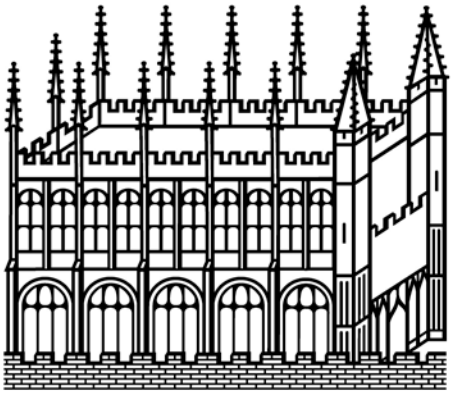


THE

"LAWS OF CHOLERA;"

REPRINTED (BY PERMISSION)

FROM "THE TIMES."

WITH

AN INTRODUCTION

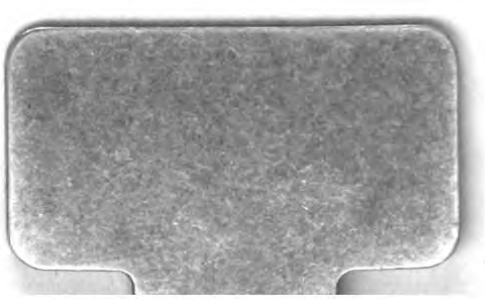
AND SUPPLEMENTARY MATTER.

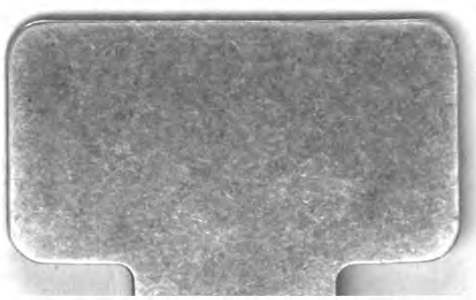
LONDON:

CHARLES KNIGHT, 90, FLEET STREET.

PUBLISHER BY AUTHORITY TO THE POOR LAW BOARD AND THE BOARD OF HEALTH.

Price Eighteenpence.





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1854.

LONDON:
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INTRODUCTION.

It is now more than twenty years since this country experienced its first invasion from Asiatic Cholera; when its causes, nature, and treatment, were altogether unknown, except to the medical officers who had witnessed it in India, and those who had profited by their experience. Since that period, as might have been expected, it has been discovered that this epidemic, like every other form of epidemic disease, has lost much of its mysterious character, and is subject to conditions which regulate its appearance, its progress, and its departure, and which call for the study of all who are anxious to escape the calamity in their own persons and families, and to assist in saving their country from the scourge, or mitigating its force.

There are many persons who think they render the greatest homage to the Supreme Ruler, by contemplating the cholera and other epidemics as ministers of the Divine vengeance, having a special mission to execute in certain places, and then to pass on to others in a prescribed course which no human agency can avert or arrest. It is much to be lamented that inquiries into the physical causes

of cholera have been rather deprecated than encouraged, from the impression that investigations of this nature were wanting in that humility and prostration which are appropriate to the visitation. Dogmas of this character, while they have a tendency to paralyse the exertions which society should make for its security, do very little honour to the character of a Wise, Just, and Benevolent Ruler over the affairs of men. The investigations which have been conducted within the last twenty years into the causes of epidemic disease, have resulted in the most satisfactory demonstration of the truth, that, whatever may be their moral causes, they are traceable to conditions which are subject to human control, and that they disappear as those conditions are removed. Leaving it to others to interpret these pestilential scourges on higher principles, the writer of the following papers has endeavoured to prove that the mission of this destroying angel is, to show the connection between physical impurity and deadly disease, and to summon individuals and governments to the grand work of sanitary reformation.

One of the greatest obstacles in the way of the intellectual and moral progress of society, is furnished by the uncleanly habits of large classes of the community. Children are too filthy to be sent to school, the hovel is so sickening that the religious instructor enters at the risk of his life, and the clergyman goes to minister his last consolatory lessons under the fear that he may fall a victim to pestilence, or carry home some deadly infection to his family. There is a known ratio between domestic impurity and moral crime. In 1843 Mr. Chadwick

called for Returns from Ireland, showing the ratios of crime in those counties in which there was a large portion of smoky mud-hovels, as contrasted with the counties in which such hovels were few. It was discovered that in 4 counties where the average proportion of mud-hovels as habitations was the lowest, the proportion of crimes of violence was 32 against 72 in those counties where the proportion of mud-hovels was the greatest. In the first class of counties, also, the crimes of passion were at the rate of 17 against 44 in the second class.

It is, therefore, leading people astray to speak of the cholera as a mysterious visitation, whose causes are unknown, and whose movements are unaccountable, when we can indicate the nest in which it was hatched, and predict the probable course of its flight; and, more than this, can indicate the healthy scenes it will leave untouched. The proper lesson to inculcate at the present season, is the duty of acting in harmony with the Divine laws, by fixing on healthy localities for human habitations, and using all available means to keep them so; or, if they have become the abodes of pestilence, then to restore them to a natural and healthy state.

Seasons of great mortality and disease naturally invite to serious meditation and the invocation of Divine protection and deliverance. If, however, we have discovered the immediate cause of the calamities we deplore, there is more good sense and active piety in labouring to remove them, than in soliciting the authority of Government to try the virtue of a national fast.

The ministers of religion, who derive their wisdom from the Scriptures of the Old and New Testaments, have not to be reminded that precepts enjoining personal cleanliness, the use of wholesome kinds of food, the avoidance of disgusting sights and pernicious smells in the camp, and the demolition of leprous houses in the city, were bound up in the religious code of the Jews; while the "divers washings," besides the higher lessons they taught, most intimately associated sanitary measures with religious rites. So closely were these things associated, that the priest of religion was really the officer of health, as every minister of Christianity should be in the present day. The highest state to which religion raises its subjects, is represented by purity, while the opposite condition is that of the "unclean."

While the amount of attention given, by individuals and by public bodies, to the work of sanitary reform is far from adequate, it is at the same time gratifying to contemplate the progress that has been made since 1833, when the attention of Parliament, and of the country, was particularly called to this most important subject by the Report founded on the Poor Law Inquiry. That Report presented the following important statements, on the authority of Mr. Chadwick, the witness whose answers are given being Mr. Charles Mott:—

"'From the statements of medical men in the metropolis, and also of such persons as Dr. Kay, of Manchester, it appears that, in consequence of the want of drainage of certain districts, and the

crowded and dirty state of the habitations, there are some neighbourhoods from which disease is never absent.'—'Have you observed similar effects in the parishes with which you are acquainted?' —'I have observed it, not only in Lambeth, but in all crowded neighbourhoods; and, seeing how large a source of unavoidable pauperism this is, I have long regretted that the proprietors of these small houses were not compelled to keep them in a proper state. An independent labourer may be industrious and provident, and yet both he and his family may be subjected to a fever, or other disease, and thrown upon the parish, in consequence of want of drainage, and filth, and other causes, which he has no means of removing.'— 'So that, looking merely to the poor-rates, it would be good economy to pay attention to drainage and the enforcement of sanitary regulations?' —'I think so: and that it would be attended with great benefit. Some neighbourhoods are so constantly the seats of particular diseases, and sources of pauperism from that cause, that if assistant overseers, and others accustomed to visit the abodes of the poor, were asked for cases of those diseases, they could direct you to particular places where you would almost be sure to find the disease at work. I remember that, one winter, when the weather was very severe, the beadles of Newington parish were directed to pay particular attention to the sick out-door poor. They went at once to some courts in Kent Street, as a matter of course, without making any inquiry (just as a gamekeeper would go to a well-stocked preserve); and returned

with two coach-loads full of most deplorable objects, the victims of frightful disease.'"—(p. 316.)

Since the above period, by means of voluntary effort, and by the exertions of the government, a considerable improvement has been effected in the sanitary condition of London and many other cities and large towns, and the work of sanitary reformation is acquiring an impetus which it is most important to sustain and increase.

One of the most effectual measures for the improvement of the public health, was the establishment of Baths and Washhouses, the origin of which is thus referred to in the Report on the Sanitary Condition of the Labouring Population (1842). "A few years since a gentleman observing some ditches in London, in the neighbourhood of the City Road, smoking with clean hot water, running away from the steam-engine of a manufactory, directed attention to the waste, and suggested the expediency of using that water to supply public warm or tepid baths. After a time, the suggestion was acted upon as a private speculation, and large swimming baths were constructed."* This example has been followed by the establishment of public baths and washhouses, not only in London, but also in Liverpool, where there are two establishments; in Hull, Bristol, Preston, Birmingham, Maidstone, Belfast, Dublin, and other places. The London establishments are in Whitechapel, St. Martin's-in-the-Fields, St. Marylebone, St. Margaret and St. John West-

* A common lodging-house, in Saffron Hill, announces the accommodation of "hot and cold baths." This tells a good tale.

minster, Greenwich, St. James Westminster, and Poplar, besides the establishment in the Hampstead Road.

The following statement shows the steady increase of Bathers and Washers in London. It was published on the 17th of January this year.

The aggregate numbers at seven establishments in the Metropolis, from January to December 1852 inclusive, amount to 800,163 Bathers; 197,580 Washers.

Corresponding period of 1851, Five Establishments:—647,242 Bathers; 132,251 Washers.

Corresponding period of 1850, Three Establishments:—509,200 Bathers; 60,154 Washers.

Corresponding period of 1849, Two Establishments:—297,831 Bathers; 9,070 Washers.

Corresponding period of 1848, One Establishment (Goulston Square, Whitechapel):—48,637 Bathers.

Showing an increase in 1852 over the corresponding period of 1848 of 751,526 Bathers, and 197,580 Washers, and an aggregate in five years of more than 3,100,000 Bathers and Washers.

The figures in the foregoing statements are irrespective of the Bathers and Washers at the George Street Establishment, which is not conducted according to the Acts.

It is needless to comment on these facts, as it would be difficult to estimate the extent to which they have contributed to the health of individuals, the comfort of homes, and the amount of moral as well as material good, of which they are the index. The "statement of proceedings" justly affirms that

"the virulence of disease must have been lessened and its progress in many cases checked," and "the increased cleanliness of so many families, and its attainment without the annoyance and discomfort (felt by working men especially) of washing at home, have improved the social condition of all, who have now, almost for the first time, enjoyed the advantages of cleanliness."

By a recent improvement in the method of drying in the washing establishments, a temperature is maintained, ranging from 130° to 140°, with due attention to economy of fuel. This high temperature is found to be "indispensable to the proper purification of the linen of the poor, and especially for that of the towels which have been used by the lowest class of bathers; for, even after they were boiled, it was found to be absolutely necessary to expose them to a high temperature to deprive them of all ill odour." The interesting and important fact is added, that "this temperature secures the destruction of insect life. Some *vermin survive being boiled, but their eggs are destroyed by exposure to a dry heat.*"

The parochial authorities of every large town in the kingdom ought to aid this important work, and their attention is particularly called to the publication of the "Statement of the Proceedings of the Committee of Baths and Washhouses," and to its valuable "Appendix." It is a disgrace to some of the large towns of Great Britain, and the large parishes of the metropolis, that they have not secured to the poor the great advantages which a little true philanthropy would place within their reach. It should

be observed, that the favourable reports made of these establishments to other countries are leading to their adoption in France, Turin, Venice, Lisbon, Hamburg, Munich, Amsterdam, and New York.

The next important movement in favour of sanitary improvement, was the establishment of two kindred Societies for Improving the Dwellings of the Industrious and Labouring Classes. Dr. Southwood Smith presented, lately, some striking statistics, in illustration of the recent experience of one of these Institutions, during the last year. "It appears," he stated, "that these improved dwellings for the poor have been occupied between five and six years; that during the first year there was a decided diminution in the comparative mortality of the residents, both adults and infants; that this diminution was still more marked in the second and third years; that the improvement has been steadily progressive up to the present time; and that now the results so far exceed reasonable expectation as to be almost beyond belief. Yet they rest on the clearest evidence of facts.

"In the Metropolitan Buildings, Old Pancras Road, for example (which contains a population of 680), the deaths during the last year have been 9, being in the proportion of 13 and a fraction out of 1000 of the living; but the total population of the whole of the Society's establishments, taken together, amounts to 1,343, out of which number there have been only 10 deaths, being at the rate of 7 and a fraction in 1000. The total deaths in the whole of the metropolis reached, during the same period, 22 and a fraction in 1000; so that

the total mortality in London was three times greater in proportion than in these establishments. It appears further, that of the total population (1,343) 490 are children under 10 years of age. Of these 5 have died, being an infant mortality of 10 in 1000; whereas on an average of 7 years the infant mortality in the whole of London has been 52 in 1000. So that the infant mortality in these establishments has been not so much as one fifth that in London generally.

"A result even more remarkable now presents itself. In London, the average deaths from typhus and other forms of fever amount to about 12 per cent. of the total deaths. Typhus fever is not the disease of the young, the weak, or the destitute; on the contrary, it is pre-eminently the disease of the adult, the well-nourished, and the strong. It is the destroyer of parents—not of children; and is thus one of the great causes of orphanage, and of consequent pauperism. It has its source in no want of food or clothing; in no condition natural to this climate; in no habits peculiar to the people;—one single word comprehends its main condition, *filth;* and the main source of this filth is the poison-pit, the cesspool. But the dwellings under the Association of which we speak have been provided with efficient drainage, and a good supply of water, while the cesspools have been removed; and the result is, that there has not been a single death from fever in any one of them since they were first opened; and that a barrier has been placed around them which this mortal pest of our towns and cities has not been able to pass."

The experience of the kindred establishment, over which Lord Shaftesbury presides, is of the same encouraging character.

The Report on Agar Town presents the following curious proof of the general good health of the inhabitants of the Pancras Road Buildings :—

"A druggist, concluding that, as a large number of families were collected together at these buildings, it would be a good speculation to open a chemist's shop in the immediate neighbourhood, opened his shop accordingly; but in fifteen months the undertaking turned out such a complete failure that it was abandoned, and converted into a provision shop."

