paper aroused suspicion. Pettenkofer, when appealed to by Dr. Taylor, stated that the danger arose from mechanical diffusion. In 1873 Mr. Barrett recognised that the colour was easily detached from walls, and that changes of a hygrometric and thermometric nature might affect a porous pigment and render it more easily detached by currents of air. Mr. Abel, 1858, tried to disprove the presence of arsenic in the air of a room with arsenical paper, and put down the poisonous symptoms complained of as accidental. Chemical investigation of the air in rooms covered with arsenical wall-papers has been carried out by Hamberg, of Stockholm, who came to the conclusion that a gaseous arsenical evaporation was going on. The paper had been up twenty-five to thirty years, the walls dry, and the paper, a beautiful light green ground, was arsenical. Since then, experiments have been made which confirm this, by Dr. H. Fleck, of Dresden.

Professors Roscoe and Schoelemmer, moreover, support the observations of Hinds, Halley, and Fleck.

In 1860 Dr. Heisch published an interesting paper on Arsenical Eaters of Styria, and stated that at the Salzburg factory workmen were compelled to become arsenic eaters for self-protection.

The evidence of the injurious effects of arsenic in wall-papers is now recognised beyond doubt by medical men, who have been much puzzled by anomalous diseases which have yielded to removing the patient to a different atmosphere, and have returned again with re-exposure to the infected air. Instances of death having actually occurred are fortunately few, but on

the other hand cases recorded where symptoms of poisoning were present are many. At Limehouse, in 1862, four children died from arsenical wall-paper. Dr. Letheby found three grains of arsenic to the square inch of paper. The following year a child aged five died at Plumstead from arsenical wall-paper; it is not stated, however, whether the paper was analysed.

Dr. Hassell's name must not be left out, inasmuch as he wrote, in 1859, on the use of arsenical and lead pigments in coloration of paper hanging and other articles of furniture, dress, and ornament; he pointed out that chromate of lead was as poisonous as arsenite of copper.

It has been frequently stated that it is impossible that arsenic could be injurious seeing that those engaged in the working of it came off unscathed; and I have at hand the letter of a gentleman who says, "my brother had much to do in the manufacture of all sorts of colours, amongst the rest of emerald green, and used many hundred weight, I believe many tons, of arsenic in a year. He was careful and looked well after his men and women, and no fatal case of arsenical or other poisoning ever occurred in the course of fifteen or twenty years; the women could be longer employed than men without any visible effect, and if any such symptom occurred they were removed to other work. The dangerous work was when the colour was in the air. The manufacture where all was wet was without danger, except such as ordinary care could prevent."

The fact that arsenic is used medicinally would carry no proof that in manufactured foods it would be harmless. Although mercury is given internally by mouth in unction and vapour, yet arsenic is employed solely by mouth and as a caustic, never by vapour so as to be taken up by the lungs. It is well known that workmen suffer when peeling off old arsenical papers—a fact I have established upon my own body. In the *Pharmaceutical Journal* for 1849 a case of death is recorded from the fumes of arsenic emitted from a chemical manufactory chimney at Plymouth. Arsenic has, moreover, been shown to be a poison to the vegetable as well as the animal kingdom. It would appear that some of the evils resulting from the introduction of poisons into domestic fabrics may be traced to that distribution of labour so common in the manufacture of almost everything. The raw material is worked in one place, and the subsequent steps towards finish are carried out in various places—for instance, a thread is made at one factory, it is woven at a second, the calico is printed at the third, whilst the colours are obtained elsewhere. The retail dealer, in the majority of cases, knows nothing and cares less about the composition of the goods provided they pass from his hands. So it is with wall-papers; the

colours are not known to contain arsenic, although the dealer is quite ready, perhaps, to say that no arsenic is present to his knowledge.

Arsenic is further used in the manufacture of cretonnes, a material of most universal use in the present day. Many aniline colours are still prepared with arsenic, and arsenite of soda is largely used for fixing aluminous and iron mordants in calico printing and dyeing, instead of cowdung. Again, arsenic from its antiseptic properties, is stated to be used in making size. Large quantities of arsenic are used also for the somewhat limited demand in bird-stuffing, and in this last requirement I have often experienced a headache in the galleries of stuffed animals in the British Museum, and believe that an examination of the dust in the cases and upon the cases, or in the bodies of the animals, might prove interesting. In 1880 a report was presented to the Medical Society of London, on arsenical poisoning by means of wall-papers, paints, &c., but the result added little to what was already known; indeed, the poverty of the report might well be pointed at by those who still think that there is much exaggeration in the present outcry against arsenic. There are two reasons which may account for the report being what it was: it is possible that the committee did not allow sufficient time for a return to be made of those to whom the circulars were sent, and secondly, very few medical men will be found able to analyse materials with sufficient care, although the testing is not much more troublesome than the daily examination of the urine so necessary in medical practice. Very few pharmaceutical chemists would be found to allow that they had sufficient time to devote to chemical research apart from their usual business, and thus it happens that the important link has been wanting to connect symptoms of an obscure nature with their real cause. Negative evidence would be of much importance to those who deny the injurious effects of arsenic; for instance, cases might be recorded where persons were sleeping in rooms with highly arsenical wall-papers, and yet being totally unaffected; but even here allowance would have to be made for individual idiocynerasy.

What then are the symptoms which are most commonly found in persons subject to arsenical influence in rooms? By my own observation I should say that the mucous membranes of the eyes and mouth give early traces of injury, whilst headache seems to be a constant accompaniment. Irritation of the skin is sometimes spoken of, and very often general depression, with lassitude. Mr. Henry Carr gives a variety of cases, carefully observed, and by the kindness of Dr. Bartlett I am enabled to give details of cases not hitherto published.

Case 1.—A lady, not in strong health, but with no disposition towards headache, giddiness, drowsiness, or lack of energy, being, on the contrary, alert and full of mental vigour, became subject to continued lassitude, with a frequent sensation of being about to fall. Dr. Habershon was consulted, and pronounced that the symptoms were not due to derangement of the digestive organs, but might be due to some unknown irritation of the nervous system. These conditions remained, and with but little fluctuation, until the summer-time advanced and the heat reached 80° Fahr. in the shade. She suffered from a series of colds, with nasal catarrh, specific irritation of the mucous surfaces of the nostrils, extending throughout the frontal sinuses, and peculiarly irritating the eyes, and in a lesser degree affecting the pharnyx, œsophagus, glottis, and trachia. Towards the end of July Mrs. H. sent me several pairs of silk gloves she had been wearing, stating that all through the hot weather she had generally found her hands in a state of eruption after wearing the gloves in question. The condition of the skin of the hands was a peculiar erithismus, sharply smarting and urticating, without leaving any permanent inflammation after the gloves had been taken off for an hour or so. I suspected, but failed to find arsenic in the colouring matter of the gloves, except in mere traces insufficient to account for the eruption.

