Second report on the deoderisation of sewer emanations and on sewer ventilation. With appendix containting detailed reports by Sir. H. Roscoe's assistant / by Henry E. Roscoe.

Metropolitan Board of Works.

SECOND REPORT

ON THE

DEODORISATION OF SEWER EMANATIONS

AND ON

SEWER VENTILATION,

BY

SIR HENRY ROSCOE, F.R.S., D.C.L., LL.D., M.P.,

WITH APPENDIX

CONTAINING DETAILED REPORTS BY SIR H. ROSCOE'S ASSISTANT.

(*Ordered to be printed by Special Sub-Committee, 19th June,* 1888.)

JUDD AND CO. LIMITED, PRINTERS TO THE METROPOLITAN BOARD OF WORKS, LONDON, E.C.

[No. 1,295.]

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SIR HENRY E. ROSCOE, F.R.S., D.C.L., LL.D., M.P.

10, Bramham-gardens,
Wetherby-road, S.W.

J. E. Wakefield, Esq.

I.—DEODORISATION OF SEWER EMANATIONS.

Sir,

In pursuance of my inquiry into the deodorisation of sewer emanations, I requested my assistant, Mr. Scudder, to inspect several of the stations in the Metropolis, where sulphurous acid is used, and to report to me. These reports are found in an appendix to this communication, and I now beg to report the results as follows—

As regards the use of sulphurous acid as a deodorant of sewer emanations, I have come to the conclusion that the

present method of applying this substance is not satisfactory, inasmuch as out of 46 stations visited, the apparatus did not work effectively in 23, or in 50 per cent.

This does not arise from the inactivity of the sulphurous acid as a disinfectant, but (1) from the difficulty of regulating the flow of the sulphurous acid from the jars, which is apt either to stop altogether, or flow out too quickly; (2) from the fact that the solution of sulphurous acid hitherto employed is not of sufficient strength, so that even when the plan is at work, the sulphurous acid escaping from the jars is insufficient in amount to completely deodorise the emanations.

I hope soon to report on a new method of deodorisation by this agent which is being tested in the Tachbrook-street sewer, Pimlico, and which I have reason to believe will prove more satisfactory. I shall report on this matter shortly.

As regards the use of charcoal boxes in the ventilating shafts of the sewers placed there to intercept the sewer emanations, I have come to the conclusion that these not only fail to effect this purpose, but that, on the contrary, they obstruct ventilation, and also act as catch-pits for street dirt. In this I agree with the statement contained in a report of the Special Purposes and Sanitary Committee, dated January 12th, 1886, viz., "That the use of charcoal or of other appli-"ances for deodorising gases in sewer ventilators is undesir-"able, as such appliances do much harm by obstructing "ventilation, are costly and troublesome, and are quite "unsuitable for general use over a large sewerage system."

I fail to understand why after this statement no order for the removal of these charcoal boxes has been given. I think this should be done at once.

I am also of opinion that the discharge of steam and hot water, chemical refuse, &c. into the sewers causes a serious nuisance. (Appendix, Lime Dock Sewer Eastern District, No. 3, letter, May 10th, 1888.)

I beg to refer to recommendation No. 2, contained in report already quoted which is as follows—"That stringent measures "be taken by the Board for preventing the discharge into "sewers from manufactories and other places of improper "substances, such as to be the cause of nuisance." These recommendations should be acted upon stringently. I am not aware that any steps of this nature have recently been taken.

II.—SEWER VENTILATION.

As regards Ventilation, so far as I have been able to judge, nearly the whole ventilation of the Metropolitian Sewers depends upon surface Ventilators, that is to say, "on shafts "leading from the crown of the Sewer, to the centre of the "road, and covered at the road-level by open gratings." The efficacy of surface Ventilation depends mainly on the size of these air openings.