"Similar results have followed the working of the Common Lodging Houses' Act. That Act imposes on lodging-house keepers the necessity of maintaining certain conditions of cleanliness, forbids overcrowding, and directs the police to enforce the law. The town of Wigan may be taken as an example of the result. In this town there are 25 lodging-houses, which have received, during the past year, 29,655 lodgers. The Superintendent of Police reports :—'There has not been a single case of fever in any one of these houses since the Act has been in force.' The town of Wolverhampton affords a still more striking instance. In this town there are 200 lodging-houses, which have received, during the year, the incredible number of 511,000 lodgers. The Superintendent of Police reports :—'There has not been a single case of fever in these houses, since the Lodging Houses' Act has been in force, in July, 1852.' Similar

returns have been received from other towns, as well as from the metropolis; yet before these houses were under regulation, twenty cases of fever have been received into the London Fever Hospital, from single houses, in the course of a few weeks."

There are now 100,000 individuals under the operation of this Act in London alone—a population equal to four or five provincial cities. The police and relieving officers report a diminution of crime as the result of this Act; and the better description of common lodging-house keepers say, though they do not make as much money as formerly, "It's far comfortabler."

"This is surely altogether a success beyond hope, and almost beyond belief. It opens a prospect of the physical and moral improvement of the people, such as before there was no warrant from experience to anticipate; and it points significantly to the means by which this great reform may be completely effected. As a general movement it may still be slow; but it must come, and then the foundation will be laid for other and higher extensions of the principle. This reform must precede all others."

The services rendered to the work of sanitary reform by publications issued periodically from the Registrar General's Office are of the greatest value. The registration of Births, Marriages, and Deaths, furnishes such vital statistics as were never before collected in this country or any other; and to these facts the most ample justice is being done by the officers, whose duty it is to

marshal them, and put them through their evolutions, for the service of the public. The Registrar General does not undertake to distribute medicine or make drains, but he collects light and disperses it, and saves the labourers in the cause of public health from the disadvantage, formerly experienced, of working in the dark. Some idea of the manner in which the labours of the Registrar General are made tributary to the improvement of the public health will be obtained from the following papers, which, however, are not intended to impart any record of the valuable contributions which those labours have made to other departments of science. Every diligent labourer in the work of sanitary improvement deserves the recognition and encouragement of his fellow-labourers. As they persevere in their various departments, the average of life will gradually rise, as, indeed, it is now rising; diseases will diminish in number and strength, and man will not only live longer, but be better fitted to answer the great ends of life.

The humbler classes ought to take a deep interest in this great work, as it practically concerns them, more than any others, the largest proportion of deaths being from among their ranks. The time is coming, and it may be hoped it is not very distant, when the conditions of public health will be well understood by all grades of the people, and when they will unite in repelling all attacks on the general health as earnestly as the members of an orderly and loyal community unite in prosecuting criminal offenders. The government and some great voluntary associations are doing much

to bring about this most desirable state of things; but their efforts to be successful require hearty co-operation on the part of the people, for want of which the work is difficult and its progress slow. It has been frequently asked, whether the cholera will become one of the permanent diseases of the country? To this question the reply is to be given by the people themselves.

The General Board of Health was called into existence, in 1848, to carry out the measures set forth in the Report on the Sanitary Condition of the Labouring Population of Great Britain, in 1842, and which Report was confirmed by the Commissioners for the Inquiring into the Health of Towns in 1844-5. The definition of the powers of this Board occurs in the preamble of the Act by which it was formed, and which says, that "further and more effectual provision ought to be made for improving the sanitary condition of towns and places, and the sewage and drainage, cleansing and paving thereof, as far as practicable, should be placed under one and the same local management and control." The proper work of this Board is to promote the execution of those public works which minister to the public health.

Already—that is, up to the spring of this year—the care of the General Board of Health has been extended to 178 cities and towns. In 105 of these places, surveys have been made with a view to the application of works in progress, and in 70 of them plans have been laid for the adoption of new works founded on these surveys. In 22 large towns and cities, including Dover, Salisbury, and

Ely, plans are laid out for the combined works of water-supply and drainage. In seven towns private and public works have been completed. The completion of such works will add greatly to the convenience and salubrity of all these towns. There will be no longer left any of those cess-pools which are the unfailing sources of poisonous malaria, as the poorest houses will be furnished with water-closets, which will be connected with self-cleansing tubular house drains, and self-cleansing tubular sewers. In all the towns for which sanitary works have been sanctioned, the sewers and drains will be self-cleansing, and will require no extraordinary supplies of water for flushing; and it is a part of this system, that the whole refuse of a town, instead of being allowed to stagnate, and require occasionally the operation of flushing, shall be made to made to "move on," by the orders of the sanitary police, at the rate of three miles an hour.

While the cost to the country for the mainte nance of the General Board of Health is limited to some four or five thousand pounds, the expenditure for the great works undertaken at the instance, and under the direction of the Board, is very considerable, amounting already to 900,000*l.* for the works completed or now in progress, while it is probable that the works required for the whole of England and Wales, will involve an expenditure of four millions and a-half. Great as this sum may appear, it is small as compared with the inefficient systems which have hitherto prevailed, as it is estimated that a sum of not less than

thirteen millions and a-half would have to be consumed for making the old-fashioned brick sewers and drains of deposit for the same extent of country. Hitherto, in order to give a neighbourhood the benefit of a system of drainage, paving, and water-supply, it has been necessary to obtain a Local Act, which, owing to the lawyers' pickings, and the various expenses connected with it, used to cost about £2000; instead of which, a town can secure all the benefits of a Local Act, in the form of a Provisional Order, having all the authority of an Act of Parliament, for about £126. By this arrangement alone, there must already have been a saving to the country, in the case of 178 towns and cities, of about £300,000, all lost to the pockets of various hangers-on, and the loss of which must, very naturally, lead to a good deal of *disinterested* grumbling and dissatisfaction with these "newfangled" ways of doing public business.

The expense of these great sanitary works falls on the public whom they benefit, in such a manner as to convince people that they are treated with justice, instead of being oppressed, as under the *ancien régime*. The average expense at which works have been obtained, under this Act, has been about one penny farthing per house per week for collecting the water of soft springs, and bringing them up to the house. For drainage, one penny per house per week. The private improvement rates, for filling up the cesspools, substituting water-closets, putting in a service-pipe and sink, and draining the house, have been effected for one penny farthing a week. The average expenses of

all these works being twopence three farthings per house per week, much less than the cost of cleaning the common cesspools alone, or the construction and maintenance of pumps.

The inefficiency of public works under the Local Acts is strikingly shown by the Report of the Commissioners of Inquiry into the Health of Towns, who state that, out of fifty towns which came under their notice, in scarcely one could the drainage be pronounced good, whilst in seven it was indifferent, and in twenty-two decidedly bad, particularly as regards the districts inhabited by the poorer classes. The same Commissioners found, with reference to sewage and drainage, that enormous sums have been spent, under legislative sanction, for works which produced little or no equivalent benefit; that ratepayers have been burdened with rates for works which positively aggravated the evils intended to be remedied; and that the expense and failure of works form the main source of distrust and opposition to new works under ordinary or representative responsibility. With reference to works for the supply of water they add, that, out of fifty towns, in only six instances could the arrangements and supplies be deemed in any comprehensive sense good, while in thirteen they appear to be indifferent, and in thirty are so deficient as to be pronounced bad.

It is some satisfaction to know that the Board, which has already done such good service to the public, will have power to prevent the recurrence of all this jobbery and bungling in future. These facts relative to this important body are mentioned

that its objects and operations may be the better understood, and with the conviction, that, as they are known, they will be appreciated as a most important contribution to the public health, having consequently the strongest claim on the public co-operation.

THE LAWS OF CHOLERA.

No. I.

The Times, September 17, 1853.

MATERIALS FOR THE LAWS OF CHOLERA. GREAT VALUE OF THE CHOLERA REPORT.

It may be right to premise, that the observations which are to follow the above title are not intended to be limited to a strictly logical definition of the Laws of Cholera, and that we shall feel at liberty, not only to advert to any facts we may find it necessary to chronicle for the purpose of showing how those laws have developed themselves, but also to digress a little from time to time, in order to bring to the subject sundry contributions by which it may be enriched. We ask leave to use our title somewhat like the x of the algebraist, and to declare its value when we arrive at the close of our process.

Until the month of February, 1852, we were not in a position to show that cholera had its laws—at least, we could not furnish anything amounting to

their digest and exposition. At the first appearance of the epidemic in this country, in 1832, and for many subsequent years, it was a subject completely shrouded in mystery; its nature was not understood, its movements were a riddle, and its proper treatment, even among the most scientific and experienced, was unknown. Of late years the magic wand of science has been drawing its circle around this angel of death, and, if we had a population ready to obey her voice, we should enjoy something like an immunity from the sufferings and the deaths which we have, with a Turkish fatality, considered inevitable.

We say February, 1852, for it was at that date that we were furnished with a complete history of cholera in England—a history both natural and chronological of the epidemic, from its first appearance down to the close of 1849. We refer to the "Report of the Mortality of Cholera in England in 1848-9, presented by the Registrar-General to Sir George Grey, the Secretary for the Home Department." That document did not appear until two years after the epidemic had passed over us, and, great as was the temptation to notice it for the invaluable information it presented, we abstained from entering into the subject from an unwillingness to revive a distressing topic, and from a conviction that a year or two would bring up the painful subject again. This document we shall now use as our text-book in the discussion on which we are about to enter, and it will be our object, departing somewhat from its order and method, to give our

readers the benefit of that extensive induction of which it is the record.

The Registrar-General having confided the duty of framing a complete history of the late epidemic to Mr. William Farr, that gentleman proceeded to his work with the scientific ardour for which he is distinguished, and, aided by his able assistants, he rendered available for his purpose the vast piles of Returns which fill the Registrar's office; taking advantage, also, of the new Population Returns "to determine accurately the mortality of the districts of London and of the country in which the disease had been most fatal."

To show the value which may be claimed for the deductions that are to follow, it may be well, in the first place, to notice the materials from which they are drawn, and which consist of a list of every case of death from cholera and diarrhœa in 1848-9, transcribed from the registration volumes, the whole forming a large mass of manuscript, which contains the particulars of 72,180 deaths. "*The list of persons who died of the two diseases in* 1848-9 *would fill an octavo volume of about* 2,500 *pages.*" The report, instead of presenting a death register, contains the abstracts and salient facts relating to each locality in a condensed form. By means of the ample tables with which we are furnished we can trace "the march of the epidemic through every country day by day," and that "through 17,000,000 of people, settled over a wide extent of country, in all the various circumstances of life."

Aided by the ingenuity of his assistants, the author

of this Report has been enabled to record the daily progress of the cholera mortality in a number of diagrams, which tell their tale to the eye of the observer in such a manner as greatly to assist him in arriving at results, and make him almost independent of the tables of figures given to assist his more minute inquiries.

We have a "Map of England, shaded to show the prevalence of cholera in the several districts during the epidemic of 1849," whereon the relative degrees of mortality are expressed by the darkness of the shading. In this map, in Hull, where the mortality was 287 in 10,000 inhabitants, the shade is darkest; in Guildford, in Surrey, where the mortality was 5 in 10,000, the shading is barely perceptible. This faithful sheet presents mournful patches of black, beginning northwards, on the east coast, at Alnwick, and going round to Newcastle-on-Tyne and Sunderland, Stockton, Sculcoates, Wisbeach, the whole valley of the Thames from Rochford and Sheppy, several miles above Brentford; then Brighton, Southampton, Plymouth and the neighbourhood, Bridgewater, Bristol, Swansea, Bridgend, Cardiff and Newport, Liverpool, and Cockermouth; while in the interior the funereal hue falls heavily on Leeds, Gainsborough, Nantwich, Newcastle-under-Lyne, Wolverhampton, Walsall, West Bromwich, Dudley, and Stourbridge, Coventry, Hitchin, Hertford, and Salisbury.

An admirably-executed diagram, very much resembling that made by the Corps of Engineers to record the visits to the Great Exhibition, gives the deaths from cholera and diarrhœa on each day

of the year 1849, with the meteorological phenomena registered at Greenwich on the corresponding days, so that on inspection the student can learn, in reference to any given day during that year, the number of deaths from either disease, the temperature, the quantity of rain that fell, the direction of the wind, and the weight of the atmosphere; and, like the well-known diagrams to which we have referred, giving the appearance of a needle-shaped mountain, throwing up its loftiest pinnacle to indicate the day on which the numbers attained their *maximum*.

In the same way, another diagram shows the deaths from cholera in 11 divisions of England; another gives the temperature and mortality of London for every week for the last 11 years, shown by circular diagrams. This is followed by another set of circular diagrams representing the Plagues of London, and showing the weekly deaths in the years 1593, 1603, 1625, 1636, 1665.

These elaborate diagrams, the extended tables by which they are followed, and the body of "Notes on Cholera," furnished by the various local registrars, form the apparatus which has been employed to work out one of the most interesting problems to which the labours of a scientific mind could be directed. How that problem has been worked, the solution given, and its practical uses, are subjects to which we deem it most important at this period to call public attention, as we intend in our further observations, and from which it will be seen that the use made of these materials is worthy of their great value and importance.

No. II.

The Times, September 23, 1853.

ENGLAND THE HEALTHIEST COUNTRY IN THE WORLD. UNEQUAL DEVELOPMENT OF CHOLERA IN THE TWO INVASIONS.

THE purpose we have in view in discussing this subject is to render the experiences of former years (1832 and 1848-9) of practical value during the present and any future visitation. If by our culpable neglect we have already failed to prevent a third invasion, we must encourage ourselves with the conviction, in reference to the country generally, that there yet remains sufficient time to adopt means which must considerably diminish its force.

There are certain fixed conditions, chiefly topographical, owing to which the epidemic took the same course on its two former visits, and which may be expected to determine its present route; but, in connexion with these facts, it is proper to notice the inequality of its development in particular places, as illustrated in the following table:—*

* Report, p. 45.

DISTRICTS IN WHICH THE MORTALITY FROM CHOLERA WAS GREATER IN 1849 THAN IN 1832.

Place or District.	Population, 1831.	Deaths from Cholera, 1832.	Population, 1851.	Deaths from Cholera, 1849.
London	1,424,896	5275	2,361,640	14,137
Portsmouth ..	46,282	86	72,676	568
Bristol and Clifton	132,331	694	143,704	1154
Shrewsbury ..	21,277	75	23,095	116
Wigan	20,774	30	77,545	563
Liverpool....	165,175	1523	255,055	4173
Leeds, &c. ..	123,393	702	189,987	2323
Hull	28,591	300	50,552	1178
Merthyr-Tidvil.....	22,083	160	76,813	1682

This table shows the difference against the places to which it refers; it is, therefore, necessary to notice the following

DISTRICTS IN WHICH THE MORTALITY FROM CHOLERA WAS LESS IN 1849 THAN IN 1832.

