Report of the Medical Officer of Health of the City of London, upon the New River water, and the church yard of St. Andrew's, Holborn / presented to the Commissioners of Sewers, Tuesday, 11th December, 1855.

REPORT

Of the Medical Officer of Health of the City of London, referred to in the preceding Report.

To the Honorable Commissioners of Sewers of the City of London acting as the Burial Board for the said City.

As the Medical Officer of Health to the City of London, I have been requested to express my opinion of certain statements recently made by the Venerable Archdeacon Hale in his Charge to the Clergy of London, and also to the churchwardens of this city, at the parish church of St. Sepulchre's, Snow Hill. These statements are to the effect that, "Intramural burial in England is not injurious to the public health." "Experience," says the Archdeacon, "proves that within certain localities certain diseases are engendered, and that the traveller who remains there for a certain time is sure to contract the disease; but no such effects have been known to follow from temporary or constant residence near or upon any church-yard in England. *Neither has it been proved that church-yards send forth emanations which are deleterious.*"

The answer to those statements may be derived from various sources; as, from the experience of mankind on intramural sepulture in all ages; from the results of inquiries into the actual condition of our own grave-yards; from an experimental examination of the process and products of animal putrefaction; and lastly, from the knowledge acquired by the physiologist and physician of the effects of putrid emanations on the living animal economy.

From the earliest periods of history we have records of the danger that was apprehended from an intercourse of the living with the dead. Moses, who blended sanitary regulations with religious ceremonials, decreed that he who touched the dead body of man should be unclean for seven days; and the process of embalming with the Egyptians and Peruvians; that of burning by the Greeks, the Romans, the Ethiopians, and other nations, were but the means of preventing the formation of those deadly effluvia, which are the common products of putrefactive decomposition.

After a time, when the Romans practised interment, it was performed in allotted spaces of ground without the walls of the city; and at last, when the dangerous practice of burying the illustrious or pious dead within the precincts of churches became general, it produced so much mischief to the health

of the priests and the people who frequented the churches, that legislative enactments were soon framed to put an end to the custom. I may allude to the regulations framed by the Council of Brague in the year 563, of Nantes in 660, by Theodulphe, the Bishop of Orleans in 794, by Charlemagne in 797, of Arles in 813, of Magouze and De Meaux in 845, and of Trebur in 895. A like spirit prevailed in the ordinances of the Catholic Church from the tenth to the eighteenth century. In proof of this I may mention the edict from Ravenne in 995, from Winchester in 1076, from the famous synod of Toulouse in 1093, from London in 1107, from Cognac in 1255 and 1260, from Bude in 1269, from Nimes in 1284, from Chester 1292, from Avignon in 1326, from Narbonne in 1551, from Toledo in 1566, from Malines in 1570, from Malun in 1579, from Rouen in 1581, from Reims, from Bordeaux, and from Tours in 1583, from Bourges in 1584, from Aix in 1585, from Toulouse in 1590, and from Bordeaux in 1624. All of these were to the effect, that the putrid emanations from the dead were hurtful to the living. It is almost unnecessary to state that the same species of legislation, founded on the same kind of experience, has led to the abolition of intramural interments in France, Germany, America, and, lastly, in this Metropolis.

As to the facts which have accumulated from

inquiry into the actual condition of our own church-yards, and the pernicious effects of the deadly emanations therefrom, I need only refer to the overwhelming evidence which has been furnished through the labours of Mr. George Alfred Walker and Mr. Edwin Chadwick. The former of these gentlemen has written a work entitled "Gatherings from the Grave-yards of London," and the latter has published a parliamentary "Report on the Practice of Interments in Towns." Both of these publications are alluded to in the Charge made by the Venerable Archdeacon, and I am much surprised that they have not convinced him of the enormous amount of mischief done to the health of the people, by the charnel-houses of this Metropolis. In fact, it was the peculiar prevalence of disease in the neighbourhood of church-yards, which first excited attention in the mind of Mr. Walker to this subject; and on inquiry he soon found that the emanations from animal putrescence, would not only occasion the instantaneous loss of human life, but would also increase the intensity of pestilential disease. In these respects his experience fully accords with the statements made in the preambles of the Bills, which were laid before the Parliaments of Paris in 1765 and 1774. In the first of these it was asserted, that "Daily complaints were made of the infectious nature of the parish cemeteries, especially when the heat of summer had increased the exhalations; then the air was so corrupted that the

most necessary aliments would keep only a few hours in the neighbouring houses. This proceeds either from the soil being so completely saturated that it cannot absorb or retain any longer the putrescent dissolution, or from the too circumscribed extent of the ground for the number of dead annually interred." In the second preamble, mention is made of the fœtid smells emanating from the vaults of churches, rendering the air insalubrious, and perhaps occasioning the distressing epidemics that have appeared in the Provinces.