I obtained pieces of the wall-paper, carpets, curtains, and various dress fabrics which had been in use. In the carpet and curtains I found the equivalent of 1·38 grains of arsenious acid.

In a sitting-room just furnished before the attack, in the dress fabrics and artificial flowers worn during the same period, the quantity must have been much larger, judging by the heavy traces found in quite small portions; but the gloves, which undoubtedly produced specific poisoning of the skin whenever worn in hot weather, contained, according to the most reliable experiments with Marsh's, and Reinsch's, and Scheele's tests, such varying and minute quantities of arsenic, that for a time I could not attribute the injury of the hands to this poison.

Just after seeing the lady restored to health by the care taken to prevent the presence of arsenical pigments in house and clothing, I had a visit from a friend, who brought me to test some silk socks which had been worn on circuit by an eminent Queen's Counsel, with the result of his being laid up with a large irregular ulcer in the foot, painful to a degree, and so persistent against all curative means employed by Dr. James Duncan. Both physician and patient were impressed with the conviction that the socks must have been coloured with arsenical dye, although a portion of each of the dozen pairs of socks

had been tested by a learned professor of chemistry of high standing, who reported that the socks contained no arsenic, nor any other poisonous matter. My own tests of portions of these socks gave the same unsatisfactory results as had been yielded by the gloves in the former case, and I was about to conclude that the assumption of arsenical poisoning in both instances, however well connected with the wearing of gloves and socks, which gave only such very small quantities of arsenic on analysis, could not be satisfactorily maintained, and that to bring forward such evidence would only cast discredit upon others in which the more palpable presence of arsenic had occasioned less injury, and therefore I did not feel justified in publishing the particulars, however interesting.

The doubt would probably have remained unsolved until now if a committee to enquire into the subject of arsenical poisoning had not been formed by the Medical Society of London, and another for the same purpose by the Society of Arts, composed of such men as Dr. John Simon, Dr. Swaine Taylor, Dr. de Chaumont, Dr. Corfield, and others.

The first step taken was to instruct Mr. Heisch and myself to undertake a series of experiments to formulate a reliable method of quantitively estimating the presence of very small proportions of arsenic in wall-papers, dress fabrics, &c. More than eighteen months' hard work not only enabled us to estimate within half a thousandth of a grain of arsenious acid in any kind of wall-paper, dress stuff, or silken material, but to be able to show it under the microscope in its true octahedral crystals. Tested by the means which we have communicated in the first instance to the Society of Arts, the socks and gloves, previously tested with almost negative results, are proved to contain distinct and definite but not large quantities of arsenic, and the connection between the wearing of arsenical socks and gloves and the skin poisoning is now as clearly proved in these instances as any *ex post facto* evidence of any other poisonous injury by connection.

Colour being no test of the presence of arsenic in many cases, chemical analysis must be resorted to in order to demonstrate beyond doubt whether or no such and such a material does contain this poison; and it is not a little remarkable that Marsh's test, which dates from 1836, should still be considered of the first importance. Reinsch's test (1843) is no less valuable. There are also others: one given by Dr. Letheby in 1846, founded on the discoveries of Marsh, Lassaigne, Soubeiran, Reinsch, and others. And one of the most important questions respecting the presence of arsenic in domestic fabrics is that of a chemical test. The determination of a test which

shall admit of the presence of minute traces, such as would come under the head of accidental or unavoidable contamination —quantities too small to produce injurious effects, but which shall effectually exclude all colours where combinations of arsenic are essential ingredients, and where the quantities of arsenic are such as to be objectionable. The consideration of a standard test has engaged the attention of a Committee of the Society of Arts for some time, but their report is not yet published.

The two methods most applicable are Reinsch's, Marsh's, or a modification of Marsh's process. Reinsch's is the most simple, and the best adapted for those who are not expert chemists: it consists in boiling a certain sized piece of paper in dilute hydrochloric acid with a small piece of pure copper foil inserted. If arsenic be present the copper will be coated by a steel or black colour; this coating, however, may be produced by sulphur, mercury, or some few other ingredients of colouring matter. In order to determine definitely whether the coating be arsenic or not, it is requisite to sublime the coppers in a reduction tube, a small thin glass tube about 3 inches in length and $\frac{1}{4}$ inch, or rather less, in diameter. If the copper be cut up, placed in the bottom of the reduction tube, and a spirit lamp applied, the tube being held horizontally, or nearly so, the arsenic, if present, will be driven off from the copper at the heated end, and will form a ring of minute octahedral crystals on the cooler part. If these crystals be obtained, the material tested is unquestionably arsenical. Messrs. Griffin & Sons, of Garrick Street, London, have been requested to supply the apparatus requisite for this process, which can now be obtained from them for a few shillings, together with full instructions for its use. A small lens, or, better still, a microscope, is requisite, by means of which to examine the crystals. There are some few cases, it is true, where the arsenic is not discovered by Reinsch's process; these cases, however, are so few, as not to interfere with the practical working of the test. The indisputable fact is that, if Reinsch's test were generally applied, the use of arsenical colours must inevitably be abandoned by paper stainers.

Marsh's method is founded on the principle of the great affinity of hydrogen for arsenic. If this gas be formed of dilute hydrochloric acid and zinc, in contact with the arsenical materials to be tested, arseniuretted hydrogen is given off; this is decomposed again by passing through a tube in a Bunson burner, and the arsenic is deposited as a dark brown or black mirror, which may be sublimed, and the crystals obtained as beforementioned for Reinsch's process. The arseniuretted hydrogen gas being, however, a most deadly poison, renders

this test unsuitable for the general public. Chemists themselves being by no means free from danger in using it. For testing for arsenic, whatever process be adopted, it is essential that the materials used be perfectly pure. The ordinary copper and zinc of commerce frequently contain arsenic to such an extent as would render a test unreliable. Hydrochloric acid may also be impure; a blank experiment should, therefore, always be made; that is, the process should be gone through without the insertion of any material to be tested. If there be indications of arsenic, it evidently must arise from the impure chemicals. If, on the other hand, the blank experiment gives no indication of arsenic, but when some certain wall-paper, or other article, be added, arsenic is found, it is clear that the arsenic is derived from the article to be tested.

The result of the long series of experiments made by the chemists on the Committee of the Society of Arts, will soon be published, and will give some valuable information. It has been said that the investigation made by the chemists in question is not needed. Professional chemists do not need the information, and the general public who are not chemists could not make use of it. Such assertions, however, are utterly mistaken. A good standard test is required by professional chemists, in order that all may work to the same guage of purity—allowing accidental and unimportant contamination, but rejecting all decidedly arsenical materials. If there be no common standard, different chemists will adopt different processes, and different degrees of impurity as the amount to be allowed. As regards the assertion that the general public could not make use of Reinsch's test, the best thing to be done is to let those of ordinary intelligence try it, and defend themselves from poisonous materials. Those who do not feel themselves to be fairly intelligent had better apply to some friend who is, or to a professional chemist.