Place or District.	Population, 1831.	Deaths from Cholera, 1832.	Population, 1851.	Deaths from Cholera, 1849.
Exeter	28,201	374	32,801	44
Plymouth....	31,080	702	52,223	839
Gloucester ..	11,933	123	32,062	110
King's Lynn..	13,370	49	20,528	2
Norwich	61,110	129	68,196	38
Nottingham ..	50,680	296	58,418	18
Sheffield	59,011	402	103,602	114
Carlisle.....	20,006	265	41,566	51
Newcastle-upon-Tyne	42,760	801	89,145	295
Sunderland ..	17,060	215	70,561	363

We may observe, in passing, that the population of Newcastle in 1851 was more than double the

number in 1831, so that the difference in the cholera mortality at those two periods was not the difference between 801 and 295, but the difference between about 1600 and 300, showing at the second invasion that the number of deaths was not one-fifth of those at the first. It is most important that careful inquiry should now be made to ascertain what unfavourable causes may be in operation at present which did not exist in 1849, but which may have operated in 1831. The letter of "A Hospital Physician," which appeared in this journal on Monday, may be referred to as explanatory of the figures given in the case of Exeter, the first place in the above table, and as accounting for the improvement in 1849.

As the history of cholera in any country into which it enters is to a great degree conformable to the prevalent health, justice cannot be done to the subject of cholera in England without giving some attention to the general state of public health in the whole country and in particular localities. It is most gratifying and encouraging to be able to state that, according to the latest observations, "England is the healthiest country in the world." We are compelled to limit our remarks to England and Wales, being prevented taking Scotland and Ireland into the account until our northern and western neighbours have a complete registration of births and deaths, and the records turned to scientific uses as they are in this country. The following table is from the Sixth Annual Report of the Registrar-General:—

England	22	deaths annually to	1000	living.
France	24	„	1000	„
Prussia	27	„	1000	„
Austria	30	„	1000	„
Russia	36	„	1000	„

The degree of attention which has been paid to sanitary reform since this table was made, although falling far short of the requirements of the case, has already reduced the rate of mortality, and would render the comparison still more favourable if made from exact data at the present time; and, if we are not stupidly neglectful of the lessons now being taught us, it will become yet more eminently true, that "*England is the healthiest country in the world.*"

If some considerable encouragement and stimulus to our exertions in favour of a higher state of public health is afforded by this general fact, we shall lose much of our self-gratulation when we come to look at the country in detail, and observe the vast inequalities presented in the rate of "mortality from all causes" in particular districts, and that from influences which we can control. The exact rate of mortality in all England, as calculated on 2,436,648 deaths in the seven years from 1838 to 1844, and on the population as taken by the census of 1841, was 2.187, being—males 2.104, and females 2·270. We are furnished with a highly valuable table for the purpose of showing how the various statistical districts fall below and rise above the mean standard. To prevent unnecessary calculations, we shall deal with the rate of mortality among males only. Our standard amount of mortality

among males in all England and Wales being 2.270, we find that the range of this necrometer (there is such a word, we hope, if not, we make one, for it is much wanted) is scarcely credible. Beginning at the healthiest districts, the rate of mortality is only 1.417; and going to the least healthy, we find it is 3.582. Dealing with 1000 instead of 100 to simplify these figures, we say, that of 1000 men living in the healthiest part of England, 14 only would die in a year, and that if the same number were living in another part of this land, 35 would die in this latter place, the deaths being more than 2½ as many as they are in the former.

The most healthy district in England includes "Glendale, Bellingham, Haltwhistle,"—all in Northumberland,—where we find the small number of deaths we have noticed; and the female deaths are fewer still, 1.383, or 13 in 1.000; and the most unhealthy place in the country, that at the very bottom of this list, is Liverpool, being a little, and but a little, worse than Manchester.

To guard against a misunderstanding of these statements, and to prevent needless alarm, it is perhaps well—though we should deem it scarcely necessary—to mention that these places so low in the list have some subdivisions in which a medium or even a *maximum* degree of health may prevail. We give the average mortality of the district, which, great as that mortality is, would be greater still if all its parts were alike insalubrious. "It often happens," observes Mr Farr in his report, "that unhealthy and healthy villages, *streets*, parishes,

and towns, are in immediate juxtaposition, and constitute *parts of the same district.* The effect of this admixture on the results is, that the unhealthy districts are less unhealthy, and experience a lower rate of mortality than they would if all the healthy parts were eliminated. Upon the other hand, the *healthy districts* are made to *appear less healthy* than they would if they consisted only of healthy places, inhabited by people in good circumstances." It will assist us, to do justice at the same time to the country, and to prepare for a more exact appreciation of the facts under consideration, if we quote another observation from the same authority:—" At that age (15 to 35) the emigration of servants and artisans from the country to the town takes place, and, as consumption—the disease most fatal—is slow in its course, its victims in many cases retreat from the towns to their parents' homes in the villages to die. And the death is registered where it happens, not where the fatal disease began, so that on comparison it is told twice in favour of the towns; once in being withdrawn from the town register, and a second time in being added to the country register, to which it does not properly belong."

We shall pursue this important subject by giving a faithful representation of the order in which various districts of this country are placed as to salubrity, accompanied, in some instances, by facts which will assist in accounting for the position they hold; suggestive of the necessity of hearty co-operation with the authorities, whose duty it is to put the country in a state of sanitary defence.

No. III.

The Times, September 27, 1853.

DISTRICTS ACCORDING TO SALUBRITY. BELOW THE AVERAGE MORTALITY. ABOVE THE AVERAGE. IMPROVEMENTS IN DWELLINGS.

THE complete system of registering the mortality of England and Wales which is now established, has furnished ample materials for a table showing the annual mortality per cent. from all causes during the seven years 1838-44, in the statistical districts of England, arranged in the order of the mortality, the healthiest districts being placed first. This document contains no less than 330 districts, and may be most advantageously studied by all who are anxious for the progress of sanitary reform, by all inquirers after a healthy location, and by the various classes who have a commercial interest in the salubrity of particular districts.

In the extracts which follow, and which are given somewhat at random, it should be observed that the places enumerated are "superintendent-registrars' districts," including generally a much larger area than the cities, towns, and villages from which they are named. It should be recollected, also, that the per-centage of deaths in all England is—females,

2.104; males, 2.270. We shall first give the districts in which the

MORTALITY IS BELOW THE AVERAGE.

Position in the Table.	Districts.	All Ages. Females.	All Ages. Males.
1	Glendale, Bellingham, Haltwhistle (Northumberland) ...	1.383	1.417
5	South Moulton, Torrington, Crediton, Barnstaple (Devon) ...	1.568	1.668
6	Anglesea, (North Wales)	1.537	1.620
12	Lewisham (Kent)	1.613	1.839
14	Isle of Wight (Hants)	1.624	1.844
15	Swansea (South Wales)..	1.628	1.790

It may be necessary, before passing further, to account for the position which Swansea holds in this table. The general opinion entertained of the salubrity of this thriving town would not place it in the favourable position it here occupies. The defective drainage, the smoke from the copper-works for 144 days in the year, during the prevalence of the north and north-east winds, and the neglect of cleanliness in the abodes and persons of a large portion of the inhabitants engaged in these works, are among the conditions which might naturally be regarded as unfavourable to the health of the town, as they are in fact. The report of Sir Henry de la Beche on the sanitary condition of Swansea, shows that the proportion of deaths from typhus and consumption is very considerable, and that the supposed corrective influence of the copper-smoke for these diseases is a delusion, and that for deaths by epidemics the rate of mortality is high. To harmonise these facts with the low rate of mortality given

in the table, it is only necessary to observe, that "Swansea includes the healthy country of Gower, whose people are as famous for whitewash as the Hollanders themselves, whitewashing, in many cases, the roofs of their buildings, and also the country of Llandilo-Talybout, and that in these two places the mortality is 1.50 and 1.52. Then, again, the employment of the poorer classes is, on the whole, good, and those engaged in the copper-works enjoy the benefit of a fair diet; so that, with respect to food, the poorer classes cannot be regarded as deficient. But the most important fact is, that *more than one-third* of the population are not born in the county of Glamorgan, and have, therefore, immigrated into the district, the population so moving in being probably, as a whole, of fair age; so that the apparent health of the place is raised beyond a just comparison with other places.

Mr. G. T. Clarke, in his report on Swansea, states that:—

1. That the mortality of Swansea town, as compared with that of its own registration district, is high, especially the infantile mortality, nor is there any reason to attribute this to want of food or to distress peculiarly affecting Swansea.

2. That, in the opinion of the medical men, this mortality is connected with a great deficiency of water supply and want of drainage, and of proper paving in the courts and alleys, and of the filthy condition of the conveniences of the lower classes, and the presence of numerous open cesspools.

Position in the Table.	Districts.	All Ages.	
		Females.	Males.
29	Ulverstone (Lancashire)	1.699	1.713
35	Launceston, Stratton, Camelford (Cornwall).....	1.725	1.791
39	Hampstead	1.731	2.317
45	Richmond, Kingston (Surrey)..	1.749	2.042
54	Rye, Hastings, Battle (Sussex)..	1.779	1.873
57	Guildford, Farnham, Hambledon (Surrey).....	1.787	1.781
67	Windsor (Berkshire).....	1.816	1.889
68	Chichester (Sussex)	1.818	2.106
76	Wandsworth (Surrey) ..... (Wandsworth district includes Clapham, Putney, and Streatham.)	1.835	2.114
83	Islington	1.848	2.144
91	Monmouth, Chepstow (Monmouthshire)	1.860	2.051
115	Shaftesbury, Wimborne, Blandford (Dorsetshire).....	1.908	1.844
118	Gravesend (Kent).....	1.909	2.274
142	Southampton (Hants)	1.948	2.136
143	Brighton (Sussex).....	1.949	2.545
177	Kensington, Chelsea (London)..	2.011	2.663
184	London city	2.018	2.255
196	Oxford	2.043	1.961
200	Pancras.....	2.051	2.392
201	Marylebone	2.051	2.493
	ALL ENGLAND.....	2.104	2.270

The following are some of the districts in which the mortality is above the average of all England:—

MORTALITY ABOVE THE AVERAGE.

Position in the Table.	Districts.	All Ages.	
		Females.	Males.
222	Plymouth (Devonshire)	2.121	2.701
223	Durham (Durham)	2.122	2.206
234	Staines, Uxbridge (Middlesex)..	2.143	2.208
237	Poplar (London)	2.150	2.666
240	Lambeth (London)	2.155	2.500
255	Greenwich (London)	2.203	2.561
259	Cambridge	2.212	2.636
264	Bath (Somersetshire)	2.229	2.711
275	Sunderland (Durham)	2.287	2.703
278	Clerkenwell (London)	2.301	2.526
292	Salisbury (Wiltshire)	2.398	2.619
304	Westminster (London).....	2.496	2.699
329	Whitechapel (London).....	2.773	3.034
331	Liverpool (Lancashire).....	3.151	3.582

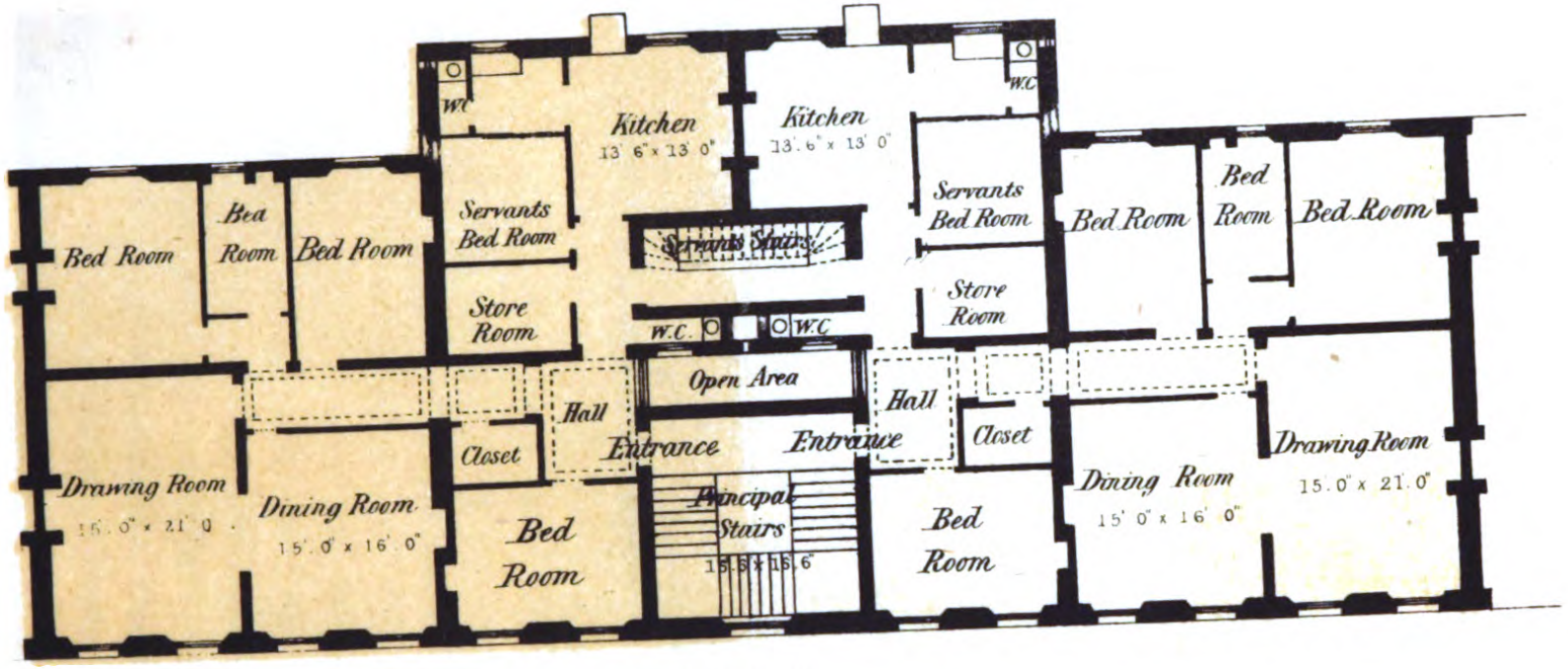
It would scarcely have been supposed that the places noticed in these lists differed so widely from each other in their sanitary condition. There will be little difficulty, however, after all that has been of late learnt on these subjects, in believing that the diversities which the tables present are the results of influences which are, generally speaking, subject to human control. The object of all who are labouring in the good cause of sanitary reform should be to induce such conditions as would reduce the rate of mortality as nearly as possible to that of the healthiest place in the country, and the table shows that there is no natural necessity in these countries for people to die at a greater rate than 13 or 14 in a thousand per annum.