As an example of the overcrowded state of our London church-yards, the following is quoted by M. Tardieu in his "Dictionnaire D'Hygiène Publique," from the Report of Dr. Sutherland: "In many church-yards that I have visited, the soil appears to be entirely composed of crushed bones, and of an oily animal mould. I saw a grave dug a day or two ago, in the church-yard in White Cross Street, belonging to the Parish of St. Giles. This grave was six feet in depth, and appeared to be dug in a wall of human bones. The grave-digger, at each stroke of his pickaxe, crushed or scattered over the earth large fragments of bones. Near me were thrown up five skulls, of which four were entire. The bones around me appeared to belong to many different skeletons, and they looked so fresh that it appeared to me that the soft parts had only just become detached. The sexton told me that, not-

withstanding this, no one had touched this part of the church-yard for twenty years. This proves the necessity for a sufficient space to insure decomposition." And, to quote from the Archdeacon's charge, "My own church-yard has existed for at least seven hundred years; the parish has always been populous, and it has been, in times of pestilence, as the registers attest, the burial place of so many thousand persons, that it is incredible how space could have been found in which to deposit so many dead corpses. I submitted to my friend portions of the earth, both from the surface and from a depth of six feet below; the two specimens exhibited on analysis, no distinctive differences, but were found, as might have been expected, highly charged with ammonia." These are the admissions of the Archdeacon, and they go to prove that, in the case of his own church-yard, there is a mass of festering human remains to the depth of six feet or more, the accumulation of seven hundred years, and the decomposing products of many thousand corpses; there they are, putrifying in the very heart of the City, without being, as the Archdeacon supposes, in any way hurtful or even offensive to the inhabitants of the neighbourhood. In fact, it would appear that it is the very magnitude of the nuisance which keeps down the danger of it; for, according to a theory of the Archdeacon's, "The mixture of several substances which are themselves deleterious and destructive of life, does not give to the atmo-

sphere a deleterious character." The ammonia, the carbonic acid, and the more deadly organic emanations, are, in his judgment, "but the qualities of every heap of the farmer's treasure." They are the gases "which slightly breathed, and in a diluted form, into the nostrils, revive the nervous system, and restore the action of the heart; or, mixed with water, are but a proof of the purity and excellence of the well." This is the theory which prompts the Archdeacon to deny the virulence of those emanations which are ranked by texicologists among the most dangerous poisons with which we are acquainted.

In respect of the actual products of putrefactive fermentation, it may be said that they are legion; for, perhaps, there is hardly a compound of carbon, sulphur, phosphorus, hydrogen, nitrogen, and oxygen, but may be produced by the ever changing combinations of these particles of matter during active decomposition. That carbonic acid, ammonia, and various compounds of hydrogen, sulphur, phosphorus, and carbon, are to be found among the putrefactive elements, there can be no doubt; but besides these, other combinations, more deadly in their nature than ought else with which we are acquainted, are also evolved. "In vain" says Fourcroy, who endeavoured to analyse these compounds, "did we endeavour to induce the grave-diggers to procure us an examination of this

