Letter by Dr. Letheby, in reply to the report of Dr. Hofmann and Dr. Frankland, on a communication from him respecting the empoisonment of the Thames with arsenical perchloride of iron.

LETTER

BY DR. LETHEBY, IN REPLY TO THE REPORT OF DR. HOFMANN AND DR. FRANKLAND, ON A COMMUNICATION FROM HIM RESPECTING THE

EMPOISONMENT OF THE THAMES

WITH

ARSENICAL PERCHLORIDE OF IRON.

LONDON:
M. LOWNDS, PRINTER, 148½, FENCHURCH STREET, CITY.

1860.

At a Meeting of the Commissioners of Sewers of the City of London, held at the Guildhall, of the said City, on Tuesday, July 31*st*, 1860 :—

It was ordered that the following letter from the Medical Officer of Health be printed and a copy sent to every Member of this Court, and of the Metropolitan Board of Works.

JOSEPH DAW,
Principal Clerk

LETTER

BY DR. LETHEBY, IN REPLY TO THE REPORT OF DR. HOFMANN AND DR. FRANKLAND, ON A COMMUNICATION FROM HIM RESPECTING THE

EMPOISONMENT OF THE THAMES,

WITH

ARSENICAL PERCHLORIDE OF IRON.

41, Finsbury Square,
July 26th, 1860.

To the Chairman and Members of the Metropolitan Board of Works.

Gentlemen,

I have just received a printed copy of a Report by Dr. Hofmann and Dr. Frankland, on a communication from me with reference to the quantity of arsenic in perchloride of iron; and as the Report reflects in some degree on my skill and judgment in the matter, and is, moreover, calcu-

lated to diminish the importance of the subject by diverting your minds from the main facts of the question, I beg leave to reply to it.

And here, at the outset, I may remark, that although the reporters have verified, in the most conclusive manner, the principal fact to which I directed your attention, namely—that the perchloride of iron which you were about to use for the deodorization of London sewage is charged with a poisonous compound of arsenic, yet their admission of it is accompanied with so many dangerous fallacies that I am bound to notice them. If it were not for this I should have left the fact in all its plainness for your consideration, being confident that you would have disposed of it in the manner best suited for the public interest.

In the first place, the reporters say, as if it were a matter of but little importance, that "the perchloride of iron, manufactured for disinfecting purposes, almost invariably contains a small quantity of arsenic, which is derived from the iron ores used in its preparation." But I must tell you this is not the only source of the poison, for it comes in far larger proportion from the crude muriatic acid employed as the solvent. Years ago, when Mr. Ellerman first proposed the pyrolignate of iron as a disinfectant, the presence of

arsenic in it, from the oxide employed, was considered a serious objection to its use, and now there is an additional danger from the large quantity of arsenic contained in the solvent. What may be the usual amount of arsenic in the perchloride is apparently open to doubt; for the reporters have found only half the proportion discovered by me. I will not pretend to reconcile this discrepancy; but I may be allowed to state that the recognition of arsenic in all its poisonous forms has been with me a subject of especial study; that the proportions mentioned in my Report are the mean of three nearly concordant results; and that the sample which I have examined was supplied to me by Mr. Dales, "as the same as that reported upon by Drs. Hofmann, Frankland, and Miller."

As to the importance of the fact that arsenic is a constituent of the perchloride, the reporters are of opinion that it need not afford grounds for the slightest apprehension of danger; for they say, "it is well known that the most efficient antidote of arsenic is the hydrated peroxide of iron, such as is produced by the addition of alkaline liquids to perchloride of iron. The action of this antidote depends upon the formation of a compound of white arsenic with peroxide of iron, which is perfectly insoluble in water, and consequently absolutely innocuous." If the reporters had been acquainted

with the medical literature of the subject, or had been so circumstanced as to have had any practical knowledge of the *modus operandi*, of the peroxide, they would not have spoken so positively of its antidotal powers, or have committed themselves to so erroneous an opinion. More than twenty years ago, Orfila, after careful inquiry, demonstrated that the hydrated peroxide of iron was not a protection to the poisonous effects of arsenic; for although it forms a compound which is insoluble in water, it is not insoluble in the acid secretions of the stomach. Modern experience has confirmed this view of its action, by showing that peroxide of iron is not an antidote to arsenic, unless it is used in sufficiently large quantity to cover or as it were to plaster the walls of the stomach, and so to prevent absorption. Even then it is a worthless antidote when the poison is in a solid form; for, to use the words of the last writer on this subject, Dr. Taylor, "it has no more effect on solid arsenic than so much powdered brick-dust, and to rest upon it as a neutralizer of the poisonous action of solid arsenic would be a delusion."