The general Ventilation of the Sewers appears to be in an unsatisfactory condition, for so far as my investigations have proceeded, the size of air openings is altogether insufficient. Thus, for instance, in the case of the Tachbrook Street Sewer, it was found that out of nine Ventilators, six were completely filled with dirt, and the available air openings in the three remaining ones between the "Royal Standard" entrance and outlet to open Sewer near Equitable Gas Works were only equal in area to 146 square inches.

I agree with the following statement contained in the Report already referred to of the Special Purposes and Sanitary Committee:—

"That the Ventilation of Sewers in the Metropolis, by "means of Ventilating Shafts leading to gratings in the "centre of roadways, has been the cause of complaint, "owing to the imperfect manner in which the system has "been carried out, the Ventilators being deficient both in "size and number."

"That pipe ventilators of large section, and constructed "with bends, and without angles, can be used with great "advantage, in addition to, and not in substitution for "surface Ventilators, wherever the consent of owners and "occupiers can be obtained to such Ventilators being "affixed."

"Your Committee believe that Pipe Ventilators can be "used with advantage in aid of the present system. Pipes "should be carried up to the ridges of the roofs of adjacent "buildings, where the owner's consent can be obtained, and "they should discharge six or eight feet above the ridges, "and as far from chimneys and windows as possible. Such "pipes would ordinarily make efficient up-cast shafts, the "nearest surface Ventilators becoming inlets for air, or "down-cast shafts."

The escape of Sewer air is practically prohibited in many quarters of the Metropolis. This is evident from the fact that the temperature of the air in the Sewer is often ten

degress above that of the outer air, into which the warmer sewer air would naturally escape, were proper means provided.

I consider that the free admission of air into the Sewers is the only efficacious means of preventing foul emanations, 1st, by the oxidation of the putrescent sewage, and 2nd, by the dilution of any offensive gases evolved. I, therefore, beg to call special attention to this portion of the subject, for I believe that the policy of closing the air openings to the Sewers, instead of allowing so much fresh air to enter as is possible, is based upon a wrong scientific principle, and that the only feasible plan of rendering the Sewers sweet is to carry out thoroughly, and on a proper scale, the system of Pipe Ventilation so strongly recommended in the excellent Report of the Special Purposes and Sanitary Committee.

I am, Yours truly,

H. E. ROSCOE.

APPENDIX

Containing Reports from MR. SCUDDER *to* SIR HENRY ROSCOE, *Lists of Stations visited, and general remarks.*

10, BRAMHAM GARDENS,
WETHERBY ROAD, S.W.,
May 3rd, 1888.

SIR HENRY ROSCOE, M.P.

SIR,

In accordance with your instructions I met Mr. G. Attwood, Flushing Inspector, this morning, and with him made an inspection of the King's Scholars' Pond Sewer, in Tachbrook Street, Pimlico, where sulphurous acid is used as a deodorant.

Entering the Sewer by a side entrance in Morton Street, I first inspected a glass syphon containing anhydrous sulphurous acid which was placed some height from the level of the water in the sewer. The syphon was fully three parts full, but no sulphurous acid was escaping. Walking along the sewer towards the Equitable Gas Works, I further inspected two sulphurous acid jars which were placed at proportional distances between Morton Street, and the outlet to

open sewer near the Equitable Gas Works. Both these acid jars were, however, empty—consequently there was no smell of sulphurous acid in the sewer; but, on the other hand, there was a distinct nauseating smell, consisting of ammonia, sulphuretted hydrogen, and a heavy earthy smell, accompanied by a vapour.

Mr. Atwood informed me that it was the custom to fill the acid jars every Monday and Friday, and that he had under his inspection 39 stations where these jars are in use. Two men are employed under Mr. Attwood to keep the jars in order, and see that the sulphurous acid is allowed to escape regularly.

Through the kindness of Mr. Attwood, who placed two men at my disposal, I visited several of the other places in Mr. Attwood's district, where these sulphurous acid jars were in use.

I append a Table showing the places visited, and the observations recorded. You will observe that about 50 per cent. of the acid jars were not in action at all, and in no single instance could I smell sulphurous acid escaping with the sewage air.