elastic fluid; they uniformly refused, declaring that it was only by an unlucky accident they interfered with dead bodies in that dangerous state. The horrible odour and the poisonous activity of this fluid announce to us that if it is mingled, as there is no reason to doubt, with hydrogenous and azotic gas, holding sulphur and phosphorus in solution, the ordinary and known products of putrefaction, it may contain also another deleterious vapour whose nature has hitherto escaped philosophical research, while its action on life is too strikingly evinced." These remarks were made as far back as the year 1787, when the burying-ground of the St. Innocents, of Paris, was the cause of so much danger to the community as to be made the subject of legislative interference; but even now we are in ignorance of the precise nature of this subtle and deadly agent. Lassaigne, who has examined the putrid matters of flesh, has found them to contain ammonia, peculiar fatty acids, and a stinking volatile oil, which is probably the poisonous ingredient. To quote the words of the late talented author of the Chemistry of Common Life,—"The true chemical nature and exact composition of many of the volatile and gaseous substances produced under these circumstances, is still unknown; but both theory and experience prove that they are injurious to human health. They are so, even when from their extreme state of dilution the organs of smell are

naturally insensible to their presence, or when, by habit, they have become so. Hence the custom of placing grave-yards in the neighbourhood of our dwellings, or of requiring people to sit for so many hours a week over putrid family vaults or heaps of mouldering human dust—is as contrary to the dictates of science and enlightened common sense, as it is to the oft repeated suggestions of sanitary experience."

The last part of this question—namely, that which refers to the observed effects of putrid emanations on the healthy animal economy, has so frequently been made the subject of investigations by authors of acknowledged celebrity, that no doubt can possibly exist in the mind of the well-informed man of science, that the most dangerous consequences have resulted from the inhalation of atmospheric air charged with the products of animal decomposition. In support of this, I may mention the names of Vicq, d'Azyr, Ramazini, Pennicher, Haller, Raulin, Navier, Rozier, Foderé, Fourcroy, Orfila, Devergie, Magendie, Christison, Walker, and the still more recent authorities of Tardieu, Levy, and Taylor. I should weary you if I were merely to enumerate the cases in which sudden death, malignant fevers, and terrible epidemics have clearly been caused by the emanations from the church-yards and vaults of this and other countries. Experiment has also proved that putrid

animal effluvia, however they may gain access to the living body, whether by inhalation, by swallowing, or by being applied to a wound, occasion a disease which closely resembles the low forms of typhus fever. Magendie, in his experiments on dogs, found, that when the animals were confined so as to inhale an atmosphere charged with putrifying matter, they quickly lost flesh; and, although they retained their gaiety and appetite, they died much emaciated in the course of ten, fifteen, or twenty days.

Lastly, I may state that the experience of every one who has had occasion to inhale the putrid emanations from the recently dead animal body, is to the effect that diarrhœa, dysentery, nausea, a general wasting of the system, and sometimes a low form of typhoid fever, are the unfortunate results. On this head the remarks of Christison, Chevallier, Ollivier, Michel Levy, and Tardieu, are particularly emphatic; and I cannot help saying that from one, who, like the Venerable Archdeacon, has had the advantage of "having for many years conversed much with men of science, chemists, physiologists, and physicians," who has thereby had an opportunity of enjoying in no ordinary degree the light of modern knowledge, the opinions and arguments which he has put forth on the present occasion, are at least remarkable; for not only are they entirely opposed to the experience of the past, but they are

also in direct contradiction to the science of the present; indeed, the great tendencyof all recent investigations into the subjects of chemistry, physiology, and pathology, has been to show that the peculiar changes which are going on in a mass of putrifying matter, are, by its mere contact with the living body, most liable to be transmitted thereto. Pathology also teaches us that of all forms of noxious matter, the gaseous are most active, because of the facility with which they reach the delicate and highly organised tissues of the lungs; and lastly, physiology informs us that man has no more power to assimilate the gaseous elements of putrefactive fermentation, than he has to use up the subtle principles of epidemic disease; indeed, all that exists in the air which we breathe, excepting nitrogen, oxygen, and aqueous vapour, are possitively hurtful to us.

H. LETHEBY, M. B.,
Professor of Chemistry and Toxicology, in the Medical College of the ~~City of~~ London.

LONDON HOSPITAL COLLEGE,
November 19*th*, 1855.