The influence of bad drainage in augmenting the natural rate of mortality has of late been brought

into notice in a variety of ways. It may be as well to adduce a remarkable illustration which is furnished in the case of the episcopal city of Salisbury, standing so low in our second catalogue. This town is always unhealthy. Its situation is in a low damp valley, in the midst of water meadows; the courts and alleys where the lower classes reside are in a filthy state, and derive no benefit from the general system of cleansing carried on in the main streets. There is a mill-dam, and any attempt, says Captain Denison, "*to improve the general drainage* would be impracticable; it would *interfere with too many interests.*" It is not surprising that, in a place in which these "many interests" render improvement impossible, the population should be on the decrease.

If this list exhibits places in which health and life are being destroyed from the neglect of sanitary means, it presents others in which those means are being actively employed, and the good work is going forward without interfering with any interest except the Pariah class, who have been permitted to herd together in a state unfit even for the lower animals. Too much has been of late written of Westminster to render necessary any description of its odious "slums," its "Almonry," and the moral and physical sewage which prevailed between the halls of legislation and the palace of the Sovereign. In that vile region, where some time back the operation of whitewashing had to be performed under protection of a guard—where every physical abomination had its *locus in quo*—where people died at the rate of about 25 per thousand per an-

num on the average—where typhus and cholera raged dreadfully, the most delightful regeneration is being accomplished, under the direction of the Westminster Improvement Commissioners. A main street is formed, by which the level of the new neighbourhood is raised 18 feet above the former level. A *cloaca maxima* has been constructed, instead of the defective drainage, and, in some cases, want of drainage, previously existing; and dwellings are springing up which give to Victoria-street a character that will vie with the Boulevards of Paris. The styles of buildings which have hitherto been well known in Paris and Edinburgh are now being introduced by a Scotch architect (Wm. Mackenzie, Esq.) into this metropolis, and cannot fail greatly to aid, not only in the improvement of the district in which they are growing, but in the renovation of the principal parts of the metropolis. As our houses are just now getting into the habit of falling down of themselves for want of being pulled down, it is most important to the progress of sanitary improvement that attention should be given to this new style of building, which will allow for the formation of wide streets through which the air can blow without interruption; of noble shops like those with which Regent-street is lined; and of the great *desideratum*, that something between a house and a lodging, the want of which is so much felt in London, but which is supplied by the flat of Edinburgh, whence this style of building is being introduced. Connected with the improved dwellings for the middle and even the upper classes, we want dwellings for the labouring



PLAN

10 20 30 40 50 FEET

class, and it is one important feature in the improvements of Westminister that they are to include such dwellings, built in flats, well ventilated, furnished by high-pressure and constant water-supply, and all the aids to salubrity which a house requires. It is a great evil to drive the poor away from the neighbourhoods in which they have to work. We should encourage their presence among us, and we may do so with these aids, and have the satisfaction of knowing that they can dwell in the heart of any neighbourhood without lowering its sanitary position.*

* By the kindness of the Westminster Improvement Commissioners the writer has been favoured with the diagrams of the Elevation and Plan of the buildings above noticed. They exhibit structures worthy of the Metropolis, and deserving of the study of all who who are seeking to accomplish great improvements in its external character, while the internal arrangements admirably economise space so as to combine elegance in the principal apartments with every convenience in the domestic offices.

No. IV.

The Times, September 28, 1853.

HYPOTHESES AND FACTS. VOLCANIC AGENCY. ELECTRICITY. DR. SNOW'S HYPOTHESIS. CONTAGIONISTS AND NON-CONTAGIONISTS. THE FUNGUS HYPOTHESIS. ORIGIN OF ASIATIC CHOLERA IN 1817.

SINCE the introduction of Asiatic Cholera into this country in 1832 ample opportunities have unhappily been afforded for the study of a disease which, although it had been for many years well known to the intelligent army of medical officers in India, furnished a new subject for the study of our faculty, and the occasion of panic to our people. What was its specific nature? Did it differ essentially from the sporadic and the summer cholera with which we were familiar, or was it only the old visitor "in a lion's skin?" Had it any assignable natural cause, or was it to be regarded only as a Divine visitation—the direct expression of God's displeasure, which it would be impious for men to try and avert by scientific skill? Was it propagated through water, through air, through contact, or through all these channels? These are among the various questions to which the epidemic gave rise at

its entrance into this country, and to some of which satisfactory replies have already been given, while others are still under investigation.

It would be a profitless and somewhat painful task to chronicle the wild hypotheses which have been framed for the instruction of those whom it is wished to enlighten on this subject, and it is unnecessary to discuss the claims of others which have the merit of suggesting inquiry in those directions that may ultimately lead to a just and perfect theory. "While fully admitting the importance of theories (says Mr. Farr), I have endeavoured to present from the returns a view of the facts, without reference to any theory, and to show, independently of the theories, that the conditions in which cholera is or is not fatal may be determined, and yield important practical deductions."

To preserve the design of these papers it is necessary to glance at the hypotheses to which we have just alluded. We have the Volcanic agency hypothesis of Mr. Parkin, who is entitled to some attention for the devotion with which he followed the epidemic for some years, subjecting himself whereever he went to a course of the malady the cause of which he was anxious to explore. The doctrine of this devoted disciple is, that the poisonous elements are generated in subterranean reservoirs and diffused in the surrounding atmosphere. It is unfortunate for this dogma that cholera is not more operative in volcanic districts than at a distance from them, and that the invasions of England have not, in 1832 or 1849, synchronized with eruptions and earthquakes.

There is the Electrical hypothesis of Mr. Orton, who suggests that "a deficiency of electricity is the remote cause of the epidemic." No one, however, has been able to show that there is any such parallelism between the electric and the choleraic records from day to day as would justify the notion of there being any essential relation between them. There is a very ingenious modification of the electrical hypothesis by C. F. Schönbein. This gentleman, who is the Professor of Chemistry at Basle, has, with other chemists, proved that oxygen, on being exposed to electrical sparks, is transformed into an odoriferous matter which he calls *ozone*, and which has the power of disinfecting the air when saturated with the miasmata of putrid flesh. The miasmatic matters thrown into the atmosphere by the infinite number of plants and animals hourly dying in the earth, water, and air, he is disposed to believe are decomposed by *ozone*. On the hypothesis that a deficiency of *ozone* is the cause of cholera, and that an adequate supply would destroy the miasmata by which it is produced, it is sufficient to suggest that the hypothesis assumes that the cholera matter is something quite independent of the agent by which it can be destroyed.

The hypothesis of Dr. Snow is, that "the disease is caused by something which passes from the mucous membrane of the alimentary canal of one patient to that of the other, which it can only do by being swallowed; and as the disease grows in a community by what it feeds upon, attacking a few people in a town first, and then becoming more prevalent, it is clear that the cholera poison must

multiply itself by a kind of growth, changing surrounding materials to its own nature like any other morbid poison, which increase is the cause of the *materies morbi* of cholera taking place in the alimentary canal." It will be observed, that this hypothesis does not describe the "something" which carries the cholera from one person to another, and that while it is suggestive of a most important topic for investigation, and of a view which further investigation may confirm, it does not go to the origin of the epidemic *ab extra*, and so, confessedly, does not comprehend the whole subject.

The hypotheses of Contagion, and of Spontaneous Development, divide the theorists naturally into two opposite parties. The former hypothesis, very ably defended by Dr. Bryson, assumes that "an atmosphere charged with the specific virus emanating from a population labouring under cholera and choleraic diarrhœa may prove effective at the distance of several miles from an infested locality." Dr. Bryson maintains that the virus may take effect at the distance of one or two miles, if not further, and, in contact with inanimate substances, may be conveyed to the distance of many hundred miles, provided the transit be accomplished within the space of about ten days. This hypothesis, modified in various ways, furnishes the only argument in favour of quarantine, which, in reference to cholera and other epidemics, has proved so thoroughly ineffective.

The Fungus theory is one of several of inferior importance, scarcely deserving notice. Drs. Brit-

tain and Swaine, of Bristol, thought that they had discovered the cause of cholera, in 1849, in a minute fungus; and another Bristol physician met with the supposed fungus in various specimens of water used as drink in places where the cholera was very prevalent. A committee of the College of Physicians, after fully investigating this fungus theory, condemned it, and its advocates are, we hope, satisfied with the attention it has received.

These notices are sufficient to show that a vast amount of labour has been expended for the purpose of establishing a theory of cholera which will indicate its origin, describe its essence, show its *modus operandi* and the means of its diffusion, and answer all the rational questions which can be proposed respecting it. They also show, that, valuable as are the contributions which these investigators have given to this branch of pathological science, the time for building up a good and solid theory has not yet arrived. The Report on Cholera goes as far as our present acquaintance with the subject will justify when it says, there is now no reason to doubt that the disease is induced in man by a certain specific matter, a variety of which was produced in India, in certain unfavourable circumstances; that this matter has the property of propagating and multiplying itself in air, or water, or food, and of destroying men by producing in successive attacks the phenomena which constitute Asiatic cholera. To this "matter," this "something," the Report proposes to assign the name of "cholerine," leaving it for future investigation to discover what that something may be. The disease

itself is placed in the class termed "zymotic," the term which is now used as the generic term for epidemic, endemic, and contagious diseases. Those who read the "Weekly Return of Births and Deaths in London" are familiar with the term "zymotic," under which are included such diseases as typhus, influenza, remittent, infantile, and rheumatic fever, and all diseases which are supposed to diffuse themselves in a manner analagous to fermentation, from which process the word has been taken. It is well to keep in mind, in connexion with these views, the observation of Liebig, that miasms, properly so called, cause disease without being themselves reproduced. Carbonic acid and sulphuretted hydrogen, which are frequently evolved from the earth in cellars, mines, wells, sewers, and other places, are among the most pernicious miasms. There are plenty of these miasms, the chemical composition of which, we, as yet, know not, but the smallest quantity imaginable of which will do its deadly work with rapidity, and propagate the specific disease it has excited. Cholerine is one of these deadly agents. Under unfavourable circumstances it was produced in India, where it first showed itself by its effects in the Delta of the Ganges, and thence extended to Burrampooter. As early as June, 1817, it prevailed to a serious extent in Nuddea, a province which is stated to be notorious for the disease in its endemic form. Jessore, the place in which the discrder put on a very malignant form, is a "crowded, dirty, ill-ventilated town, surrounded by a thick jungle, and (in the rains) by an immense quantity of stagnant

water." The villages in which it raged most extensively were considered by the natives as comparatively unhealthy and obnoxious to fevers, being exposed to the effluvia arising from marshes and extensive lakes.

No. V.

The Times, October 1, 1853.

INFLUENCE OF THE SEASONS ON THE PROGRESS AND DECLINE OF CHOLERA.

THE term "law," in the digest which is to follow, is to represent simply the forms in which the phenomena under consideration arrange themselves. It is not easy to exaggerate the importance, at the present time, of those laws which have been ascertained in reference to cholera in this country, by the careful application of the inductive method to the mass of facts duly registered in relation to its appearance and progress in 1831-2 and 1848-9, and by the study of which much error will be removed, some unnecessary alarms will be prevented, and many invaluable suggestions obtained.

I. There are some important laws of cholera in relation to the seasons which are deserving attention.

The two former invasions of England by the epidemic occurred at the end of harvest, and extended their ravages till the close of the following years, running their course in each case in fifteen months. In every instance the greatest amount of fatality in this country has been soon after the harvest. Without assuming any closer connexion between the cholera and the wheat plant than there is between the Goodwin Sands and Tenterden

steeple, we cannot withhold the remarkable passage in the Cholera Report which points out a very curious analogy in the history of the plant and the epidemic. "The cholera in England kept pace in its development with the wheat plant, which took root in October, germinated in the winter, flowered in June, filled in July and August, was cut down by the reaper before the first week in September, when cholera was most rife, and would have been dead ripe in October and in November, when cholera ceased." No descriptive observations will enable the reader so clearly to perceive the relation between the months of the year and the fluctuations of the epidemic as the inspection of the following table of

DEATHS IN ENGLAND FROM CHOLERA DURING EACH MONTH THAT THE EPIDEMIC REIGNED.

Months.	Deaths from Cholera in England.		Of the Total Deaths from Cholera the proportion per cent. in each month.	
	1831-2.	1848 9.	1831-2.	1848-9.
1831—1848.				
October	..	354	..	.651
November	97	376	·314	.691
December	282	375	.912	.689
1832—1849.				
January	614	658	1.986	1.210
February	708	371	2.289	.682
March	1519	302	4.912	.555
April	1401	107	4.530	.197
May	748	327	2.419	.601
June.....	1363	2046	4.408	3.761
July	4816	7570	15.574	13.916
August.....	8875	15,872	28.699	29.178
September	5479	20,37[illegible]	17.718	37.463
October	4080	4654	13.194	8.555
November	802	844	2.593	1.552
December	140	163	.453	.300
Total ...	30,924	54,398	100.000	100.000

In each of the years presented in the table there was a gradual increase in the number of deaths from the period of the commencement of the epidemic. In 1831-2 this progress continued for five months, and then sunk down so as to encourage the hope that it was dying away. In 1848-9 there was a similar gradual progress for four months. In the former case the lowest point was reached in May; in the latter in April. Then came the fresh eruptions, reaching their high numbers in August and September, after which period the storms having expended their fury rapidly ceased. In the diagram, showing the relation of temperature to cholera, from day to day, in 1849, the line of temperature fluctuates during January, February, March, and April, but without any rise, and during the same months, as the above table shows, the cholera declines, dipping as low as only 107 in all England, in the month of April. Then the temperature and the cholera *both* rise until August, when the heat attains its greatest height. Not so the cholera, which continues to mount with rapidity until September, when it shoots up to its highest point, after which it as rapidly descends. It would be wrong to infer, from this departure from the parallel between the temperature and the epidemic, that the supposed relations were disproved. The radiating power of the sun, in relation to us, is greatest at Midsummer, but our *maximum* heat is not reached until August; and we see a perfectly analogous case in the fact that the cholera reaches its culminating point some time after the temperature has made a corresponding advance.