The acid contained in the jars seemed, to my senses, very dilute; but I cannot say more on this point at present.

I am, Sir,

Your obedient servant,

FRANK SCUDDER.

146, Earl's Court Road,

Earl's Court,

May 5th, 1888.

Sir Henry Roscoe, M.P.

Sir,

On Saturday morning, May 5th, I met Mr. R. Fernley, Flushing Inspector, and with him I inspected 13 stations in his district where sulphurous acid jars are in operation.

The total number of stations where sulphurous acid jars are in use in Mr. Fernley's district is 44.

The jars are changed twice a week, and there are two men employed under Mr. Attwood to keep them in order, and pay constant attention to them.

Mr. Fernley informed me that the acid jars had only been attended to on Friday last, and I found that out of 13 stations visited, at only 2 stations the jars were stopped, the rest were working more or less satisfactorily.

I append a Table showing the places visited, and the observations recorded.

In only one instance could I smell sulphurous acid escaping with the sewer emanations, viz., in Tollington Road, N. Here there was a strong smell of sewer gas, and sulphurous acid, and a good deal of vapour escaping.

In Mr. Fernley's district there are no syphons in use.

I am, Sir,

Your obedient servant,

FRANK SCUDDER.

146, Earl's Court Road,
Earl's Court,
May 10*th*, 1888.

Sir Henry Roscoe.

INSPECTION OF SEWERS.—EASTERN DISTRICT.

Sir,

I have this day inspected Mr. T. Anthony's district, and beg to report as follows :—

There are at present 38 stations where acid jars are in use. Two men are employed under Mr. Anthony to attend to them. Part of the district is densely crowded with manufacturing works, many of which discharge into the sewers chemical refuse, hot water or steam, and filth. (I must here remark that I consider it is essential in the examination of some of the sewers in this district that great discretion ought to be exercised in bringing a light into the sewers, as there is no doubt that inflammable materials are discharged into them.)

The first place I inspected, viz.—Opposite St. Mary, Stratford, Bow, Sunday Schools in Old Ford-road, E., a strong smell of naphtha, or a light tar oil, was perceived in the entrance to sewer, accompanied by sewer gases and vapour. The acid jar placed in the ventilating shaft was at work, but was thoroughly incapable of deodorising the gases which after this treatment had then to pass through charcoal. On examination of the charcoal box, it was quite evident that the arrangement obstructed ventilation considerably, and accounted to some extent for the accumulation of offensive gases in the entrance to the sewer. There are a number of charcoal boxes in use in the district, and after inspection, I am forced to the opinion that charcoal boxes in many cases become receptacles for collecting street dirt, and thereby not only hinder ventilation, but also prevent the charcoal from absorbing, or deodorizing the sewer emanations.

Access to the sewers which I have visited were by man-holes, situated on the foot-path. The openings in the gratings above the ventilating shafts in the centre of the road are very small in comparison to other districts.

In Upper North-street, Poplar, I found a method of ventilating the sewer by carrying a shaft from the sewer to the side of the road, and connecting to it a vertical pipe attached to the head of which was fixed a "cowl." There are about six of these contrivances at work, and were introduced many years ago by Mr. Parker, the Surveyor to the Board. Mr. Anthony spoke well in favour of this system.

I further inspected the Lime Kiln Dock Sewer at a point where they were removing the mud which had collected in the sewer. The mud was black, and had a very nauseating smell. Mr. Anthony thought it would contain a deal of tarry matter and chemical refuse, as it was found very injurious to the workmen's shoes. Samples of this mud have been forwarded to the laboratory for examination.

The atmosphere of the districts of Old Ford and Poplar is polluted with noxious vapours caused by the manufacturing works. I am inclined to think that many of the acid jars at present in use could well be dispensed with until specific complaints are made of the sewer emanations.