In order to test the value of Reinsch's process, one hundred wall-papers were procured in a manner to secure having a good general sample of different manufacturers. The result was that all those papers which blackened the coppers thoroughly were found to be arsenical, and gave ample crystals when sublimed. Those which did not blacken the coppers in a complete manner were further tested by the modification of Marsh's process, and were proved to be non-arsenical by both tests. Reinch's test may therefore be considered reliable for all practical purposes, though a professional chemist might hesitate to give evidence that a paper was free from arsenic unless he had tried it by Marsh's process also.

If the chemicals be pure the production of octahedral crystals

by any process is positive proof of the presence of arsenic, though in some few cases the failure to obtain crystals by Reinsch's process may not prove the absence of arsenic; however, in the 100 cases above mentioned there was no failure, and every paper which coated the copper eventually proved to be arsenical.

Mr. Henry Carr has, in his little work on "Poisons in Domestic Fabrics," collected valuable information and epitomised it from a manufacturing point of view, and I fail to gather from what appears there, that there would be much difficulty in avoiding the use of arsenic in manufactures entirely. Some paper manufacturers have already given up the use of arsenic, and seem as able to compete as before; others state that a prohibition would be a matter of indifference to them; others that legislative inquiry would be satisfactory. Again, it is stated that as long as the present feeling exists a non-arsenical paper manufacturer would be at a positive advantage. Although firms may be found who would undertake or do undertake to make paper free from arsenic, there is no doubt that great care would have to be taken, both by themselves and the public to search for arsenic. The question of cost has also been entered upon, and the evidence forthcoming seems to show that this would soon right itself, inasmuch as the cost of the colouring matter is small compared with the cost of the entire paper; moreover, it is stated that prohibition would not involve any considerable outlay, except in this respect, that there would be loss upon the manufactured paper in stock.

Lastly, has any case been made out for legislative interference? I cannot help thinking that each year more and more evidence has been forthcoming in proportion to the greater attention that has been bestowed upon the subject, and to the quickened interest taken in it by the public.

So well has the subject of pure water and efficient drainage been ventilated, that dangers to health above ground such as are produced by poisons in various manufactured foods for domestic use, can only claim and will receive a like attention. Some amongst those interested in this subject object to the further interference of the liberty of the subject, by the imposition of additional laws to prohibit the use of arsenic and other poisons in domestic fabrics, but I would hold strongly that laws are good, if only to appeal to in cases of real necessity. In this country legislation has generally and will generally be the outcome of a public cry for it, and those who are in power for the time are bound to lend an ear to a complaint when backed up by sufficient evidence, and by men of unquestioned reputation.

Much work, I think, still requires to be done in systematically

examining all and every kind of material of wearing apparel or fabric used in house decoration, for it will be found that arsenic is present in many things apart from wall papers, which have performed the useful task of first calling attention to this important subject.

Mr. C. S. Smith proposed a vote of thanks to Dr. Lediard for the paper he had read.

Dr. Sargeant seconded the motion.

Professor Stevenson Macadam, referring to the subject of the paper, said he did not think that appealing to the colour-makers, or even the exposure of coloured paper hangings, as in the Section room, would do any good. The moment they spoke to colour-makers and paper-stainers about arsenic, they said it produced a cheap and bright colour, and pleased the eye, and the difficulty was to get something as cheap, which would effectually fill its place. He thought there should be some stringent legal enactment passed upon this matter, such as they had in France and Germany, which would render it impossible for our merchants to sell wholesale quantities of poisonous material.

The resolution was then carried.

"*Infantile Mortality—some of its Preventable Causes*," *by* Alfred E. Harris, Medical Officer of Health, Sunderland.

A large and beautiful ship moves majestically before a steady wind up the English Channel. All sails are set, and so unconscious of danger are those on board that all her ports are open, and she looks, as she really is, a thing of beauty. The hum of happy voices may be heard everywhere on her decks, for her gallant crew are looking eagerly forward to the evening, when they hope to be once more in the midst of their friends, or in the bosom of their families. But suddenly there is a terrific squall, accompanied with a blinding sleet, which hides the ship from the gazers on shore, who, when the sun breaks out, and they look seaward again, can see no ship, for she, with her brave men, has gone to a watery grave. All England laments her hardy sons, and our grief is made more bitter when we are told the ship might have been saved *if* her ports had been closed, for

they would have given her sufficient stability to resist the fierce blast.

An express train is approaching a station at which it does not usually stop, and the engine driver, looking at the signals, thinks he reads that the line is clear. But he is in error; and the train, with its living freight, dashes with dreadful momentum into another standing at the station. There is a terrific crash, and in a moment numbers of our fellow creatures are killed or maimed. And again the country laments their sad fate, and again we are told, to add to our sorrow, it might have been otherwise, *if* the driver had made quite certain there was an open line.

A pitman is working in the coal mine, his lamp does not burn brightly, and he removes the gauze cover to trim the wick. The light ignites the gas accumulated in the pit, and in a moment there is a terrible explosion, and many, many families are left fatherless; and the public are shocked, and their feelings are still farther harrowed by the knowledge that it might have been far different *if* only that man had done his duty by obeying the colliery regulations respecting naked lights. Oh, that saddest of all sad words "*if!*" It has in these instances made us hear with tenfold anguish the gurgling of the waters over the stately ship; the crash of the express train, and the explosion in the pit.

And yet around us on every hand, throughout the length and breadth of this fair land, thousands of human beings die every year, and we do not see their piteous, beseeching, little faces, nor hear their supplicating feeble cries, and they die, and dying attract little attention, save among the very few, although they too might have been saved were it not for an "*if*," the "if" of the twin demons, ignorance and neglect.

The general public do not seem alive to the amount of infantile suffering or mortality which surrounds them on every hand. Few persons of high position give that attention to the subject that the pressing necessity of the case requires. I have therefore chosen this subject more with a hope that it may attract the sympathies of the people of this city and the neighbouring populous towns, rather than with a view of throwing any new light on it.

Charles Dickens more than once in his speeches and writings pictured in burning words, as he alone knew how to do, the sufferings of infants on their journey to premature graves. Unfortunately all our great intellects do not think as he did, but we hear them speak and write of these infant deaths in terms of implied thankfulness. And I have heard men, professing our common Christianity, express themselves in similar strains. This may be the feeling of the political economist, but

it is certainly not the view which the members of such an Institute as this should allow to be put forward without protest.