Our experience, hitherto, shows a relation between the seasons in England and the intensity of the epidemic, which is more accurately represented by the table than it could be described by any verbal expression. It would be no argument against this position that in other places instances could be shown in which cholera raged in the cold season. We know that in St. Petersburg it has raged with great violence in the winter, and that in Scotland it existed during intense frost in January. Exceptional instances of this kind may perhaps be accounted for by local conditions, and may only assist to prove the rule, as perhaps is already done in the case of St. Petersburg, where the system of heating the dwellings may create, by artificial means, a condition perfectly analogous to our natural cholera harvest.

During the intense season of the last cholera invasion much attention was directed to the atmospheric changes which were supposed to precede or accompany the various outbreaks. A discovery of the genesis of the epidemic was anticipated from observations on the electrical state of the atmosphere at St. Petersburg, where, indeed, the electricity appears to have been disturbed during the whole course of the epidemic, being "so much diminished that the machines could not be charged." To make these phenomena available for the purpose they were intended, they should have been accompanied by evidence that such disturbance in the neighbourhood of St. Petersburg had not taken place before or since, and that similar phenomena were observed in many other places while the cholera

was present. These phenomena were not general. There was no loss of power in the magnet at Hamburg or at Berlin, where observations were made. In London, during the "cholera quarter," the magnets were seldom disturbed, and "the amount of electricity, though less than usual, seems to have diminished only in proportion to the less amount of humidity in the air."

There is, however, one observation in reference to the state of the atmosphere during the choleraic eras which is of great importance, and which corroborates the views we have taken of the agencies prevalent during these seasons. Mr. Glaisher, of the Royal Observatory, Greenwich, states that the horizontal movement of the air during the whole of this period was *only one-half of the usual amount*; that the period was distinguished by a thick stagnant atmosphere; that the air was for the most part very close and oppressive: and that, on some days, when there was a strong breeze blowing at the top of the Observatory and over Blackheath, there was not the slightest motion in the air on the banks of the Thames.

This observation acquires increased importance from a comparison with the description given by Mr. Thom, of the atmosphere of Kurrachee, some time before the dreadful outbreak of cholera in that town, when "the temperature was unusually high, the quantity of moisture in the atmosphere was greater than he had ever seen it before in any part of the world, and light, weak, and unsteady winds or calms had prevailed in the early part of June, instead of the strong steady winds and the overcast

sky, for which June and July are remarkable in Kurrachee; and, finally, there had been excessive rains. The people, as the result, suffered from languor and oppression, and inability to undergo the slightest fatigue without extreme exhaustion. For ten days before the outbreak of the epidemic it was a common remark among the old hands that it was regular "cholera weather." The Report of the Board of Health, whence this account is taken, adds, that "It is important to bear in mind that these physical conditions of the atmosphere which thus oppress the vital powers are the very conditions under which noxious animal and vegetable refuse decompose with the greatest rapidity, and in which the products are carried in greatest quantity into the blood by the respiratory organs."

No. VI.

THE LAW OF ELEVATION.

II.—THERE are laws of cholera in relation to place which are peculiarly interesting, and call for particular attention.

The comparative rate of mortality from cholera, so far as place is concerned, is influenced, not by longitude or latitude, but simply by elevation; our observations on place, therefore, will refer exclusively to perpendicular position.

There is a very general knowledge of the fact that low and damp situations are unfavourable to health, and that, in the generality of cases, there is nothing like the fine fresh mountain air to revive and restore the invalid. People who are perfectly free to choose the spots in which they are to live, will, in most cases, select a site which commands a prospect, and will find that this prospect is only one of several advantages of which such a situation is productive. Our ears, as well as our eyes, are delighted with hill tops and mountain sides, which

are the favourite regions of our singing birds, whose songs invite us to go up and hear them, and leave the frogs and toads to croak in the stagnant ditches down below. The traveller, if his breathing apparatus is in proper order, feels, as he is ascending a moderate eminence, that every upward step carries him into a purer region, and that his spirits are mounting the while.

Discoveries which have recently been made as to the influence of elevation in carrying man beyond the reach of the choleraic poison harmonise perfectly with this natural preference for elevated spots when man is in the pursuit of health or anxious for its preservation. It has already been observed, that the Asiatic Cholera originated in the low, marshy, jungly tract of country which forms the Delta of the Ganges, from which, and similar sources, it is being constantly renewed during its progress into and through this country. In the history of its progress, constant notice is being given of its development in low and marshy places, and along the course of rivers, but only up to a certain level, and also by the sea-side, in places where Deltas were formed, and into which masses of impurity were being continually carried down. The notices in the Report of the Board of Health frequently speak in this manner:—"Still maintaining a north-west course, it arrived *coastward* at Scinde, where it first broke out at the sea-coast, and gradually it extended upward to Hyderabad." "Penetrating into Syria, it spread to Damascus, in a few days reached Aleppo, and in the following

month it extended its ravages over the whole of the Upper Tigris and the Lower Euphrates."

The inquiry which has been made into the mortality of cholera in England has in the most satisfactory manner shown that, *cæteris paribus*, there is a close and constant relationship of the epidemic to elevation. It has been observed in a former paper in this series, that there is a close connexion between the general health of this country and the distribution of cholera. Now, the tables of mortality in England show that, as a general rule, the mortality declines as we ascend rivers, and that the majority of healthy districts are at certain elevations above the sea.

The relation between the level of places and the strength of the cholera has been most carefully tested in the case of London, and the result has been the discovery of the mathematical correspondence between the two elements under consideration.

The districts of London have been classified according to their elevation above the level of the Thames. They are divided into those the elevation of which is not, on an average, above 20 feet ; and at this level the deaths from cholera were 102 in every 10,000. In the second group, at from 20 to 40 feet elevation, the deaths in the same number were reduced to 65. In the third group, from 40 to 60 feet high, the numbers sank to 34 in 10,000. In the fifth group, with an elevation of from 80 to 100 feet, the deaths were but 22 in 10,000. In a district 100 feet high, the mortality was 17, while at Hampstead, about 350 feet above the level of

the Thames, the deaths were only 8, of which one resulted from infection brought from Wandsworth.

It was found, on further examination of these facts, that the mortality from cholera on ground under 20 feet high being represented by 1, the relative mortality on each successive terrace is represented by one-half, one-third, one-fourth, one-fifth, one-sixth, so that the mortality from cholera, at each successive elevation, is one-half, one-third, one-fourth, one-fifth, one-sixth of the mortality in the terrace immediately below it.

To do justice to Mr. Farr, by whom this law was discovered, and for the guidance of scientific inquirers, who may wish further to understand and test it, it is necessary to add the following paragraph from his Report:—

"The elevation of the five terraces may be represented by 10, 30, 50, 70, 90 feet. The elevations of the two higher districts are 100 and 350 feet. It will be observed, that the mortality at 100 feet is 17, at 50 feet 34 in 10,000; consequently, at *half the elevation the mortality is doubled.* The half of 50 is 25, and the double of the mortality, 34, is 68. Now, observation gives 65 in 10,000 as the mortality at 30 feet of elevation. As the processes of dividing the elevation and of multiplying the mortality by 2 may be carried on *ad infinitum*, it is evident that the mortality is not strictly in the inverse ratio of the heights of the soil."

We may add, however, that this inverse ratio is maintained as accurately as is requisite for the theory, bearing in mind the various modifying circumstances which must produce some little deviation from strict mathematical accuracy. For example, the advantages which are afforded to Hamptead by its elevation are somewhat diminished by he deficiency in the supply of good water; and

the disadvantage of some lower levels is compensated by the better supply of water, and by the means and appliances secured by the wealth of the inhabitants.

In considering the law which is thus announced, it is scarcely necessary to observe, that it must be always viewed in connection with the circumstances which may impede its operation. It is quite possible to convert the most elevated spots into unhealthy places, and render them sources of pestilence to the surrounding districts. Salisbury, Merthyr-Tydvil, Bilston, Newcastle-under-Lyne, and St. Giles's are on levels favourable to a healthy state, and have suffered purely from causes which it was within human power to prevent.

In the absence of proper attention to the great work of sanitary reform, if our rivers are to remain as polluted as they now are, if the most vigorous efforts are not employed to bring about a state of salubrity at the lowest levels, people who can afford to select their place of residence, and who are anxious to get beyond the reach of the epidemic, must betake themselves to sites which are some 400 or 500 feet above the level of the sea, taking care at the same time that there is no unhealthy marsh in the neighbourhood, and no local manufactory of pollution, by which the natural advantages of the place are being destroyed.

Better still would it be to employ the wealth, the science, and the industry at our command to deal with the places at low levels, and so pluck up the evil at its roots. For, with the means in our possession, it is very practicable to place such

localities as Southwark, Westminster, Liverpool, and Newcastle-on-Tyne in a perfectly sanitary state, and surround this island with such a *cordon sanitaire* as would effectually resist the future invasions with which we may be attacked.

Dr. Duncan, the Health Officer of Liverpool, who was present when a paper was read by Mr. Farr, at the Statistical Society of London, April 19, 1852, on the influence of Elevation on cholera, soon afterwards presented to the Society the following letter to that gentleman:—

"15*th May*, 1852.

"My dear Sir,

"In compliance with your suggestion, I have examined the question, as to the influence of *elevation* on cholera in Liverpool, and the following are the results:—

"The borough is divided into 16 municipal wards, or districts. In the 8 highest districts, having an average elevation of about 100 feet above high-water mark, the mortality from cholera was 90 in 10,000 inhabitants. In the 8 lowest districts, with an average elevation of about 35 feet, the mortality was 214 in 10,000.* The higher districts had a population of about 165,000.

"Dividing the districts into *three* groups, having, as nearly as the arrangement admits of, equal amounts of population, the mortality in the highest group was 59 in 10,000; in the middle group, 176 in 10,000; in the lowest, 211 in 10,000. The average elevation of these groups was, respectively, about 125, 50, 30 feet. In the first group, the elevations varied from 110 to 160 feet; in the second, from 44 to 175 feet; in the third, from 20 to 38 feet.

"Taking the districts singly, where the difference of elevation is only 2 or 3 feet, I find the law is not carried out, being, apparently, *overpowered by disturbing elements* which came into opera-

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* "By the law in the previous paper, 113 : 48 :: 214 : x=19 = mortality from cholera in the highest districts. The actual mortality observed was 92."—W. F.

tion. But when the districts of approximating elevations are grouped together, and the groups so formed contracted, the results distinctly point to a relation between the elevation of the soil and the mortality from cholera.

"I myself estimated the elevations from the contour Map of the Borough; so that they cannot be depended upon as *strictly* accurate: they are as nearly so, however, as I could make them.

"I am, dear Sir, yours faithfully,

"W. H. DUNCAN."*

"William Farr, Esq."

The following Table and Diagram are adduced in confirmation of the doctrine of Elevation expounded in this article.

LONDON DISTRICTS ARRANGED ACCORDING TO THE ELEVATION OF THE SOIL.

Number of Districts.	Elevation in Feet above Trinity High Water Mark.	OBSERVED AVERAGE.						
		Annual Mortality to 10,000 Persons living.		Numbers of Persons to		Average Annual Value of		Poor Rate in the £ of House Rent. 1842—3.
		Cholera 1849.	All Causes. 1838—44.	An Acre.	A House.	Houses.	House and shop room to each Person.	
						£	£	£
16	Under 20	102	251	74	6.8	31	4.645	.072
7	20—40	65	237	105	7.6	56	7.358	.071
8	40—60	34	235	184	8.5	64	7.342	.056
3	60—80	27	236	152	8.8	52	6.374	.049
2	80—100	22	211	44	7.7	38	5.183	.036
1	100	17	227	102	9.8	71	7.586	.043
1	350	8	202	5	7.2	40	5.804	...
	All London...	62	252	29	7	40	5.419	.063

"The houses necessarily raise the people of London above the ground; and if their habitation day and night, is, on an average, thirteen feet above the ground level, it is evident, that the mortality

* Journal of the Statistical Society of London, 1852, vol. xv., p. 183.

within the limits observed, is in the inverse ratio of the elevations at which the people live. The causes of the discrepancies in particular districts are partly explained by differences in the wealth of the people, and other causes which are noticed in the Report."*