I would suggest that the Clerk of the Board be requested to furnish you with a list of the places from which complaints have arisen during the past twelve months, and also to furnish you with a list of the more important ventilating shafts in their several districts.

I am, Sir,

Your obedient servant,

FRANK SCUDDER.

146, Earl's Court Road,
Earl's Court,
May 15*th*, 1888.

Sir Henry Roscoe.

1. DEODORISATION OF SEWER EMANATIONS.

Sir,

I have to-day inspected 11 stations in Mr. Attwood's district where sulphurous acid jars are in use, and I beg to report as follows :—

The whole of the 11 acid jars are placed at certain positions in the King's Scholars Pond Sewer, between the "Royal Standard" entrance in Victoria-street, and the outlet to open sewer at the entrance to Equitable Gas Works.

I was told by the men in charge that these 11 jars had been attended to last Monday (May 14th), but, on inspection, not one was found working. The jars contained some acid, but, in every instance, the flannel upon which the acid drops had not the faintest smell of sulphurous acid. I may add that these acid jars are difficult of access, the workmen have to enter the sewer by the "Royal Standard" entrance, and work their way along to Moreton-street.

The defectiveness of this method plainly shows itself.

2. VENTILATION OF SEWERS.

The Sewer from the "Royal Standard" entrance in Victoria-street, S.W., to the outlet into open sewer at entrance to Equitable Gas Works, is ventilated by means of shafts leading from the crown of the sewer to gratings in the centre of the road.

The openings in the surface gratings have the following capacities :—

	Air opening equal in area to square inches.	
Opposite 172, Tachbrook-street	33¾	
Moreton-street, Tachbrook-stdeet	33¾	
Opposite 120 ,, ,, ...	33¾	
Charlwood-street, near Tachbrook-street	33¾	
Opposite 58, Tachbrook-street	33¾	
,, 34 ,, ,, ...	33¾	
	——	202½
,, 4 ,, ,, ...	48¾	
Rear of Vauxhall Bridge-road	48¾	
,, ,, ,, ...	48¾	
	——	146¼
Total ...		349

I found many of the ventilating gratings choked up with road refuse. In six of the ventilating shafts charcoal boxes were fixed, and in every case the charcoal was covered with street dirt, and ventilation obstructed.

You more specially desired me to-day to report on the ventilation of sewers, and for this object I took with me an anemometer to measure the speed of the air escaping at various ventilating shafts. At the six ventilating shafts with charcoal boxes no air was passing, and on removal of the charcoal box a down draught was caused at first, afterwards an upright draught, and, at times, both currents in tha same ventilator. Readings of the anemometer showed in one case, 1st, a down draught, 280 cubic feet per hour—a few minutes after an up draught, 250 cubic feet per hour. The external influences seemed so complicated, and the anemometer readings were so unsatisfactory and irregular, that it was decided to try if better results could be obtained by working from the inside of the sewer.

The temperature of the air in the sewer, a little way from the "Royal Standard" entrance, was ten degrees warmer than the external temperature,

The temperature gradually lowered as we reached the flaps, and about 50 yards from the outlet it was only three degrees warmer than the external temperature.

There was no motion of the air inside the sewer, but when the charcoal box was lifted out of the Ventilating Shaft, external air rushed into the sewer, which displaced the foul air around the crown of the sewer. The same difficulties were experienced with the Anemometer, the readings being very irregular. The height of the Ventilating shaft from the crown of the sewer to the gratings, would only be about three or four feet, a height which no doubt to some extent accounts for the various draughts. At times the air in the Ventilator Shaft would remain motionless for several minutes.

The large wooden flaps at outlet to open sewer were closed, and practically no air entered the sewer, but on opening the flaps, the external air rushed in at the rate of about 350 cubic feet per hour. On former visits, sewer gases and sewer air were escaping from the flaps.

A map showing the exact position of this Sewer from the "Royal Standard" entrance to outlet in open sewer, at entrance to Equitable Gas Works, with the positions of the several ventilators, and the fall of the sewer, would be of assistance. Perhaps this could be supplied by Mr. Lovick, Engineer's Department, Spring-gardens.