Alas, for such feelings and such sayings! In my opinion, it were a thousand times preferable to inculcate into the minds of the people the baneful teachings of a Besant and a Bradlaugh, than that they, having had children, should be taught that "only the fittest survive," or that "the country is over populated." Once let these ideas become rooted in the minds of the people, and I fear they will become inducements to parents to neglect their progeny.

I cannot believe that an Almighty hand ever sent these little ones into this world, that having lived in it an hour, a week, a month, a year, they should gain an eternity. Surely He never intended that these new spokes in the wheel of life should be injured or fall out through being rolled over rough and broken ground that it was never meant they should travel over.

Some people say, "Children must die—you can't prevent them." Many, I know, must; it is impossible, or nearly so, to preserve the children of weakly or diseased parents. But, on the other hand, let us recollect the lesson to be derived from the village of Harbottle, in this County, where, at all events up to 1877, and I have no later record, no child had died for twenty years; and where among the families of a farmer and his three shepherds, having between them forty-seven children, no child had died for thirty years. Such facts as these irresistably point to the conclusion that much of the infantile mortality is an unnecessary evil.

Statistics.—The figures of infantile mortality are deserving our closest attention. In the decade 1870–1880, there died no less than 1,278,326 infants under twelve months old; or, expressing it graphically, about as many infants perished as there are inhabitants in Northumberland, Durham, Cumberland, and Westmorland.

In the sixteen years 1838–1854, the death-rate was 165 per 1,000 infants born, but during part of this period—viz., 1841 1845, inclusive—the rate was as low as 147 per 1,000, which is the lowest rate registered in this country.

From 1850 to 1870 the average infant mortality rate was 154 per 1,000, and during the period 1870–1880, inclusive, the rate was as high as 158 per 1,000, while last year, in the twenty large towns, the rate was 152 per 1,000.

The average death-rate in Dr. Farr's healthy districts is only 103 per 1,000 infants born alive. With a rate such as this universally existing there would be a saving of 44,000 lives in a year; or, in other words, sufficient lives would be saved to people a town the size of Southampton, and in ten years 440,000 lives,

or a population greater than that of Northumberland; or, in twenty years, 880,000, or as many lives as there are people in Kent.

But it is in the large towns that the greatest mortality prevails, and the rate of some of them—*e.g.*, Leicester—reaches to 200 per 1,000. To understand the effect of these rates on the general mortality of a town, I will take the case of Sunderland and Newcastle last year.

In the former town the annual rate from all causes and at all ages was 20·9 per 1,000 inhabitants, and by deducting the deaths of infants under a year, and the deaths of old people 60 years and upwards, and whose lives at this time are at the best uncertain, I find the mortality of the population is reduced to 12·1 per 1,000, and in Newcastle to 12·7.

Improper Clothing.—A few words now as to the causes of all these deaths.

Perhaps there is nothing that is so difficult to persuade a woman, be she of high or low degree, to do, than to dress her child in a manner which is not only sensible but conducive to the health and well-being of her offspring.

Examine the ordinary infantile dress. It is low in the neck—the better to promote chest complaints. It is short in the sleeves—the better to chill the blood coursing through the arms. It is long in the skirt—the better to cripple the legs and to deny them that free play that strengthens them, and prepares them for the future support of the body. The ribbons on the short sleeves, the lace on the low neck, and the embroidery on the long skirt fill the mother with

"Soft visions of serene delight"

in the prospect of outshining some one else's baby, or perhaps with the better motive of making the child attractive to the father's eyes.

Dresses like these are evils quite sufficient to be borne with patiently in the house, but when used out of doors they demand the severest reprehension. We cannot walk down any back street, in any weather, without seeing mothers on all sides with their "bairns" in their arms, standing at their doors gossipping with their neighbours and exposing the child at once to the cold atmosphere, and to the draught of the doorway.

But as a rule, strong and hale though the mothers may be, we will not see them trifling with their own bodies. They wear no low dresses, and no short sleeves, for they know that such dresses cannot be worn with safety. When remonstrated with the ever-ready excuse is at hand, "it makes the child hardy." What medical man is there who cannot tell of innu-

merable deaths the origin of which began in making a child "hardy?"

It seems that many cannot begin this process too soon, for even before their first month is passed I have seen children exposed to the effects of our uncertain climate, and like the early primrose,

> "Too soon deceived by suns and melting snows,
> So falls untimely in the desert waste,
> Its blossom withering in the northern blast,"

many of them are laid in a premature grave. Prejudice will not allow the mother to reason. Her mother dressed her child as she has done, the nurse recommends it, "the child would be such a fright"—and besides all her friends dress their children in a similar manner.

Is it any wonder that in 1880 there were

15,790	victims to	Bronchitis,
5,632	„	Pneumonia,
1,266	„	Congestion of the Lungs,

in all 21,688 deaths of infants under twelve months old?

Enquiry into the cause of these deaths elicits the fact that many of them commenced with a cold—the child "caught a cold." The very words almost condemn the mother or nurse, because the child could hardly, of its own volition, have exposed itself to winds or draughts. I am quite aware that all these deaths have not arisen through the carelessness of the mother, but I am thoroughly convinced, and my experience as a Health Officer, though short, has more than satisfied me that a large percentage of these deaths are entirely preventable.

Time will not permit any allusion to other causes of these, and other respiratory complaints; I will however mention a practice that to a certainty causes a large number of these deaths. I allude to the custom of carrying infants to theatres or churches at night, more particularly in the winter season. The infant breathes the heated atmosphere for hours, after which the delicate lungs are exposed to the great cold of the outside air.

Feedings.—As regards feeding, the great curse of infantile life seems to be the ardent desire of parents and nurses to behold their infants taking solid food; and they wait with considerable impatience for a few weeks to pass until at last they give the infant bread, biscuits, or some specially prepared food, all of which may be very appropriate for a child that has cut

some teeth, but which, given in its early days, are frequently the foundation of debility and death.

Lately it has been my duty to make enquiries in Sunderland as to the cause of the great amount of diarrhœa that usually occurs at this season, and I found in many cases that the infants had been most improperly fed, and that there is a great deal of ignorance respecting the food on which infants should be reared. For instance, a child one month old at death had been fed on Neaves' food for three weeks previously; another had been given suet puddings, potatoes, and "everything the same as the parents;" another was fed on raw eggs and bread and milk; while a fourth had been nursed by his mother, who weaned him, and then for only a week, in order to suckle her newly-born infant.

With examples such as these before me, I am not astonished to find that there were in England in 1880—the latest year for which returns are available—

18,578 deaths from Diarrhœa and Dysentery, and
18,486 „ „ Convulsions.

In addition to these there were

20,125 deaths from Atrophy and Debility

for whose causation improper feeding is much accountable. In all there were 57,189 deaths, very many of which were undoubtedly caused by the ignorance of mothers respecting the nurture of their infants.