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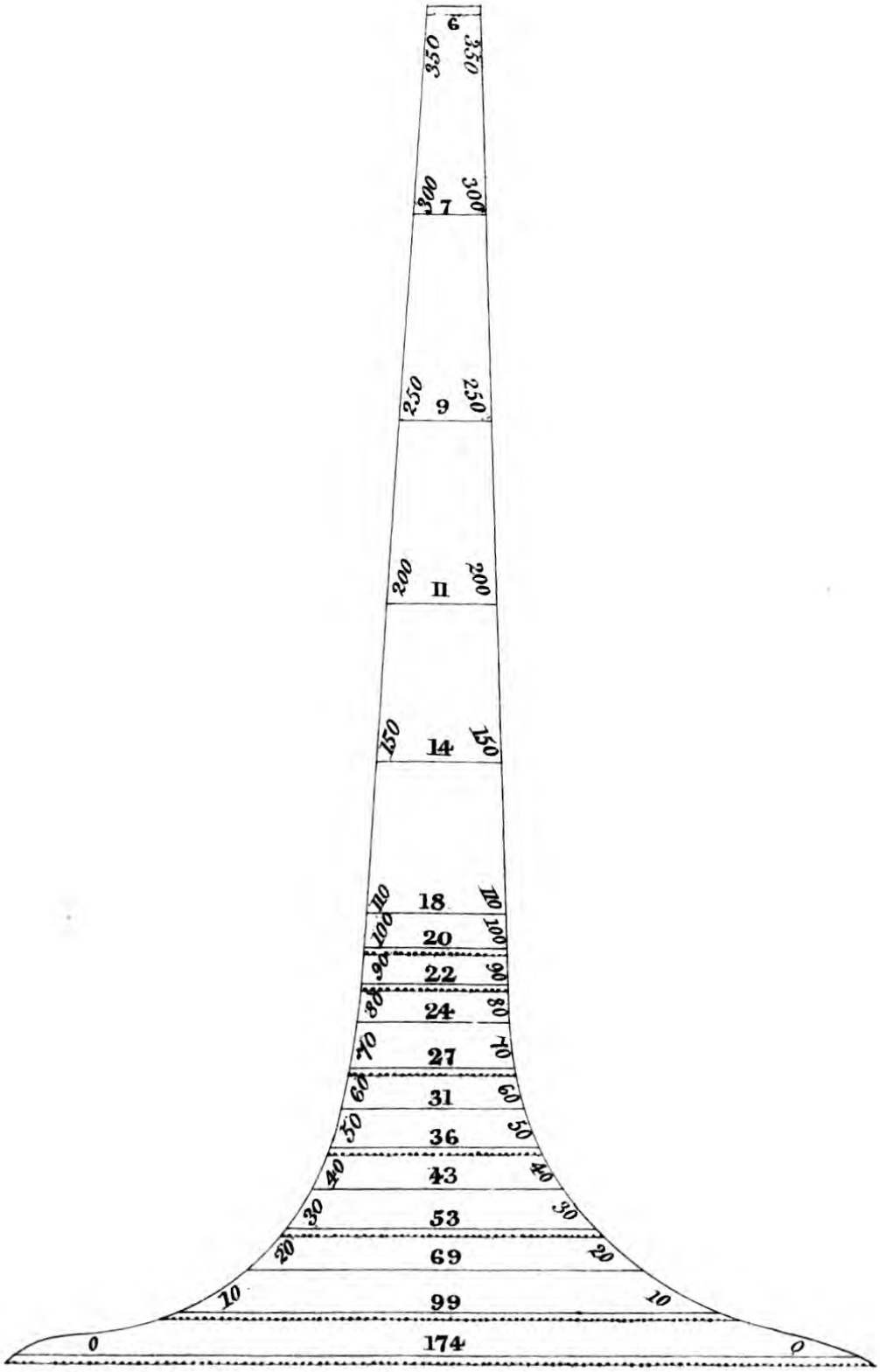
* The law of Elevation is confirmed by the experience of the present year, as will be seen by the following extract from the Weekly Returns of the Registrar-General :—

"Cholera continues to be most fatal in the lower parts of the London basin. In conformity with the law which, it was found, regulated the mortality of cholera in 1848-49, the mortality in the present epidemic, although the numbers are few, is nearly in the inverse ratio of the elevation of the ground on which the dwellings of the inhabitants stand.

"The mortality from cholera in the districts at an average elevation of less than 20 feet above Trinity high-water mark has been 38 in 100,000 inhabitants; in the districts of an average elevation of 20 feet and below 40 (20—40 feet) the mortality has been 20 in 100,000; at an elevation of 40—60 feet the mortality has been 13 in 100,000; at 60 feet of elevation and under 120 the mortality has been 8 in 100,000. At Hampstead, where the elevation may be put at 350 feet, there has hitherto been no death from cholera.

MORTALITY BY CHOLERA IN THE HOUSES OF LONDON AT VARIOUS ELEVATIONS.

Average Elevation of the ground in feet above Trinity High-water Mark.	Population, 1851.	Deaths from Cholera in the eleven weeks ending Nov. 5.	Deaths to 100,000 Inhabitants.	
			Observed.	Calculated series.
350 feet	11986	0	0	2
60—120 „	538973	43	8	8
40— 60 „	513588	67	13	13
20— 40 „	438193	88	20	19
Under 20 „	859496	330	38	38
Under 350 „	2362236	528	22	22
1	2	3	4	5



DIAGRAM

REPRESENTING THE MORTALITY FROM CHOLERA IN LONDON TO 10,000 OF THE POPULATION AT 16 DIFFERENT ELEVATIONS FROM 0 TO 350 FEET

"The series, col. 5, was obtained by dividing 38, the rate of mortality in the lowest terrace, successively by 2, 3, 5, and 17, in conformity with the law laid down in the Registrar-General's Report on Cholera (p. lxiii.)."

EXPLANATION OF DIAGRAM.

The figures in the centre of the Diagram opposite express the number of deaths from cholera to 10,000 inhabitants living at the elevations expressed in feet on the sides of the Diagram.

The length of the black horizontal lines shows the calculated relative fatality of cholera in districts at relative elevations, indicated by the height from the base of the Diagram. The dotted lines indicate the mean mortality observed in the elevations given. Thus: in districts at 90 feet above the Thames the average mortality from cholera was 22 in 10,000 inhabitants.—*Report on Cholera, by W. Farr, Esq.*

No. VII.

INFLUENCE OF ATMOSPHERIC IMPURITY—OF THE ORIGIN AND PREVALENCE OF CHOLERA.

III. We have seen how the development of cholera is affected by time and place, using the latter term to indicate degrees of elevation, and proceed now to show its dependence on the state of the atmosphere with respect to purity.

The density and temperature of the air operate on the choleraic poison principally as they affect its power *as a carrier*, and the attempts which have been made to establish a connexion between the cholera and negative electricity have proved a perfect failure. At great elevations the rarity of the atmosphere loses its power as a vehicle for the transmission of the miasmata by which cholera is produced, as is illustrated by the fact that they have never been carried over the Alps or the Himalayas, and by the remarkable influence of elevation described in the preceding paper. The carrying power of the atmosphere is materially affected by

its hygrometric condition, of which every observer is sufficiently sensible. With a dry atmosphere, we can endure a degree of cold which would be scarcely tolerable if the air were charged with moisture, for the simple reason that the dry air cannot carry away the caloric from the body as the moist air can; while, on the same principle, we can bear a higher temperature in dry weather than when the air is in that moist state which we compliment by the name of "muggy." That the matter of cholera (*cholerine*) is plentifully dispersed in a humid, as it is not in a dry, state of the air, is, accordingly, well-established. During the awful prevalence of the epidemic in Kurrachee "*the quantity of rain* which fell was much beyond anything that had occurred for a long time before." The Report of the Board of Health says—

"Upon the whole, the general result of observation and experience is, that the natural physical condition of the air which is the most conducive to the production and propagation of cholera is a hot, *moist*, and stagnant atmosphere."

The central parts of India are the most subject to the epidemic, because of the more constant occurrence of the south-west monsoon, or sea-breeze of the hot months, and which is "a hot wind saturated with moisture."

In confirmation of this view is the statement made in the same Report, that "these atmospheric conditions can be regarded only as powerful accessory causes, acquiring peculiar force in a climate in which they are so intense as in India, and by no means as the sole or essential causes, since the pestilence has prevailed extensively and severely in

countries and seasons in which such atmospheric conditions do not exist."

Although we have quoted this passage, we do so without approving the distinction between "accessory" and "essential" causes. Things are causes, or they are not. The cause of cholera has yet to be determined, but with this cause, the agency of the atmospheric moisture in its distribution, and in the distribution of any other aërial poison, should not be confounded.

The condition of the atmosphere which affects the power and diffusion of cholera is that which now engages so much public attention—its sanitary character, produced by the presence or absence of noxious exhalations from animal and vegetable sources. Whatever may be the essence of *cholerine*, it is certain that it is powerless in a pure and natural atmosphere, into which no sickly ingredients from decayed organic life have been introduced. The aërial invader has no power to injure where there is no foe within the camp.

Under the sheer force of law, people are now renewing the work of cleansing the Augæan stable, on which they were operating four years ago, but which work they left unfinished as soon as the moment of danger was passed. Polluted drainage, open sewers, foul canals and ditches, putrescent mud, cesspools, overcharged dust-bins, knackers' yards, catgut factories, and bone-boiling establishments, are now most heartily denounced, and, just in proportion as they are put down, the epidemic will be disarmed of its terrors; and if we had energy and patriotism enough to put them down

altogether, and keep them down, we should have learned one of the greatest lessons the cholera was intended to teach, and enjoy immunity from its visits in all future years.

Although this doctrine is sufficiently understood to render proofs superfluous, it may be as well to adduce two or three instances by way of illustration. Merthyr-Tidvil is one of the places that suffered dreadfully from diarrhœa and cholera in 1849. This town enjoys the natural advantage of the high level of 500 feet above the docks at Cardiff, and the most populous parts of the town are well situated on sloping ground, its situation is open, airy, and well exposed, and would have been unvisited by cholera if the inhabitants had not prepared a home for the unwelcome guest. It appears, however, that from the poorer class of the inhabitants, who constitute the mass of the population, throwing all slops and refuse into the nearest open gutter before their houses, and from the impeded course of such channels, some parts of the town are complete networks of filth. During the rapid increase of the town no attention seems to have been paid to its drainage. There are no regulations for draining the town; the surface water is retained; there are stagnant pools and ditches contiguous to the dwellings. There are no "dust-bins," "no scavengers," the liquid refuse is allowed to remain on the surface, or thrown into the water-courses, which are cleansed by the rain only. Some of the town refuse is carried to waste parts of the town and the beds of the rivers Taf and Morlais; after a long drought the stench is almost intoler-

able in many places. Is there any mystery connected with the record, that in Merthyr there were, in 1849, no less than 1682 deaths from cholera, being at the rate of 234 out of every 10,000 ?

Dr. Sutherland, in his Appendix (A) to the Report of the Board of Health on cholera, refers to a suburb on the east side of Hull, called Witham, which he visited in 1849. He observed in this place a triangular piece of ground surrounded by houses, so as to leave an open space in the centre of nearly three acres in extent, about two acres of which were then used as a place of deposit for the night soil of the town and other manure. When he visited this place, he says, it was covered with the elements of disease and mortality. The surface presented one mass of heaped-up filth. An offensive open ditch ran through the ground, and the whole atmosphere was sensibly polluted to some distance. The guardians had received notices from the General Board of Health nine months previous to Dr. Sutherland's visit, in consequence of which it was their duty to have this filthy region purified. He warned them again by a written protest, and told them of their danger. The epidemic arrived, "the real time for preparation had been allowed to pass over," and now the most fearful ravages were committed among the people. "The deaths occurring from cholera in the *streets surrounding* the 'muck-garths' in Witham were upwards of 80,—a greater portion, considering the area of the population, than in any other part of the town."

This connexion of cholera with a polluted state

of the atmosphere, and of immunity from attack with proper attention to purity, is very satisfactorily shown in those cases in which people learnt the lesson taught by the first invasion, and put themselves into a state of defence against the second, and reaped the reward of their practical wisdom. Of this a very satisfactory instance is furnished in Dr. Wynne's *Report on Cholera in the United States in* 1849—50. The report states that those places in Louisville which bore the brunt of the cholera in 1833, and which have been improved, so as to be dry, clean, and airy, had no case of cholera in them in 1849 or 1850, except a single case in one of the improved squares. But those places which were scourged in 1833, and which remained in the same state they were in then, were scourged again in 1850.

This may be the proper place in which to notice the case of the Jews in London, who, during the last invasion, enjoyed remarkable exemption from the epidemic. Their case attracted much attention at the time and subsequently. The fact, which is unquestionable, has been accounted for in the following manner, and is eminently suggestive :—

1. It is well known that, however poor the lower class of Jews may be, they never crowd more than one family into a room.

2. They are not, as a class, given to the abuse of intoxicating liquors.

3. They, in virtue of their religion, are particular in the food they eat. All shellfish is avoided. If any disease is found in a slaughtered animal, it is condemned, and not allowed to be sold for human food.

4. Sabbath rest is strictly enjoined by their religion.

5. They are unable from religious motives to enter our workhouses, and are relieved by the more wealthy of their own persuasion.

6. The Jewish festival of the Passover enjoins every Jew to have his house thoroughly cleansed annually, and the rooms of the lower classes are for the most part annually limewashed.

No. VIII.

POLLUTED WATER A MEDIUM FOR THE DISTRIBUTION OF CHOLERA.

IV. Careful attention ought to be directed, in the next place, to the close relation between cholera and the water-supply in any given locality.

This subject is intimately connected with the topic discussed in the previous paper. Pure air and water generally go together, in accordance with the axiom which Mr. Farr has quoted from Lancisi—"*Ubi bonæ sunt aquæ, ibi bonus, ubi malæ, malus itidem est aër.*" It is unnecessary to furnish proofs of the doctrine that foul and polluted waters, whether stagnant or running, always aid the retention and diffusion of the choleraic element by the malaria they discharge into the atmosphere, and that still more potently, when used in drink, it becomes the vehicle in which seeds of death are carried into the system. Observation has served to teach the natives of India that the use of bad water, during the invasion of cholera, is very certain to subject them to the attack, from which they expect immunity by its careful avoidance

The Report on Cholera in Bengal mentions that "some of the natives place great faith in boiled water as a preventive," and that one of the principal native gentlemen of Calcutta ascribed the singular healthiness of his numerous household to his having taken the simple precaution of allowing no water to be drunk by them, until it had been previously boiled, and that report adds, "that bad water sometimes, no doubt, immediately induces the disorder," while it very properly adds, "we must not suppose it is the sole cause of it."

The "Thames and its Tributaries" furnish all the illustrations it will be necessary to present for the purpose of showing the inseparable connexion between polluted waters and the plentiful diffusion of choleraic poison. It is scarcely necessary to dwell on the distinction between the element in its vaporous and its fluid states, as in either condition, if it be only duly charged with morbific matter, it will prove the diligent familiar of cholera, ready to fly or swim.

The Thames collects the waters of 6160 square miles of country, and the great body of this water flows and reflows through London in tides. How changed its character since the days when Sir John Denham wrote of it as,

"Though deep, yet clear!"

It is now the receptacle of all the sewage of more than two millions and a quarter of people, and the vile and poisonous refuse of the works in which they are engaged, besides a not very easily estimated supply of all the putridity which the animal

and vegetable decomposition of the metropolis can furnish. With London proper for the centre of oscillation, this material is swung backwards and forwards as the tide rushes up and down, with results which all patrons of halfpenny, penny, and twopenny boats must be prepared to anticipate. The "simmering waters" of this ill-used river are constantly giving off their foul and pestilential gases in quantities which, in popular parlance, might be called immense, but which are not immense, for they have been measured, and it may, perhaps, serve a good purpose if their dimensions are given.