REPORT

OF THE

MEDICAL OFFICER OF HEALTH

OF THE

CITY OF LONDON,

UPON THE

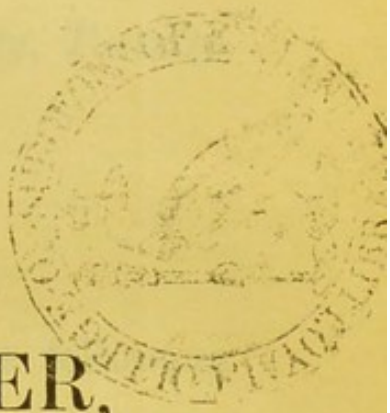
NEW RIVER WATER,

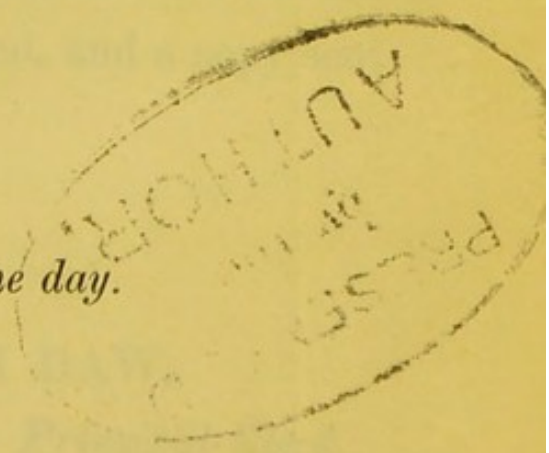
AND THE

CHURCH YARD OF ST. ANDREW'S,

HOLBORN,

PRESENTED TO THE COMMISSIONERS OF SEWERS, TUESDAY, 11TH DECEMBER, 1855.





Ordered to be Printed same day.

LONDON:
PRINTED BY M. LOWNDS, 141½, FENCHURCH STREET, CITY.

1855.

At a Meeting of the Commissioners of Sewers of the City of London, held at the Guildhall of the said City, Tuesday, December 11*th*, 1855:—

The Clerk laid before the Court the following Report of the Medical Officer of Health, which was read at length.

ORDERED—

That the said Report be printed, and the accompanying illustrations lithographed, and a copy sent to every member of this Court.

JOSEPH DAW,
Principal Clerk.

To the Honorable Commissioners of Sewers of the City of London.

Tuesday, December 11th, 1855.

Gentlemen,

In reference to the Inspectors' returns now before you, relating to 231 houses, I beg to submit a list of places requiring the orders of your Honorable Court for their sanitary improvement in various particulars.

Also a list of places requiring further proceedings in respect of orders already issued, but not yet complied with.

I have the honor to subjoin, as usual, a tabular statement of the Mortality in the population of the City of London for the two weeks ending December 1st and December 8th.

REPORT ON THE QUALITY OF THE NEW RIVER SUPPLY.

In accordance with the instructions which I received from your Honorable Court on the 13th of November last, I have made an examination of the water supplied to the City by the New River Company; and the following is my report thereof.

The water was taken from the main at my own house, on the 14th, 15th, and 16th ultimo. When it was first drawn it presented a very turbid appearance, from the presence of a comparatively large quantity of clay, flinty matter, and animalcules. The sample No. I. is a specimen of the water as it was received from the main tap.