Some of these from convulsions may have been caused by teething, but teething being a natural process, rarely alone causes death. Personally I have never seen a case of which I could positively affirm "teething caused this death."

In confirmation of this opinion let me point out, on the authority of the Registrar General for Scotland, that whereas in England 35 infants out of every 1,000 die from convulsions, only six die in Scotland. Commenting on this fact he says "there is, therefore, something terribly faulty in the present mode of feeding infants in England, and there is the most urgent necessity for something to be done to arrest this fearful waste of life . . . . . for if the English mortality were reduced to the Scotch standard, 17,000 lives would be annually saved to England. These 17,000 infants . . . . . are truly lives wasted, and these deaths are truly preventable deaths. There cannot be the slightest doubt that the high mortality among the nursing children of England is due to the fact that they get spoon meat far too early in life, before the stomach of the tender babe can digest anything but the mother's milk." And then the Registrar General points out that "As a general rule no spoon meat of any kind is given to infants in Scotland

until nine months from birth are expired, or until the child has cut his front teeth."

Facts such as these demand our most anxious thought to devise some means to save such a large proportion of the infantile life of the country, through erroneous feeding.

Ignorance and neglect of the simplest facts of hygiene are also factors in the mortality of infants. It is from this cause that many of the diseases which arise from filthy surroundings arise.

A great essential of an infant life is pure air, yet it is really astonishing to find how generally the custom prevails of covering up the child's head in bed, whether lying with its mother or in its cradle. Strange perversity of custom that the very mother, who will heedlessly expose her child to cold when in her arms, will also adopt the extreme opposite plan of covering it too carefully when in bed! She smothers him with bedclothes, so that if in bed with her, the infant is compelled to inhale the exhalations from the parent's skin, in addition to its own already respired breath. The mother is ignorant of the fact that she is all the time making a miniature Black-hole of Calcutta of her bed or of the cradle.

From suffocation alone there were 1,282 deaths in 1880, and there can be no doubt that the greater portion of these was caused by either suffocation from bed clothes or overlaying.

Filthy air is a common occurrence in the rooms of the working classes. The window does not open, and the crevices between the sashes are sealed with paper, the chimney is stuffed, or the fire-place is boarded over, and even the key-hole is closed to keep out the cold. The uneducated do not understand much about the necessity of ventilation. In their rooms we find the debilitated, pale-faced, consumptive child, while others fade away before they have reached the end of their first month.

Dr. Clarke, of the Rotunda Hospital, Dublin, places on record in 1783, that during twenty-five years there were 18,000 infants born in the institution, of whom 3,000 died in the first fortnight, or 15·5 per cent., whereas, afterwards, when the hospital was ventilated, out of 15,072 infants born alive only 530 died, or 3·9 per cent.

Now it can hardly be questioned that a cause which proved so fatal in a large hospital will also be proportionately fatal in the homes of the people, more especially when overcrowding is present. But when this last-named evil exists we may generally look for two others, namely uncleanliness of person and uncleanliness of the house. Amidst such surroundings as these it will be a rare sight to find a clean baby. Yet newly-born children require perfect cleanliness, and the morning bath is

almost as requisite as its mother's milk. Nevertheless this bathing is sadly neglected among the poor, and more especially in the large towns, where dirty children are not unfamiliar sights to our eyes.

Dirt is the truest and most constant ally of disease, and where it leads the way the other surely follows. The mere influence of filth causes children to die at three or four times a greater rate than the standard. In filthy homes and in filthy districts we will find zymotic disease in its deadliest forms, and there we will find those diseases whose main characteristics are diarrhœal.—(*Seaton.*)

When in practice in the South of England, I attended a woman in three confinements, and in each instance her child, although born quite healthy, withered away within a week. The only cause to which I could ascribe these deaths was the filthy condition of the house, in which the very air seemed rancid, even with the windows open to their fullest extent.

Exposure of Children to Infection.—There is another and a most unnecessaay, cause of many deaths, a cause that is solely attributable to the carelessnesss, the rashness, and the ignorance of parents. I allude to the exposure of infants to infectious complaints. It is a usual practice for a mother, taking her child with her, to visit a friend or neighbour whose child, or other member of the family, is ill with some zymotic disease; to sit with her while in the sick room for company, or in case of death to condole with her. I have seen such an occurrence scores of times myself, where measles, scarlet fever, typhus, and even small-pox were present. Some women, it is well known, do this designedly in the case of measles and scarlet fever, believing it is best for the infants to be attacked with these ailments when young. Others treat the matter in a fatalistic manner, and say that if a child is destined to be attacked, it will be attacked when the proper time arrives, and not a moment sooner or later.

I have seen most culpable carelessness on the part of mothers in placing their infants in bed with a brother or sister who was stricken with an infectious complaint. Sometimes this is done thoughtlessly, but often with the deliberate intent that the child might catch the infection, so that at a future period she may be saved the trouble of another nursing. I wondered at their foolhardiness, but can hardly ever wonder again since recently I read in the public press of a populous city a letter from a medical man, advocating, or at all events upholding, the practice of exposing children to light cases of measles or scarlet fever. I trust no people will follow his very questionable practice. Let them recollect that though the disease may be light, yet that it does not necessarily follow that the new attack may be

mild also, and that *it might* end fatally. And let them recollect too that, though the fever in itself may turn out to be as the parents desired, there are consequent diseases affecting the kidneys, and other parts, which may leave the children cripples for life.

Perhaps the most heedless risks of all are incurred in the case of whooping cough. Mothers who would sooner cut off their hand than expose their infants to the blighting influence of scarlet fever or smallpox, will, without hesitation bring them into the presence of whooping cough.

There is no sight more painful than a little frail speck of humanity straining and struggling with this complaint. Its little eyes seem to burst from their sockets, the veins in the chest, neck, and face are turgid, and the face itself is purple and bathed in profuse perspiration. The throes of the child are agonizing, and his suffering must be great. The number of deaths from wooping cough annually is about six thousand, many of which are as truly preventable as the accident to ship, the train, or the pit.

Baby Farming.—Baby farming, "the vilest trade that human malignity could have invented," according to a distinguised judge, and one of "the seven curses of London," according to a recent popular writer, is the cause of numerous deaths. One wonders why it is allowed to continue. It should be repressed altogther, or else a more rigid inspection should be made of all houses where children are farmed. For many years past shocking cases of the ill-treatment of children have continually been cropped up, and yet there is nothing done.

The law requires amendment so that the Infant Life Protection Act should cover the case of single infants. At present there must be more than one child received by the farmers before the Act is operative. Meanwhile it is possible for mothers to have their children, who are mostly illegitimate "murdered in single file," murdered, not by a blow, or by a cut, but murdered by improper feeding, murdered by improper clothing, murdered by filth, and murdered by every other kind of neglect.