Mr. Glaisher, of the Royal Observatory, Greenwich, was requested to make an estimate of the amount of vapour raised by evaporation from the Thames in London, and gave the Registrar-General a statement, of which the following is an epitome: —In one year 678,505 gallons evaporate from an acre of water, which is at the rate of 1857.6 gallons daily. The bed of the Thames in London is estimated approximately at 2,245 acres; consequently, 4,170,000 gallons are raised from the Thames on an average daily through the year. The quantity evaporated at low water is perhaps much less than this; on the other hand, the evaporation in summer is more active than in winter, and the proportion of decomposing organic matter, in the water and on the bank, exposed to evaporation is greater at low than at high water. Hence it is probable that in summer 4,000,000 gallons, or about 18,000 tons of water, are raised from the polluted Thames

daily, and discharged into the atmosphere which is breathed by the inhabitants of London.

When the temperature of the river rises above 60°, as it does from the end of May until the middle of September, the poisonous gases are discharged freely, and in a choleraic season they are the effective aids of "the pestilence that walketh in darkness." Near the river, and especially in the lower districts of the town, where the poison is not much diluted, the mortality from cholera is intense. In Wandsworth it was (in 1849) 100 in every 10,000 inhabitants; in Lambeth, 120; St. Saviour's, 153; St. Olave, 181; Bermondsey, 161; Rotherhithe, 265. In the three sub-districts of Stepney adjoining the Thames, the mortality from cholera was twice as great as in any two districts away from the river.

The nearly stagnant canals connected with the Thames furnish their quota of evidence to the admonitory truth under consideration. The waters of the Regent's Canal round London are in a state of most disgusting filth, and Cumberland Basin has been described as no better than a stagnant putrid ditch, and accordingly in the last invasion "a great deal of choleraic disease prevailed among the men who were employed in the barges, and most of the families living in the houses on the wharfs were more or less affected."

If cholera is produced by inhaling the deadly emanations which are furnished by the river, and the great sewers which supply it, and which contribute a part of their treasures on their way, we have a still larger measure of the morbific matter

introduced when such water is employed as a drink. Water is perhaps the principal vehicle into which the deadly element is received, and by which it is carried into the human system. The awful prevalence of the epidemic in Paris in 1832 was attributed to the circumstance, that at that time four-fifths of the water of that city were taken from the Canal de l'Ourque, which was appropriated to the navigation of boats and barges. If this country had been suffering from excessive population, and a plan had been desired for giving free scope to the operations of the epidemic, it would not have been easy to make more effective arrangements than those on which we have fallen, though not by design. Only suppose the infection to have seized on a few individuals, and remember that the sewers run into the Thames and the Lea, and then that the Lea supplies the New River. We are assured in some cases that the water is taken from so pure a part of the Thames, and then is so well filtered, that there is no danger whatever to the public health from the supplies with which we are furnished. Still people die of cholera from the water supplied to them in London. This water has different degrees of impurity, and, apart from the deterioration it receives from bad cisterns and worse butts, and the infiltration from the soil, it is conveyed from its original sources in a state most dangerous to the public health. During the last cholera season in the six districts supplied with water taken from the Thames above Battersea there were fifteen deaths in 10,000; in those districts supplied from the New River, the Lea, and the

Ravensbourne there were 48 deaths in 10,000; and in the districts supplied from the Thames between Battersea and Waterloo-bridges the deaths were 123 in 10,000.

People cannot with safety entrust their health in times like these to the water served to them by any company, whatever be the scientific testimonials given in their favour. Dr. Lyon Playfair, on being asked, "What sort of precautions do you recommend at the time of cholera with respect to water?" replied, "The most effective means of avoiding injurious results would be to boil the water, if it were immediately used on cooling. It should be allowed to cool in a close vessel, because boiled water is more absorptive of all gaseous malaria than unboiled water. It is also advisable, although it does not remove the danger to the full extent, to filter the water through charcoal, which removes a large portion of the organic impurities." People owe it to themselves, and the establishments over which they have control, to secure an ample supply of water which has been filtered chemically as well as mechanically, having passed through charcoal (animal charcoal is the best), as well as through porous stone or gravel; and great care should be taken to see that the filter itself is not a means of deteriorating the water from the presence of any material which is liable to decomposition. Water may appear limpid and sparkling without having undergone the purification which is essential to safety, and which can result only by the use of an efficient chemical medium.

There has been a serious difference of judg-

ment between certain influential bodies as to the kinds of food which should be avoided during the prevalence of cholera; but experience and careful observation will probably lead, if they have not already led, to something like unanimity on this subject. There is no division of opinion as to the danger connected with the use of food in an unwholesome state, such as "putrid fish, bad pickled pork, decayed cheese, &c.;" all indigestible food (bearing in mind that the kind of food easy of digestion to one person may not be so to another), and excess in the use of food, predisposed for the attack many in whose cases it has proved fatal soon after these abuses. Opinion is, generally speaking, in favour of the use of wholesome and ripe fruits only, supposing proper exercise to be taken. Much of the fruit sold in the streets of London is kept at night in the crowded and filthy dwellings in which the stall people and costermongers reside. Often, at night, the apples and pears, which are to be offered for sale on the morrow, are stowed *away under the beds* into which these people crowd; and, if cholera is making its way through the neighbourhood, these fruits naturally become the media through which the infection is conveyed in the system. The important Report which has furnished the principal materials of these papers states, that—

"The vegetable acids and other compounds in fruits are an essential part of food; that the want of them causes scurvy, undermines the general health, and prepares the way for the zymotic diseases, as is proved by the experience of the navy, and by the most decisive observations. The exemption of Herefordshire from

cholera is evidence that cider, notwithstanding the popular prejudice, is a much safer beverage in the time of an epidemic than the spirits which were so largely consumed in the places where it was most fatal."

The direct tendency of intemperance to predispose the system to the attacks of cholera is placed beyond dispute. Abundant evidence was afforded during the epidemic to establish this point. Occasional excesses led to a great number of attacks. At Hamburg there was among the numerous sailors in that great port a regular accession of cholera every Monday and Tuesday, owing to the men going ashore and getting drunk on the preceding Sunday. The result of the inquiry as to the days of the week on which the cholera was most prevalent is singularly confirmatory of the statements as to the effect of excess in inducing cholera. The worst days for cholera in London were Saturdays, when the numbers were 2,607; Sundays, 2,011; Mondays, 2,194; Tuesdays, 2,136; Wednesdays 1,978;—all above the average: the best were Thursdays, 1,927; Fridays, 1,824; both below the average. In this case Friday loses the bad name which superstition assigns to it.

Cholera in England, in 1849, proved rather more fatal to females than to males, the deaths being—males, 26,108; females, 27,185. It was fatal to persons of all ages. It carried off 3,866 boys under 5 years of age; 3,837 men between 25 and 35, and two old men of 95 and upwards. The deaths were most numerous in the middle and most active period of life. In diarrhœa the law is different, the deaths of children and old people

being much more numerous than the deaths of persons in the middle period of life.

During the previous invasions it was discovered that its mean duration in females was 2.102 days, or 50.44 hours; in males 2.060 days, or 49.44 hours; the woman living an hour longer than the man. Dividing the cases into three groups, the following results were obtained:—

Duration of fatal cases of Cholera at various ages.

	Mean Duration.	
	DAYS.	HOURS.
Persons of the age of 15—35 . .	2.121 =	50.904
„ „ 35—55 . .	1.954 =	46.896
„ „ 55 and upwards	1.973 =	47.352

CONCLUSION.

From what has been said it follows—

THE CHOLERA, INSTEAD OF BEING A MYSTERIOUS VISITATION, WHOSE ORIGIN AND MODE OF PROPAGATION ARE HIDDEN IN OBSCURITY, IS THE RESULT OF KNOWN PHYSICAL CONDITIONS WHICH ARE SUBJECT TO HUMAN CONTROL.

It has been the object of the preceding papers to show that cholera has its laws, and that these laws are known, to an extent sufficient to teach man how he may avoid the sufferings which have been considered inevitable. A few divines have been too ready with their ignorant comments on the causes to which these invasions were to be ascribed, and the exact lessons they were sent to teach. Some fanatical preacher is reported to have told his congregation, lately, that the matter of cholera was created at the time of the Fall, although it does not seem to have made its appearance until the year 1817, when it was generated in the Delta of the Ganges, certainly not earlier than 1781.

Nature must be studied and catechised before her laws can be learned, and when they are understood the means of security will be discovered. It is quite out of the question to get at the *rationale* of this epidemic by a sermon, or to stay its virulence by a Scotch fast or a popish mass. Religion is honoured when it is presented in harmony with

nature, it is profaned when it is employed to secure immunity from the effects of violating her laws. The Noble Home Secretary of this country, must therefore, be commended for the valuable suggestions, which he has lately directed his Private Secretary to make to the Presbytery of Edinburgh, when they invoked his Lordship's assistance, to bring about a national fast. The following language commends itself to the good sense of every one who has read it, while it need not offend the piety of the most devout :—

"There can be no doubt that manifestations of humble resignation to the Divine Will, and sincere acknowledgments of human unworthiness, are never more appropriate than when it has pleased Providence to afflict mankind with some severe visitation; but it does not appear to Lord Palmerston that a national fast would be suitable to the circumstances of the present moment.

"The Maker of the universe has established certain laws for the planet in which we live, and the weal or woe of mankind depends upon the observance or the neglect of those laws. One of those laws connects health with the absence of those gaseous exhalations, which proceed from overcrowded human beings, or from decomposed substances, whether animal or vegetable: and these same laws render sickness the almost inevitable consequence of exposure to those noxious influences. But it has, at the same time, pleased Providence to place it within the power of man to make such arrangements as will prevent or disperse such exhalations, so as to render them harmless,

and it is the duty of man to attend to those laws of nature, and to exert the faculties which Providence has thus given to man for his own welfare.

"The recent visitation of cholera, which has, for the moment, been mercifully checked, is an awful warning, given to the people of this realm, that they have too much neglected their duty in this respect, and that those persons with whom it rested to purify towns and cities, and to prevent or remove the causes of disease, have not been sufficiently active in regard to such matters. Lord Palmerston would, therefore, suggest that the best course which the people of this country can pursue, to deserve that the further progress of the cholera should be stayed, will be, to employ the interval that will elapse between the present time and the beginning of next spring, in planning and executing measures by which those portions of their towns and cities which are inhabited by the poorest classes, and which, from the nature of things, must most need purification and improvement, may be freed from those causes and sources of contagion which, if allowed to remain, will infallibly breed pestilence, and be fruitful in death, in spite of all the prayers and fastings of a united but inactive nation. When man has done his utmost for his own safety, then is the time to invoke the blessing of Heaven to give effect to his exertions."

It may be presumed that it is not the intention of the Noble Lord to recommend that all prayer should be postponed until "man has done his utmost." He should be encouraged, if he "lack wisdom" to seek it from "the Father of lights,"

and when doing his work he should invoke the Divine benediction thereon, as has been the custom of many of our best physicians, while employing the greatest skill; and certainly, "when he has done his utmost for his own safety, then is the time to invoke the blessing of Heaven, to give effect to his exertions." No language can be quoted, more appropriate to this subject, than that in which the Bishop of London addressed his clergy, in 1847:—

"As, on the one hand, it is clearly one of your first duties, to impress on the minds of your people, whatever be their condition in life, the necessity of an implicit trust in God, and of an entire submission to his will; so, on the other hand, you will discharge an office of real piety and charity, in urging upon them the importance of removing all *those physical causes*, which *invite the approach of disease, and aggravate its malignity;* and, in endeavouring to persuade them, that, while we may not look for a blessing upon the resources or contrivances of human skill, if they are not employed in humble reliance on the power and goodness of God, so, neither, if we neglect to use all probable and practical means of prevention and preservation, have we any reason to expect, that He will especially interfere, to rescue us from *the consequences of our own negligence.*"

The Law of Elevation suggests some important and practical directions which cannot be given better than in the language of Mr. Farr, by whom it has been expounded.

1. "Persons who have the means may, by an

early removal from an infected district, always find safety in such salubrious districts as the tables show had deaths neither from diarrhœa nor cholera in the year 1849. . . . . Many persons left London and went as usual to the sea-side. This was an error. Sometimes the disease within them was developed on the low land; sometimes they were attacked not only in the towns but in the villages on the coast.

2. "Strangers who can avoid it should not visit a town in an epidemic. They appear to be peculiarly liable to an attack. Persons, whose duties confine them to an infected town, will find that removal from districts in which the epidemic is raging, to high clean districts of the same town, insures a great degree of immunity.

3. "In outbreaks where it is necessary to remove large numbers of people, they should be sent to high dry ground, where good water can be procured.

4. "High places are also generally safe asylums from plague, yellow fever, remittent fever, and ague. It is necessary, as it is in cholera, to keep away from marshes and rivers in the lower parts of their course, and to obtain water, if possible, from unpolluted springs.

5. "Travellers in unexplored countries should not rest on low, swampy spots. They have the best chance of preserving their health and that of their horses and cattle, by passing the nights on high ground, in the neighbourhood of springs, or near small rapid rivers."

This important direction will apply, of course, to travellers in this and every country.

The operations of which the banks of the Danube are now the scene, may give a peculiar importance to the following suggestion :—

6. " Armies suffer more from cholera *on march* or immediately afterwards than they do in station. The encampments and marshes in the Indian armies lie often by rivers on low grounds. Cholera found the Marquis of Hastings near the margin of the Scinde, in Bundlekund, on Nov. 7th, 1817, and destroyed in one week 764 fighting men, and some thousands of the camp-followers of the grand army. It ceased after the 19th, when he crossed the clear stream of Betwah, and encamped on its high and dry banks at Erich."

" *Intercommunication*. It does not appear that the quarantine has been of any avail in cholera. But the arrangements of all the lower classes of vessels are far from satisfactory, and the circulation of dirty pestilential ships, like the " Eclair," from low port to low port, is not unattended with danger to the health of the community. A sanitary maritime police, therefore, is necessary, into which it would be advantageous to convert all the quarantine officers of Europe. The futile superstitious practices of the lazarettos are as contemptible in the eyes of science as they are injurious to commerce. Vagrants are the pestilential ships of the land; and they carry diseases and zymotic venoms as well as vermin and vice to lodging-houses, workhouses, and gaols over the country. This peculiar and degraded race can only be dealt with by special measures."