Again,—if the reporters had studied a little more deeply the therapeutics of our chalybeate springs, they would have attached no importance, as far as the present case is concerned, to the fact that "modern chemistry has proved the existence

of arsenic in the ferruginous deposits from the majority of mineral waters;" for those waters are never used for domestic purposes. On the contrary, they are so highly charged with medicinal substances, as to be used only for medical purposes. It is not correct therefore to say that the Wiesbaden water, which contains one grain of arsenic in 166 gallons, is generally regarded as a wholesome water; nor would the reporters, with all their apparent confidence in the antidotal powers of dilution, be rash enough to tell you that such a water is fit for common or domestic uses.

Above all it is not an unimportant fact, that if perchloride of iron were used for the disinfection of sewage, as much as one part of arsenic would exist in 3,000 of the sediment; for all who are acquainted with the criminal jurisprudence of modern times are aware how serious a matter it is to have arsenic in anything which may, by accident or otherwise, be brought into contact with the human body. Over and over again the presence of this poison, not in the proportion of one part in 3,000, but of less than one part in 140,000 of the soil of a grave-yard has embarrassed the labours of the chemist, and obstructed the progress of justice. Many a criminal accused of having murdered with arsenic, has found a successful defence in the fact that the soil in which the dead body has laid may

have been charged with arsenic, and may have furnished the poison found in the corpse. Who, therefore, would rashly complicate such an inquiry by adding arsenic to the soil in which a poisoned body may be found? Or why, as in the present instance, should you resort to a disinfectant which is not only useless and expensive in its application, but so dangerous in its results; for where, let me ask, would be the chance of a conviction if, after the saturation of the soil of the Thames with arsenic, a cunning poisoner were to get his victim stranded upon the shore of the river? I beg of you to consider that it is no light matter, to resort to a process of disinfection which might not only be dangerous on its own account, but by impeding the course of justice might also favour the commission of crime.

Lastly: I may remark that the statements made by the reporters concerning the dilution of the arsenic with the water of the river is not altogether in accordance with facts. They say that the average volume of water which passes Richmond daily is calculated at 800,000,000 of gallons, and that with other supplies the quantity of water for diluting the arsenic is not less than a thousand millions of gallons daily. But this is the daily average for the whole year: it is not the quantity which flows into the Thames during the hot days

of summer when the deodorizer would be in use. At that time there is no such dilution of the poison at the points where you would cast it into the stream, for the downward flow of fresh water is barely sufficient to provide for evaporation, and little or nothing goes to the sea. On the contrary, there is an upward flow of the current, and the water of the Thames becomes largely impregnated with sea salt. Then it is that your deodorizer would be used in the largest proportion; and day by day it would be poured into the same body of water, and would oscillate between the ranges of the tide, making it more and more poisonous until the danger might be beyond a remedy.

Apart, however, from all these considerations, may I venture to ask you what would be your opinion, and what the opinion of the public, if a manufacturer on the banks of the Thames were to cast daily into the river a quantity of refuse containing as much as a hundred weight and a half of arsenic? Do you think that if a legal prosecution were instituted against him, as most assuredly it would be, the law would be satisfied, or you or the public contented, with the sophistical defence which your reporters have furnished to you? Would it be enough to say that the oxide of iron in the river was the antidote of the poison—that there were mineral springs in Europe with larger

proportions of arsenic than the river contains, and that the water of the Thames had diluted it to an enormous degree? I know what your answer would be to such a case, despite the most skilful arguments, and knowing it, I beg of you to consider that by adopting the use of this arsenical perchloride of iron, you would be doing that which the manufacturer is supposed to have done, and would be the means of casting into the Thames as much as a hundred weight and a half of arsenic daily. I can scarcely venture to think that any kind of confidence in the arguments of your reporters would justify you in adopting such a course, or would excuse you for the mischief that most assuredly would come of it.

I remain, GENTLEMEN,

Your obedient Servant,

H. LETHEBY.