Hereditary Disease.—I am afraid hereditary disease as a cause of infantile deaths can never be reached until that Utopian time come when the phthisical and others afflicted with constitutional complaints shall cease to intermarry, and when all men and women shall be virtuous, and when drunkenness shall be unknown.

Immorality amongst parents causes the deaths of about 2,000 infants annually, and doubtless there are many more who pay the penalty of their parent's transgressions. Tubercular

Meningitis destroys about 3,000 babes every year, the excesses of the parents becoming a curse to the guiltless children who so recently struggled into life, and who are now relegated to the silent slumbers of an early tomb. Drink, the curse of our country, which so often brings ruin to the home and infamy to the mother, in these cases brought death to the children.

Only three weeks ago I was at a house making inquiries relative to a death from diarrhœa. The room in which the parents lived was most filthy, and in it were the parents and another woman who lived in the same house. I questioned them relative to the time at which the deceased had been first seized, but could obtain no intelligible replies, so that at last I wrote across the page of my note-book devoted to the case, "too drunk to give any information." Within a fortnight I was again in the same house relative to another death from the same cause, but this time it was the child of the woman who was with the other parents.

Midwives.—Every medical man whose practice lies among the artizans is aware that only a comparatively small proportion of them avail themselves of medical skill. They employ midwives, who, as a class, are unskilled, ignorant, and very conceited. When a child is born who does not cry, or who on the application of their rough treatment gives a gasp, and no more, they place him aside, and say he is still-born. If a medical man were present, or if a higher standard of midwives were insisted on, many of these lives would not be martyred by unskilled hands.

Something, too, is required to be done with respect to the registration of still-born infants. At present it is very easy to get them buried. A certificate from the nurse to the burial authorities is all that is needed. It would be well if as at Boston, U.S., these certificates were first submitted to the Medical Officer of Health for his approval, so that a vigilant watch might be kept on all midwives. Dr. Farr is of opinion that something ought to be done, and states that the only cause assigned for their not being registered is that it is difficult to distinguish them from abortions and miscarriages.

Conclusion.—In concluding this paper, the question arises, What can be done to lessen this mortality? I have hinted that the law regarding baby farming requires amendment, and that the registration of still-born infants should be enforced.

As regards hereditary disease, I can only say that people cannot be made virtuous nor the drunkard turned into a sober man by Act of Parliament.

But as regards those large classes of disease that are induced by ignorance, I think something might be done.

Our working population need instruction. They should be more looked after than they are. Greater efforts should be made to impart information to them by means of lectures and addresses on health subjects, not delivered in large halls, which, as a rule, are distant from their homes, but in small school-houses, or other places in their districts. Philanthopic societies, especially ladies' societies, are required to bring the "gospel of health" into their homes. Women can do much with women. This is eminently a woman's mission, but one which is a trying one in our large towns. Yet much can be done, and thousands of lives can be saved, as truly as that the ship would have floated if her ports had been closed, and the train saved if the engine driver had been more careful. In the saving of lives from convulsions alone there is a noble mission.

But this should not be all. Our young population should be taught the rudiments of Sanitation in our schools, more especially in our Board Schools. They might be shown the value of cleanliness, the necessity of pure air, the evils of improper clothing, the difference between wholesome and unwholesome food, and other subjects of a similar character. Far better to do this than to spend money on the higher class education that so many School Boards at present seem to aim at. I believe the well-being of the future generation is largely in the hands of our Board Schools, and as they now embrace or neglect the opportunity of teaching the elements of hygiene, so will that generation be in a far better, or only in a similar condition to our own.

It can do no harm to try the experiment, and it may, and I believe would, do incalculable good.

Let them be taught that they are the gardeners of their own bodies, and also of those little infants who will by-and-bye be entrusted to their care; and that as these bodies are treated well or ill, so will they bud into a sturdy infancy, blossom into the vigour of adult life and bear the fruit of hale old age, or drop from the tree of life as a prematurely withered leaf.

Mr. H. E. Armstrong, M.R.C.S., moved a vote of thanks to Dr. Harris for the paper he had read, and which he was sure they had all listened to with satisfaction. If Mr. Harris had dealt with an oft-told tale, he had dealt with it well, and it was one which could not be told too often.

Dr. Ward seconded the motion. He said that as medical officer for a large district, he could endorse all Mr. Harris had stated.

The vote of thanks was then carried.

On "Bread Reform," by Miss Yates, Hon. Sec. Bread Reform League.

The relation between food and the progress of the human race is so great that it may truly be considered the foundation of national prosperity and welfare.

The *desire* to obtain food is one of the strongest motive powers which incite to industry the human race. To satisfy the pangs of hunger the earth is cultivated, and the exchange of the products of different countries has created the complicated system of modern commerce, with all its manifold political and social influences. On the other hand, the *choice* of various foods exercises an immense influence on the physical and mental character of different nations. Air and water must be included in the general term of food, for they both nourish the body and sustain life to such an extent that it can be maintained on them alone for a very long period, but deprived of them it is very soon terminated. *Pure* air, *pure water*, and a properly selected diet are necessary for healthy life; and it is generally acknowledged that if these essentials could be universally obtained, most of the diseases which afflict the human race would rapidly disappear. When food plays such an important part in the welfare of mankind, a true knowledge of its properties should be widely taught.

It is to be hoped that this will soon be considered as essential a part of education as "reading, writing, or arithmetic." An educator means one who leads, and surely a State, which has undertaken the responsibility of educating or training the young for the battle of life, ought to teach what is essential for their future welfare.

No one who considers the subject can doubt for a moment that the knowledge of how to obtain health is of primary importance to every one, but for the working classes this subject is most essential, for health is their sole capital. The subject of the right choice of food is for them of the utmost importance, for although sanitary houses and healthy occupations may at present be almost beyond their reach; as they can choose their own food if we can only teach them to adopt what will nourish the body most completely at the least cost, there will be a chance of their resisting the injurious influences constantly surrounding them.

In these days of high pressure and mental strain it is well to

remember that to build up healthy bodies is a more precious gift than education and that—

> "It is food which sends out those supplies,
> Which make us both strong and wise.
> If you would improve your thought,
> You must be fed as well as taught."

Surely it is disgrace to our boasted civilisation that whilst farmers have learnt what mixture of fodder will enable them to obtain from their cattle the greatest amount of meat, milk, wool or work, that there should still prevail such dreadful ignorance on the right choice of human food when deficiency of proper nourishment during the period of development and growth may cause much suffering and produce many diseases which might easily have been avoided.