It is not the object of these papers to repeat the

valuable instructions which have been already given for the prevention of cholera or for its cure, when its premonitory or advanced symptoms have appeared—those instructions are issued by the Board of Health, and very widely circulated. An epitome of these documents is given by J. J. Scott, Esq., in a valuable pamphlet entitled, "How to meet Cholera;" and we here introduce, for easy reference, the following paper drawn up by the Royal College of Physicians in reference to the best mode of treating cholera:—

"The Cholera Committee of the Royal College of Physicians have received, from various quarters, applications for some plain directions calculated to be of service to the public during the prevalence of epidemic cholera, when medical advice may not be immediately at hand, and before such advice can possibly be obtained.

"For this reason the committee deem it right to offer to the public some instructions, which, on account of an extended 'notification' having been issued by the General Board of Health, on the 20th of September, 1853, may be brief; and are in no case intended either to supersede the necessity of having recourse, as speedily as possible, to further medical assistance, or to impose any authoritative restriction on medical practitioners.

"DURING THE PREVALENCE OF CHOLERA,—

"1. No degree of looseness of the bowels should be neglected for a single hour. Medical advice should be at once sought when the looseness begins; and, previous to the arrival of a medical attendant, some of the medicines, at other times used for

checking diarrhœa, should be taken; for example,—the chalk mixture, the compound cinnamon powder, or the compound chalk powder with opium, in doses of from 20 to 40 grains for an adult.

"2. No saline aperients or drastic purgatives should be taken without the advice of a medical man.

"3. Intemperance in eating or drinking is highly dangerous. But the moderate use of vegetable as well as animal food may be recommended; and, in general, such a plan of diet as each individual has found by experience to be most conducive to his health: for any considerable change in the diet to which a person has been accustomed, is seldom advisable during the prevalence of an epidemic.

"4. Debility, exhaustion, and exposure to damp, render the poor especially subject to the violence of the disease. The committee urge upon the rich the necessity of supplying those in need with food, fuel, and clothing.

"5. The extreme importance of removing or counteracting all impurities, whether in the air, water, or soil, as by ventilation, cleanliness, and the free use of the chloride of lime or chloride of zinc, cannot be too strongly insisted upon.

"Lastly, since the reports made to the College of Physicians show that, of the persons who were engaged about the sick in the last epidemic, the number of those who were attacked by the disease was, in proportion, exceedingly small, the fear of infection may be practically disregarded.

"The committee forbear to dwell upon the extreme importance of providing medical attendants at Dispensaries for the treatment of the diarrhœa among

the poor: of organising in every district affected by cholera what is called the system of house-to-house visitation; and of establishing temporary hospitals for the reception of patients who cannot be properly treated at their own homes; because these measures have been strongly and properly enforced in the 'notification' published by the General Board of Health."

BE CLEANLY IN YOUR PERSON.

BE CLEANLY IN YOUR DWELLING. REMOVE THE CAUSE OF ALL OFFENSIVE SMELLS.

IF THERE ARE BAD DITCHES, OR DRAINS, OR CESSPOOLS, NEAR YOUR DWELLING, INFORM THE PARISH AUTHORITIES, AND DO NOT REST UNTIL THE NUISANCE IS REMOVED.

DO NOT TAMPER WITH YOURSELF IF YOU EXPERIENCE ANY INTERNAL UNEASINESS. GET THE BEST MEDICAL ADVICE YOU CAN, AND AS SOON AS YOU CAN.

SEE THAT THE WATER YOU DRINK, AND WITH WHICH YOUR PERSON AND APPAREL ARE WASHED, IS PURE.

GREAT ATTENTION SHOULD BE PAID TO THE FILTRATION OF WATER FOR DOMESTIC AND PERSONAL USE. It has been shown that water is one of the principal media through which the choleraic poison is conveyed into the system. The water in Newcastle-on-Tyne, which appears to have acted like poison on the inhabitants, is said to have been filtered by the company before it was dealt out to the inhabitants. This water "taken from the River Tyne has been analysed by Dr. Robert Dundas Thomson. He found it to contain a quantity of

organised matter mechanically diffused through it (loaded with living vibrios) to the amount of 4·502 grs. per gallon. Of this 0·545 grs. was destructible matter; the remaining 3·957 grs. consisted of siliceous forms resembling the shields of infusorial animals or diatomaceous plants. Dissolved or finely diffused in the water, he further found 2·68 grs. per gallon of organic matter. The water likewise contained 1·18 gr. per gallon of chalk and 7·3 grs. of muriatc and sulphate of soda and sulphate of magnesia. The total solid contents were 15·662 grs. per gallon. This water was, it is said, filtered, but the process is not described by the Water Company."

Mr. R. D. Grainger, who is engaged in inspecting various localities of the metropolis, by direction of the General Board of Health, with a view to ascertain their sanitary condition, in his report respecting Whitechapel, makes the following remarks on the quality of the water supplied to the inhabitants of the metropolis :—

"I examined the water in some of the tubs, as it had just flowed from the Company's water-pipes, and found it discoloured and totally unfit for domestic purposes. It was proved by ample experience, in 1846, that the use of impure water exasperated the virulence of cholera, and the same thing has been conspicuously shown in the present outbreak at Newcastle. I have lately obtained a careful microscopical examination of the water supplied by one of the principal water companies, and found that it abounded in decomposing animal and vegetable matters; much of the state of the

present water supply in London, demands, in my judgment, serious attention, as I feel satisfied that, if cholera became epidemic, the most injurious results must ensue as regards the health and safety of the population. Although no practical expedient can purify water exposed to the taint of decomposing organic matter,—a defect which is prevalent in the metropolitan supply,—at present it is still more desirable as a palliative, that the water before delivery should be efficiently filtered.

(Signed) "R. D. GRAINGER."

Still more important is it that water should be "efficiently filtered" *after delivery*. By one of Ransome's* stone-filters all the water used in a large establishment can be filtered at a very moderate cost, and one of the essential conditions of health secured, while a poor man can ensure a similar advantage to himself and family for a trifling outlay.

IT IS MOST IMPORTANT TO CULTIVATE THE VIRTUE OF MORAL COURAGE, AND THAT CHEERFUL DEPENDENCE ON THE DIVINE WILL WHICH WILL BEST

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* There are no filters which so fully realise the description already given in these papers of a perfect filter as the newly-invented apparatus of Messrs. Ransome, which is a chemical purifier and a mechanical strainer, uninjured by the use of sponge or any medium liable to decomposition, and has the advantage of being adapted to all circumstances and classes. A further advantage can be obtained by the use of the Gasogene apparatus, by which any one can manufacture pure aërated or soda water for his own use, by the elements usually employed, or, which is much better, by the new preparation of sulphuric acid and bi-sulphate of potash, sold with the apparatus.

PREPARE FOR ACTIVE DUTY OR CHEERFUL RESIGNATION. In the midst of the perplexity and alarm which are prevalent in scenes of great public calamity, how truly has it been said by Lord Bacon, "that there is no greater blessedness than for the mind to move in charity, rest in providence, and turn on the poles of truth." Christianity demands moral courage and provides for this noble virtue, which, while it overcomes the fear of death, fits man for the most arduous and perilous duties of life.

These remarks cannot terminate more suitably than by an extract from the valuable Report which has supplied our principal facts. The quotation presents a fair view of the object which ought to be attained by medical science, one that will prove as beneficial to the public, as it will be honourable and gratifying to the faculty.

"No city, perhaps, ever possessed such an efficient body of medical men as are now practising in London. During this (1849) epidemic they have performed services which in any other field must have won the highest honours; combating the disease, night and day, in the most pestilential quarters, on much more settled principles than the public might be led to expect from certain discussions at the medical societies. And their office has been discharged with so much kindness, as to deserve the gratitude of the poor, instead of drawing down on their heads the charges with which the physicians of other countries have often been assailed by the populace. Nearly all the sick have been seen by these practitioners; yet 12,837 per-

sons have already died of cholera in London. How is this? The medical force will be found to have been employed at an immense disadvantage. *It is called into action at the wrong end of the malady.* Inquiries prove, that, while medical advice is generally sought in the characteristic stage, it is seldom obtained in the premonitory stage, when the power of medicine is decisive; and to that more important period, preceding the premonitory stage, which is prevented as easily as cured, medical practice has had little or nothing to say. Cholera, here also, only shows in high relief what exists in ordinary circumstances. Medical men, rarely, if ever, treat the beginnings of diseases; and are scarcely ever consulted professionally as to the preservation of the health of cities or families. The art of preserving health is taught in no regular course of lectures, at any of the great Schools of Medicine in the United Kingdom. Yet the classical sanitary works of Pringle, Lind, Blane, Jackson, Johnson, and Martin, have been framed from observation in the British Army and Navy. In the Science of Health there are more exact demonstrable truths than in the Science of Disease; and the advantage of 'prevention' over 'cure' requires no proof. In the Cyropædia of Xenophon, physicians who only treat the sick are compared to 'menders of torn clothes,' while the preservation of health is declared a noble art, worthy of Cyrus himself. Vegetius speaks in similar, Jackson in stronger, terms, but, perhaps, unjustly; for if it is godlike to save many from suffering, and to carry them in healthy life up to the natural term of

existence, it is a worthy occupation to rescue a few from the arm of death or incurable infirmity. But the preservation and the restoration of health are parts of one Science; and if, as has been done by the cities of London and Liverpool, Health Officers be appointed in all the districts of the Kingdom, the art of preserving health will be studied by a higher order of men, well paid by the public: and, ultimately, with an increase of their remuneration, the diminution of sickness, the disappearance of epidemics, the immense advantage to the public—the whole medical profession may devote themselves to the preservation and development of the vigour of the human faculties, instead of being tied down to the treatment of the sick and dying. 'And this,' Lord Bacon says, after his great Survey of Learning, 'we hope, might redound to a general good, if physicians would but exert themselves, and raise their minds above the sordid considerations of cure; not deriving their honours from the necessities of mankind, but becoming ministers of the Divine power and goodness, both in prolonging and restoring the life of man; especially as this may be effected by safe, commodious, and not illiberal means, though hitherto unattempted; and certainly it would be an earnest of Divine favour, if, whilst we are journeying to the land of promise, our garments, those frail bodies of ours, were not greatly to wear out in the wilderness of this world.' "

FINIS.

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Manufactured in the Patent Stone which has obtained the Medal of the Society of Civil Engineers, the Medal of the Great Exhibition of 1851, the approval of the most distinguished Men of Science, as **Faraday, De la Beche, Buckland, Cubitt, Ansted Phillips,** &c., &c., of the most eminent Men in the Medical Profession, and of the leading Journalists, whose Testimonials are given in a Pamphlet of Sixteen Pages, gratis, on application per post, 2*d*.

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From ALFRED SMEE, Esq., F.R.S., London,

Senior Surgeon to the Royal General Dispensary, Surgeon to the Bank of England, &c.

"Gutta Percha, from its imperviousness to moisture, and want of power to conduct heat, is far preferable to leather for the soles of boots and shoes; from these properties it keeps the feet warm and dry,—very important requisites for the maintenance of health."

From JOHN TAYLOR GORDON, Esq., M.D, London,

Heretofore Physician to His late Majesty, and to H. R. H. the Duke of Cambridge, but now retired.

"In reply to your late note of inquiry as to my opinion (after considerable trial) of the Gutta Percha Soles, I have no hesitation in stating, that I find them the pleasantest wear imaginable,—more durable than leather, if properly applied, and truly valuable on the score of health, as they preserve the feet from wet and cold,—of such importance to all persons of delicate constitution, or advancing in years. I consider they must be most beneficially adapted for our Sailors and Soldiers, as well as our Colonists in Canada, &c."

From the Rev. T. GARDNER, M.A.,

Incumbent of St. Anne's, Stanley, near Liverpool.

"I have found great comfort in the use of Gutta Percha Soles on the muddy roads with which this district abounds, and I have recommended them to my parishioners. I consider the discovery a great blessing to the poor in particular, and hope they will take extensive advantage of it. If the working-man would devote a share of his leisure time to the repair of his own and his family's shoes with this material, instead of worse than wasting his evenings in the ale-house, he would soon find his account in it."

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18, WHARF ROAD, CITY ROAD, LONDON.

WATER POISONED BY LEADEN PIPES.

"THE above Engraving represents accurately a section of a Leaden Pipe, which was employed for a short time in conveying water from a well on the grounds of Mr. Dick, of Bonchurch, Isle of Wight. The original section of pipe is 8½ in. long, 2½ in. diameter, and 5-16 in. thick. A great part of the internal surface is corroded by the action of the water; but, as shown in the drawing, four deep excavations have been made, and another is shaded out of view by the manner in which the section of the pipe has been cut. The water has cut these deep pits almost through the pipe, and not only upon the portion which we have illustrated, but has formed similar chasms throughout the entire length."—*Expositor.*

DURABILITY OF GUTTA PERCHA TUBING.

Many inquiries having been made as to the durability of Gutta Percha Tubing, the Gutta Percha Company have pleasure in giving publicity to the following Letters from parties who have had it in use for a considerable length of time:—

From Sir RAYMOND JARVIS, Ventnor, Isle of Wight.

(Second Testimonial.)

"*March 10th*, 1852.

"In reply to your letter received this morning, respecting the Gutta Percha Tubing for pump service, I can state, with much satisfaction, it answers perfectly. Many builders and other persons have lately examined it, and there is not the least apparent difference since the first laying down, now several years; and I am informed that it is to be adopted generally in the houses that are being erected here."

From C. HACKER, Esq., Surveyor to His Grace the Duke of Bedford, Woburn Park.

(Second Testimonial.)

"*Office of Works, Woburn Park, Jan. 10th*, 1852.

"Gentlemen,—In answer to your inquiries respecting the Gutta Percha Tubing for pump suctions, I find that the water has not affected it in the least, although it will eat lead through in two years; we have adopted it largely, being cheaper than lead, much easier fixed, and a more perfect job."

N.B.—The Company's Illustrated Circulars, with instructions for Joining Tubes, &c., and for securely attaching Gutta Percha Soles, will be forwarded (*post free*) on receipt of four postage stamps.

THE GUTTA PERCHA COMPANY, PATENTEES,

18, WHARF ROAD, CITY ROAD, LONDON.