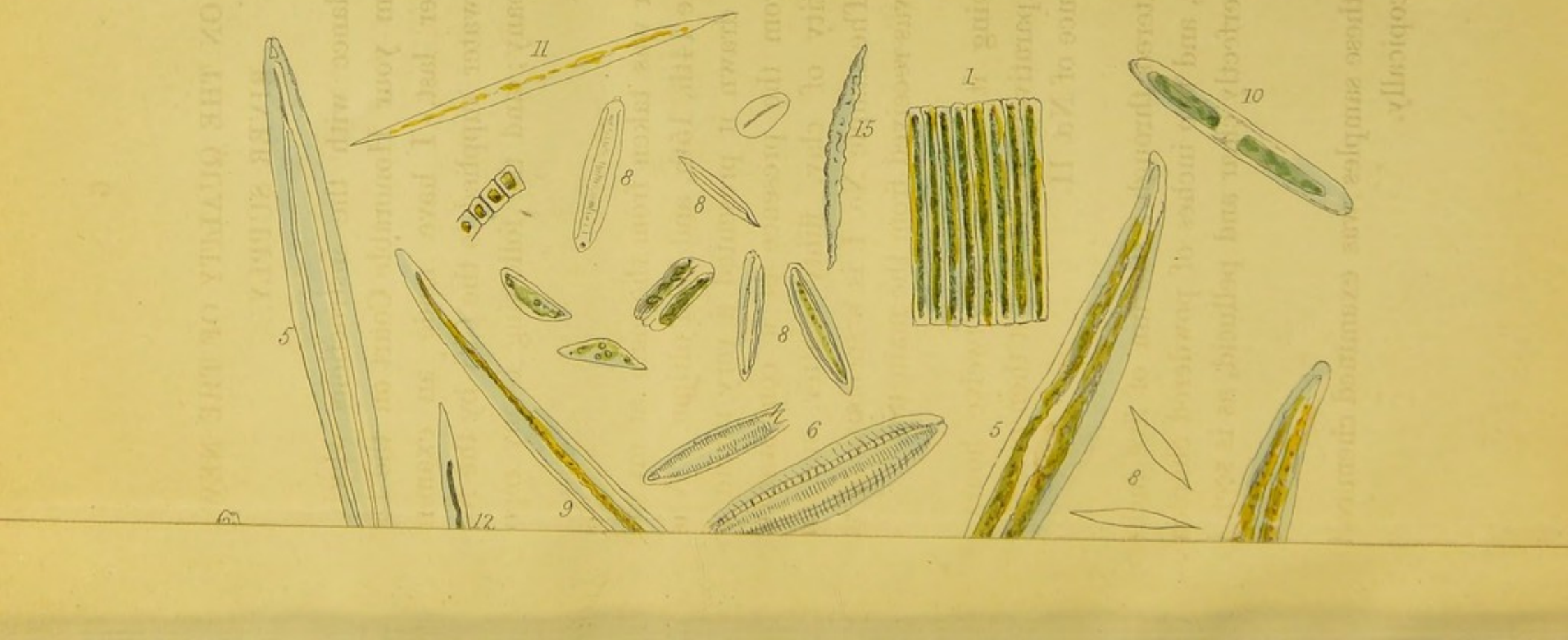
On allowing it to stand for twelve hours it became comparatively bright, and it then presented the appearance of No. II.

When filtered through a stratum of five inches of fine sand, and two inches of powdered charcoal, it became perfectly clear and pellucid, as is seen in No. III.

Each of these samples was examined chemically and microscopically.

ANIMALCULES CONTAINED IN THE SEDIMENT OF THE NEW RIVER WATER,

MAGNIFIED 350 TIMES.



No. I. contained 24·1 grains of solid matter in the imperial gallon. Of this 8·1 were chalk, 1·9 sulphate of lime, 1·7 common salt, and 1·8 nitre, 0·6 sulphate of potash, 5·7 flinty matter and clay, and 4·3 organic matter.

No. II. contained 16·8 grains of solid matter in the imperial gallon; and the saline matters were precisely the same as in the last case; although there were only seven-tenths of a grain of silica, and 2·2 grains of organic matter.

No. III. contained only 14.7 grains of solid residue in the imperial gallon; and the organic and flinty matter had almost entirely disappeared, the proportion of the former being only eight-tenths of a grain, and that of the latter one-tenth.

When examined by a magnifying power of 320 linear, the deposit from the water was seen to be composed of minute particles of flint, clay, and living organisms. The latter are shown in the drawing which I place before you; and it will be observed that they consist of a number of animalcules belonging to the families *navicula*, *fragilaria*, *synadra*, and *coconema*, besides which there are spicula of sponge, and filaments of conferva.

When I first examined the deposit, the animal-

cules were in a living state, and they appeared to be thriving very prosperously on the organic matter dissolved and suspended in the water.

The sample of filtered water did not exhibit any sign of organic life, or of mechanical impurity.

The cause of this turbidity in the New River water is doubtless to be attributed to the heavy rain which had fallen a short time previously. This had washed the clay, flint, and organic matters from the ploughed and well manured land of the districts through which the river had flowed; and I may remark that this condition of the water is not at all uncommon in rainy seasons.

At present the Water Companies have not the means of effecting a perfect subsidence and filtration of turbid matters from water; but it is to be hoped, that when the new system of purification and storeage come into full operation, we shall then see no more of these filthy deposits, which, in the case of the living organisms, are signs of putrescence and decay. An examination of the three samples of the same water, now before you, will fully satisfy you how easy it is to remove such impurities.