I am, Sir,
Your obedient servant,
FRANK SCUDDER.

146, Earl's Court Road,
Earl's Court,
May 30th, 1888.

Sir,

I have to-day inspected an air shaft opposite No. 78, City-road, complained of by Messrs. Withers and Withers.

The smell of the sewer emanations was very offensive at the time of my visit, 3 30 p.m.

The escape of the gases was intermittent ; for a time there was an up current in the air shaft, then suddenly changing to a down current.

The acid jar was working, and had been attended to in the early morning.

The smell was earthy and nauseating. Messrs. Withers and Withers told me that it entered their rooms on the second storey, which would be quite 30 ft. away from the air shaft. I could smell the gusts 10 ft. away.

This air ventilator is the only one in the sewer, and on a previous visit, viz. : May 3rd, I noted that there was a nauseating smell and vapour escaping.

I am Sir,

Your obedient servant,

FRANK SCUDDER.

Mr. ATTWOOD'S DISTRICT.

	Stations Visited.	Remarks.
1	78, City-road	Acid jar working. Nauseating smell and vapour. Messrs. Withers and Withers, of No. 82, City-road, have complained of the sewer emanations.
2	Gray's-inn-road, opposite Wilson-street, W.C. ...	Acid jar empty. Nauseating smell and vapour.
3	Gray's-inn-road, opposite Calthorpe-street ...	Acid jar working. Nauseating smell and vapour.
4	Gray's-inn-road, opposite Eley Bros., and near Royal Free Hospital	Acid jar working. Nauseating smell, no vapour.
5	Opposite Prospect-terrace, near Sidmouth-street, W.C.	Acid jar working. No smell or vapour.
6	Opposite Swinton-street and Manchester-street	Acid jar stopped. No smell or vapour.
7	King's-cross-road, near "Northumberland Arms"	Acid jar working. Slight smell, no vapour.
8	Pentonville-road	Acid jar working. Nauseating smell.
9	Gray's-inn-road, Chad's-place...	Acid jar stopped. No smell.
10	St. Pancras-road, opposite Salt and Co. ...	Acid jar stopped. Nauseating smell and vapour.
11	Opposite Weller's-court, St. Pancras-road ...	Acid jar stopped. No smell.
12	Opposite Midland Railway Cab Yard	Acid jar stopped. Nauseating smell and vapour.

Mr. R. FERNLEY'S DISTRICT.

	Districts Visited.	Remarks.
1	Hackney and Stepney Relief Sewer, Mare-street, Hackney, near Town-hall.	Bottle working. Slight smelt and vapour.
2	Mare-street, opposite Ellingfort-road	Bottle very inactive. Little or no smell, ventilator stands in crossing.
3	Mare-street, opposite No. 132	Bottle working. No smell, slight vapour, ventilator side of curb.
4	Corner of King Edward-road, opposite Public-house "Royal Edward"	Bottle stopped. No smell or vapour.
5	Queen's-road, N.E., opposite Albion-road, E. ...	Bottle working. No smell or vapour.
6	Shrubland-grove, Queen's-road	Bottle working. No smell, slight vapour.
7	Sandringham-road, opposite St. Mark's Church...	Bottle working. No smell, very slight vapour
8	John Campbell-road, N., opposite No. 25 ...	Bottle working. No smell or vapour.
9	Mildmay-road, opposite No. 47	Bottle working. No smell, slight vapour.
10	Ferntower-road, opposite butcher's shop, No. 10	Bottle nearly stopped. Very slight smell, and slight vapour.
11	Highbury New-park, opposite No. 80	Bottle working. No smell or vapour; many complaints previous to placing acid jar in sewer.
12	Tollington-road, N., opposite No. 2, Holloway-road end	Bottle working. Strong smell of sewer gas, sulphurous acid, and a good deal of vapour.
13	Holloway-road, opposite No. 474	Bottle stopped. No smell or vapour.