Food is taken into the human body for the same reason as you put coals into an engine to produce the force which moves it. An ordinary engine, however, gets worn out, and you are obliged to have it mended, but the human body has the power of repairing the waste caused by work. Every movement, every thought, wears away a certain portion of the human body. It is, therefore, necessary that the food should contain materials to replace this constant waste. Three classes of materials are required to maintain life, namely, flesh-forming materials, such as albumen, fibrine or gluten; heat-producing materials, such as fat, sugar, and starch; and bone-forming or mineral materials; any single one of them alone will not maintain life. If you feed a dog on heat-producing material alone, such as starch or butter, it will die of starvation.

If you feed it on meat, from which the mineral part has been extracted by soaking it in cold water, the dog will die, just as surely as if you gave him nothing. So that, to maintain life, it is absolutely essential that the food should contain these three materials—flesh-forming, heat-producing, and bone-forming materials—in right proportions. An ordinary mixed diet, of bread, meat, and vegetables, supplies them all; but the present high price of meat prevents thousands of people, especially children, from ever tasting it. As bread is, therefore, almost their sole food, it is of the utmost importance that it should approach as nearly as possible to a standard food. Experiments, made by Drs. Gover and Majendie, prove that white bread alone will not sustain life; for dogs, fed on it, died at the end of forty days; whilst those fed on whole wheat-meal bread throve and flourished.

It is a mistaken idea to imagine that white bread has been

long and universally adopted. In the present day, brown bread (not, however, the sham mixture of white flour and coarse bran prevalent in England, but good whole wheat-meal bread) is used by a very large portion of mankind. There are numerous instances of races of people being healthy and vigorous without ever touching meat, when their principal food is good brown bread. The reason for this is, that it contains, in almost the right proportions, those materials which are essential for the maintenance of life—namely, flesh-forming, heat-producing, and bone-forming materials.

In the olden days—although white bread was always used as a luxury by the rich, who had plenty of animal food—the poor, who could rarely obtain meat, lived principally on brown bread.

In Wilke's "Encyclopædia," published in 1810, wheaten bread is described as made from flour from which only the coarse bran has been removed; whilst household bread, or the bread of the people, is described as that which is made from the whole of the grain.

I have been told that in Northumberland it is only within the last thirty or forty years that white bread has been generally adopted in that county; whilst in Devonshire many informed me they could remember when the Devonshire farmers baked a loaf of white bread as we should provide a cake for an honoured guest, and then never baked another for two or three months. It may therefore be considered certain that during the last hundred years a very considerable change in diet has been made by the English people; for during this period they have discarded the bread which had been their principal support during hundreds of years. Meat has more than doubled its price during the last thirty years. Trade and agriculture are in such a depressed state that it is impossible for the working classes to obtain a sufficient amount of animal food. They are therefore almost entirely dependent upon bread to maintain them in health; and the bread they have adopted is one from which a large portion of the flesh-forming, and nearly all the bone-forming, materials are extracted.

It is therefore not surprising that there should have arisen considerable scientific discussion on the physical deterioration of the English race. In an article which appeared in the *Lancet* on this subject, it was stated that our town population, "deprived as they are of fresh air and healthy exercise, combined often with an improper and inadequate supply of food, and consequent resort to artificial stimulants. Such people are growing up under circumstances which can only lead to one result, namely, that of defective development." It is an undoubted fact that there exists an immense number of sickly, stunted, and

ricketty children, whilst on all sides we hear complaints that the teeth in the present day are very defective.

The examination of a diagram of the grain of wheat as seen under the microscope will enable you to understand the difference which exists between white flour and what we call wheat-meal. The centre part is occupied with large thin cells, principally filled with starch, the heat-producing material of wheat. Beyond the central starchy mass is a single row of squarish cells, filled principally with gluten, which is the flesh-forming material of wheat.

Beyond these square cells are five thin skins, which form the part called bran. These skins and the germ situated at one end of the grain, contain soluble albumen, a flesh-forming material; cerealine, a ferment which assists the digestion of starch, vegetable fat, and the phosphates which form bones and teeth, and nourish the brain and nerves, and a certain proportion of fibre, about 2 per cent. of the whole grain.

White flour contains from 8 to 10 per cent. of nitrogenous material, whilst whole-meal contains from 10 to 16 per cent. A slight objection has been raised against our movement on the score that the nitrogen of white flour is in the shape of gluten, similar to the fibrine of meat, whilst the nitrogen of the outer portions contains a small part of non-albuminoid (similar to the gelatine of meat), and that the rest is in the condition of soluble albumen and cerealine. These theoretical objections are in no way proved by practical experiments on human digestion, whilst most eminent physiologists state that albumen in food is quite as essential as fibrine. From the fact that albumen is present in the typical foods (milk and eggs), whereas fibrine is absent, the albumen would appear to be of greater importance. The *Lancet* states that Ranke shows very clearly that for the absorption and application in the economy of non-nitrogenous food a certain amount of albumen is absolutely necessary. Its presence, therefore, in wheat-meal bread can be no disadvantage, and is probably most essential. Dr. Pavy states that wheat-meal bread acts as a stimulant to the digestive organs. It has been brought to the attention of the League that people find they can digest fat much better since they have adopted good wheat-meal. If this experience is corroborated wheat-meal bread may prove of good service as a prevention against consumption and other diseases where there is a difficulty in assimilating fat. But the most important difference between whole-meal and white flour is the large proportion of mineral substances that whole-meal contains. The part the mineral elements of food play in the nutrition of the body has only of late years been properly understood.

Mineral substances constitute about one-third of the solid materials of the body. The mineral elements in food are essential for the digestion of the other substances. Dr. Letheby observes: "Bread which does not contain the right proportions of nutritive salts is not properly digested, and passes through the system without any advantage."

The immense importance of these mineral substances will be realised, when it is known there is good reason to Believe that their absence or presence in insufficient quantities (either from diminished supplies or imperfect assimilation), will not only make children liable to suffer from bad teeth and rickets, but is also considered to be one of the pre-disposing causes to the fearful scourge consumption.

With reference to this subject I should like to direct the attention of the Congress to and obtain the opinion of the medical men present on a statement contained in a book on "Phosphates in Nutrition," by Mr. M. F. Anderson (published in Coventry). It is there mentioned that after death from starvation, although the body presents the same emaciated condition as after death from consumption, there is a very striking difference in the constituent parts of the tissue. After death from starvation the mineral elements of the tissue are said to be in excess of the normal healthy standard; after death from consumption the percentage of mineral elements is said to be below the normal healthy standard. I don't know if this is corroborated by other experiments, but if true it is a strong argument against the folly of discarding, by costly artificial processes, the mineral elements stored by nature in the grain of wheat. One pound of white flour only contains 49 grains of mineral matter; whilst one pound of whole-meal contains 119 grains. Professor Church states that in 100 lbs. of white flour there is only half a pound of bone-forming material, whilst 100 lbs. of whole-meal contain two pounds of bone-forming material. Every one who keeps poultry knows that unless they are given lime in some form they lay eggs with soft shells, because their food does not contain the materials requisite for making shells. If you attempt to feed children on food deficient in bone-forming materials the bones and the teeth must suffer, for you cannot form bones and teeth out of nothing. Another important advantage of wheat-meal is the large proportion of phosphoric acid it contains, one pound of wheat-meal containing 57 grains of phosphoric acid, whilst one pound of white flour has only 21 grains.