As for the general quality of the New River supply, I take this opportunity of stating, that when the water is properly filtered, and so deprived

of mechanical impurities, it is amongst the best descriptions of water supplied to the Metropolis; and, from the circumstance of its containing but a comparatively small proportion of innocuous saline matter, it is excellently well fitted for all the purposes to which it is applied.

In conclusion I may inform you, that it is easy to construct a cheap and effective *household filter*, which will readily deprive water of all its mechanical impurities. A large zinc funnel, capable of holding about a gallon of water, is to be placed over a jar or other vessel from which the filtered water can be easily drawn off. The stem of the funnel is to be packed to the depth of five inches with fine white sand. and above this a stratum, two inches thick, of coarsely ground animal charcoal—such as the sugar-bakers employ. The sand and the charcoal are to be well washed before they are put into the funnel, and a disc of perforated zinc is to be placed at the bottom of the stem to prevent the sand, &c. from running out. An instrument constructed in this way will keep in perfect action for a long time; and when it fails, it is easily repaired by rewashing the sand and charcoal. I have had a filter of this description in constant use for the last seven years. It has been cleansed only twice in that interval, and it still continues to act very effectively.

ST. ANDREW'S, HOLBORN HILL.

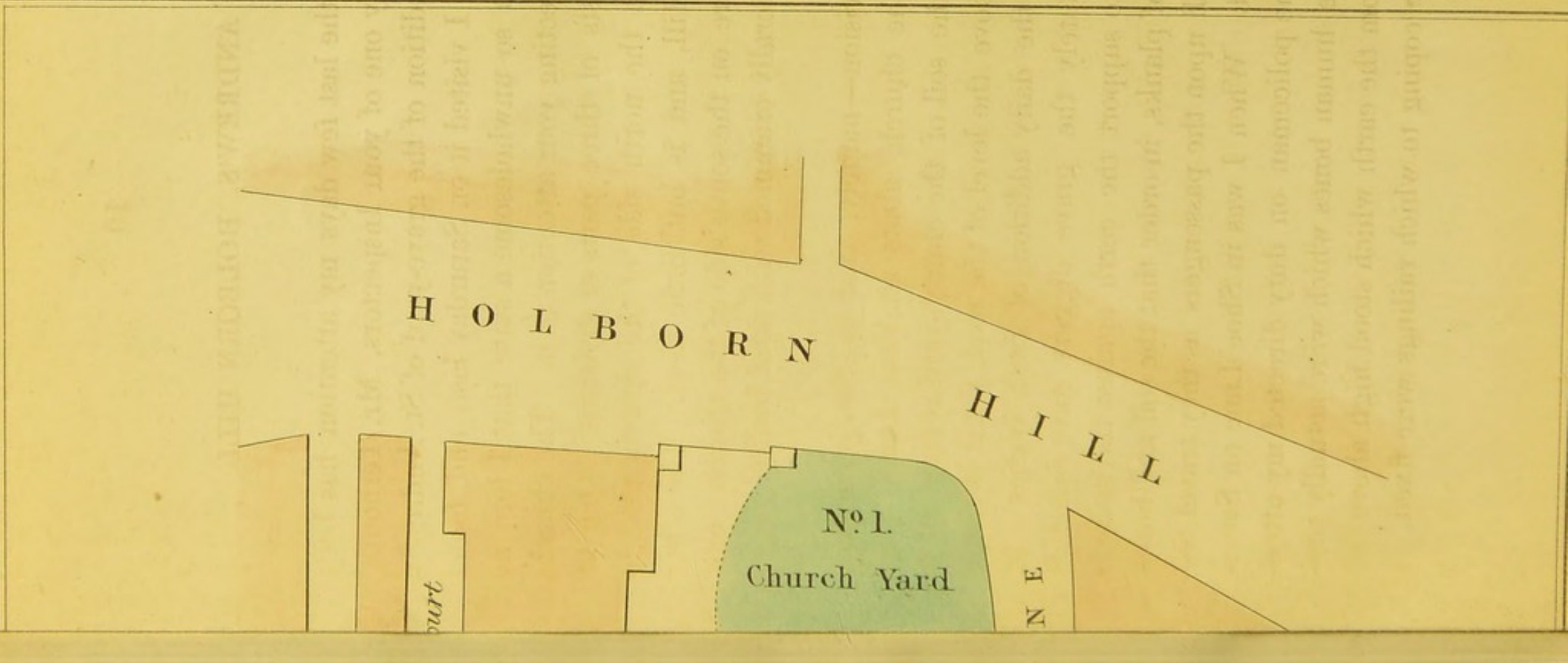
Within the last few days my attention has been directed by one of your Inspectors, Mr. Ternouth, to the condition of the grave-yard of St. Andrew's, Holborn. I visited it on Saturday last, and found it to be in so unwholesome a state that I lose no time in directing your attention to it. The church-yard consists of three parts or divisions. One of these is on the north side of the church, next to Holborn Hill, and is but little used. The other divisions are on the south side of the church: and they are literally crammed with dead bodies.