No. 3 District. *May* 10*th*, 1888.

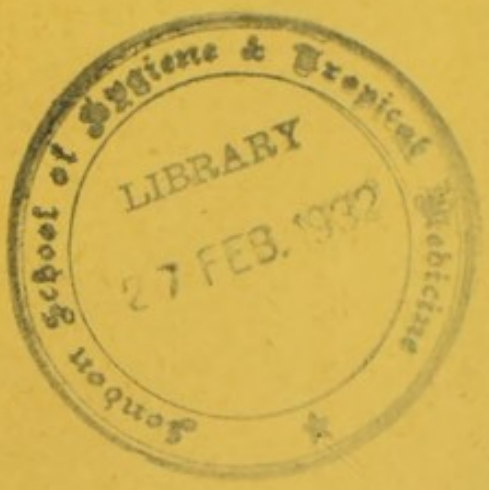
Mr. T. ANTHONY'S DISTRICT—EASTERN.

	Districts Visited.	Remarks.
1	Old Ford-road, opposite St. Mary, Stratford, Bow, Sunday Schools	Acid jar working. Strong smell of naphtha, sewer emanations, and vapour. No smell of sulphurous acid.
2	Upper North-street, opposite Pekin-street ...	Acid jar stopped. Smell of sewer emanations, vapour.
3	In Garford-street, corner of Bridge-road ...	Acid jar stopped. No smell, no vapour.
4	Bridge-road, oft Emmett-street	Acid jar stopped. No smell, no vapour.
5	Ropemakers' Field, opposite Taylor and Walker's Brewery	Acid jar stopped. Smell of sewer emanations, also brewery smell, vapour.
6	Nightingale-lane, Limehouse	Acid jar stopped. Stink of sewer emanations, no vapour.
7	Havering-street	Acid jar working. Stink of sewer emanations, no vapour.
8	High-street, Wapping, Union Wharf	Acid jar working. No smell, no vapour.
9	Great Hermitage-street	Acid jar working. Smell of sewer emanations, no vapour.
10	Great Hermitage-street, opposite Seaward Bros.	Acid jar working. Smell of sewer emanations, no vapour.
11	Upper East Smithfield	Acid jar working. No smell of sewer emanations, but a brewery smell accompanied by slight vapour.

Mr. ATTWOOD'S DISTRICT.

	Stations Visited.	Remarks.
1	Tachbrook-street, opposite No. 172	Charcoal box. Acid jar stopped. Charcoal very dirty, opening in grating filled with dirt.
2	Moreton-street, corner of Tachbrook-street ...	Charcoal box. Acid jar stopped. Charcoal very dirty, openings in grating filled with dirt.
3	Tachbrook-street, opposite 120	Charcoal box. Acid jar stopped. Charcoal very dirty, openings in grating filled with dirt.
4	Tachbrook-street, Charlwood-street	Charcoal box. Acid jar stopped. Charcoal very dirty, openings in gratings filled with dirt.
5	Tachbrook-street, opposite No. 58	Charcoal box. Acid jar stopped. Charcoal very dirty, openings in gratings filled with dirt.
6	Tachbrook-street, opposite No. 34	Charcoal box. Acid jar stopped. Charcoal very dirty, openings in gratings filled with dirt.
7	Tachbrook-street, opposite No. 4	None. Acid jars stopped. Openings in grating clean, no smell of sewer emanations.
8	Rear of Vauxhall Bridge-road	None. Acid jar stopped Openings in grating clean, very slight smell.
9	Rear of Vauxhall Bridge-road	None. Acid jar stopped. Openings in gratings clean, very slight smell.
10	Tachbrook-street, opposite No. 170	Side entrance only. Syphon. No smell of sulphurous acid escaping, Syphon about ¾ empty.

Note.—There was no ventilating shaft in the district through which a free current of air could pass.—F. S.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