This element is so essential for mental work that a celebrated German has observed, "No phosphorus, no thought."

It is useless to send children to school and examinations

unless their food will so nourish their brains that they may derive benefit from such instruction.

The interior of the grain is nearly all starch; the flesh-forming materials increase as you approach the outside, whilst the bone-forming materials are nearly all on the outside.

Fine white bread is made from the central starchy part; household bread contains more of the flesh-forming material, but the truly valuable remainder, which is so rich in flesh and bone-forming materials, is sold to feed cattle, a great waste, for cattle can be fed on many things not available for human food.

In the manufacture of white bread the millers reject from 20 to 25 per cent. of the most valuable part of the grain. Ordinary brown bread is made from the sieved white flour and a sprinkling of the outermost coarse bran, which has very little nourishment, being nearly all woody fibre. Ordinary whole-meal contains all the nourishment of wheat, but it is ground so coarsely that a very large number of people cannot digest it.

Wheat-meal bread should be made from wheat-meal, which after being thoroughly cleansed from the beard, dirt, chaff, &c., is ground, as advised by Dr. Campbell Morfit, in a quasi-granular form, fine enough to all pass through an 18-mesh sieve. Professor Church states that there is no reason, on chemico-physiological grounds, why the whole of the wheat grain should not be digested by the ordinary healthy digestion. It is the mechanical or physical state produced by a bad system of grinding which prevents the ordinary wheat-meal being assimilated by many persons. Dr. Edward Smith says that when finely ground the mechanical irritating effect of ordinary whole-meal is remedied, and the particles so exposed to the action of the gastric juice that the stomach appropriates nearly all the nourishment.

When *properly prepared* the small percentage of fibre (2 per cent. of the whole grain) is advantageous for the majority of mankind, and remedies the constipating effect of white bread, for Dr. Beddoe states, "a moderate percentage of indigestible matter of quality otherwise suitable, is rather beneficial than otherwise to the average healthy adult." For delicate digestions it is advisable to remove the outermost fifth skin of bran, which is nearly all woody fibre. When properly made wheat-meal bread is most palatable and digestible, and so different to the ordinary coarse, hard, heavy, whole-meal and brown breads, that innumerable instances prove that people soon prefer it to the insipid over-fermented white bread generally sold, and find their health improved by its use, and that it sustains and nourishes better than white bread does, and that a larger amount of work can be done on it alone than on white bread, This bread ought to be considerably cheaper than white bread. and contains so much more nourishment, that if you had only 3s. to spend in bread, if you bought wheat-meal bread you would obtain as much nourishment as from the expenditure of 4s. in white bread, a saving of 25 per cent. besides a great improvement in family health and diminished butcher's bills.

When these facts are understood it will be realized how necessary this bread is for those who have little to earn and many to keep.

All classes of society should, therefore, consider this subject. The statesman, who wishes to maintain the nation in that health which is the truest national strength and wealth; clergy, and all interested in the poor, who should remember that an ill-fed nation is never a wise or a virtuous one; whilst, if ladies would remember that the word "lady" means "loaf-giver," they might exercise a woman's right which no one could refuse, by securing to their poorer sisters a true staff of life—instead of the broken reed they now lean upon. When it is realised that thousands of children will grow up sickly and deformed, unless some change is effected in the bread which is almost their sole daily food, our cause must appeal to every one who has at heart the good of their country. We earnestly beseech you to listen to the cry of these helpless children; and, for their sakes, for the sake of the poor children, who are ill-nourished, from being fed on impoverished white bread—and not too much of that—rarely tasting meat food, whilst the materials containing the phosphates and bone-forming substances, which their bodies require, are recklessly and wickedly wasted and cast away: for their sakes, let me beseech each one of you to do everything in your power to promote the general use of wheat-meal bread, as a means of assisting the rising generation, at a small cost, to grow up in health and strength, as they will do if they have a true "staff of life" to sustain and support them.

The Chairman said that they had listened to an address couched in delightful and beautiful scientific language, and he complimented Miss Yates upon the beauty of her address. He trusted that her perseverance would meet with the success it deserved.

Captain Hildyard proposed a vote of thanks to Miss Yates for the reading of her paper.

Professor F. de Chaumont, F.R.S., in supporting the motion, referred to the able and excellent way in which Miss Yates had brought

forward her paper, and said that the subject which it embraced was, in his opinion, a very important one. Referring to the bread, he said that with regard to the outer parts, he thought he should feel inclined to advise that they should always be removed, because, besides being tough, they contained a certain amount of silica, which proved extremely irritating to persons of delicate constitutions, especially to children. With regard to the other points, he said he could only cordially agree with what Miss Yates had said.

The motion was then agreed to.

Miss Yates, responding, said that what she meant to convey was that, for the majority of people, if the wheat was thoroughly cleansed from the beard, dirt, foreign seeds, &c., and ground very fine, the outer part would do. It was so much easier to get the whole grain ground fine, that, if persons could digest it, for the sake of their getting the other portions, it was better for them to do so. She thanked the Section for the vote they had passed.

SECTION II.

ENGINEERING AND ARCHITECTURE.

ADDRESS

By Prof. Henry Robinson, M.Inst.C.E.,

VICE-PRESIDENT OF THE SECTION.

An address to the section of this Congress which deals with "Engineering and Architecture," might be devoted to technical details that would only interest experts. It is however thought that the objects which the Sanitary Institute of Great Britain have in view will probably be better served if some of the broad principles that govern the question of house sanitation, water supply, and sewage disposal, be touched upon with the view of recording the points on which there is a general agreement, and of indicating where changes are called for.

There will be no attempt to introduce novel ideas, as existing data afford ample opportunities for the skill and energy of engineers and architects. To those non-professionals who may hear or read these remarks, it is suggested that they, too, should require nothing novel to attract their attention, as it is considered that the reference to a few facts as to what is occurring every day will afford sufficient food for thought.

The Institute aims not merely at the advancement of technical sanitary knowledge by promoting collections of useful appliances such as those which are brought together in this town, but it also desires either to create or to increase an interest in the public mind with reference to matters affecting health, and thus to secure sympathy and co-operation far and wide.

The work of any institution like this naturally commends itself to the public mind, as it is helping to carry on the great work of sanitary improvement which has already accomplished so much in the direction of diminishing the death rate in the kingdom, and of reforming sanitary evils where they existed.