One division—namely, that in the immediate south of the church, abuts on Shoe Lane; and, although the soil of the church-yard is from 10 to 15 feet above the level of the road, yet it is rising higher by the daily addition of fresh bodies. In fact very lately the grave diggers have found it necessary to support the earth against the railings by means of planks, in order that the soil and bones may not fall upon the passengers as they travel the public road. When I was in Shoe Lane on Saturday last, the policeman on duty directed my attention to the human bones which were actually protruding from the earth which stood high above the level of the coping to which railings were fixed.

PLAN OF ST. ANDREW'S CHURCH AND CHURCH YARDS,

HOLBORN HILL.

Copied from Mr. Haywood's Plan.



On going into the church-yard I witnessed the active preparations which were being made for the next Sunday's burials. Several graves were already dug; and at the bottom of one of them I noticed a coffin barely covered with earth; in the side of another a coffin was exposed, which the grave-digger said had been buried only a few days. Everywhere on the surface of the ground, bones and decaying wood were abundantly scattered about, and the soil itself was saturated with decomposing organic matter; indeed, it exhibited in a very marked degree, that peculiar oily or unctuous quality which is characteristic of the overcharged soil of the London grave-yards. I took away a portion of the earth for experiment, and I place before you the disgustingly fœtid liquor which I obtained by a distillation of only two ounces of the soil. This will convince you that church-yard earth is not so innocent or innocuous a thing as many have supposed.

In all directions the ground was considerably above its natural level; and, at my request, the grave digger and his assistant explored it in several directions, in order that I might ascertain at what depth the coffins were buried. In several places they were not more than three feet from the surface, and in one case the coffin was covered with less than two feet of earth.

How long this church-yard has been used as a burial ground, I know not, but it is manifest from the appearance of the soil, and the elevation of it above the natural level, that thousands of dead bodies have undergone decay in it. I am told, that at the time of one of the cholera visitations, it was considered to be unsafe to have any fresh burials in it, and the ground was closed for many months. Judging also from a Parliamentary Return which is in the possession of your Principal Clerk, it appears that on the 9th of May, 1853, the Secretary of State ordered this church-yard to be closed *forthwith*, but I am informed that, with the exception of one day, the burials have been continued in it ever since. In fact, from an examination of the books, which are in the custody of the Sexton, I find that as many as 1026 bodies have been interred in this church-yard since the beginning of the present year. This gives an average of about 21 burials per week. So that in the course of the two years and a half that have elapsed since the Secretary of State ordered the immediate closure of this overcrowded grave-yard, nearly 3000 bodies have been added to the soil—the entire area of which is considerably less than an acre.

It is, I am quite sure, unnecessary to extend this Report, by advancing any proofs of the mischief which must result from such a congregation of

decaying animal matter; for you will readily believe that it must be a constant source of danger to the inhabitants of the neighbourhood; and it may, at any moment, be the cause of pestilential disease. Indeed, the poor children who frequent the City of London National School, which is built out into the very centre of this grave-yard, may be the first victims of its malignant influence. I, therefore earnestly commend this subject to your attention, saying that it involves the public safety. My opinion is that the church-yard should be closed as soon as possible.

I have the honor to remain,

Your obedient Servant,

Hy. LETHEBY, M.B.