

## **The sewage of the metropolis, and how to utilise it / by Thomas Ellis.**

### **Contributors**

Ellis, Thomas.

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THE  
SEWAGE OF THE METROPOLIS,

AND

HOW TO UTILISE IT.

BY

THOMAS ELLIS.

*Handwritten signature and date: 1875*

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TO THE  
RATEPAYERS OF THE METROPOLIS;

TO WHOM THESE LETTERS

(ORIGINALLY PUBLISHED IN THE "STANDARD," "STAR," AND "HERALD,")

Are dedicated

WITH GREAT RESPECT.

---

GENTLEMEN,

THE following letters contain a brief review of the evidence taken before the Select Committee of the House of Commons on Sewage of Towns, in so far as it bears upon the question of the profitable Utilisation of the Metropolitan Sewage.

To the solution of this great problem I have already devoted many years of patient labour and conscientious consideration.

The difficulties which I have had to contend with in the promulgation of my views have been of a nature which I could not anticipate. I was prepared for an opposition from the Artificial Manure Interest, but I did not expect that its agents would meet me with misrepresentations of public documents, perversions of facts, the entrapping of public men into their service by gross misrepresentations, and other contemptible artifices. To what extent this unprincipled opposition has been carried the public are only partially informed, but I assert with confidence that every public step taken by those opponents has been met by exposure.



In my efforts to secure a great reduction of the local taxation of the Metropolis by means of the profitable Utilisation of the Sewage, I have held back from no labour, I have spared myself no sacrifice. Assuredly I have discharged my duty to you to the best of my ability ; and I have confidence that you will now do your duty to yourselves in your various localities, in your vestries, in the Corporation, in your public and your private capacities. You are bound, in duty to yourselves and your fellow-citizens, as well as to the nation, to take this question in hand, and to do so without delay.

But a few days now remain to you to make your wishes known, to preserve your property from confiscation in the interests of the Artificial Manure Monopolists, to secure for yourselves an immense reduction in your local taxation, and to confer an enormous benefit upon the agriculture of England. Speak out, then, gentlemen, and let the country hear what the Ratepayers of the Metropolis can say in defence of their own interest, and their legal rights.

I am, Gentlemen,

Your obedient servant,

THOMAS ELLIS.

76, WARWICK SQUARE, BELGRAVIA,

September 14th, 1863.

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THE  
SEWAGE OF THE METROPOLIS,  
AND  
HOW TO UTILISE IT.

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LETTER No. 1.

THE "VESTED INTERESTS" OF THE ARTIFICIAL-MANURE PARTY  
OPPOSED TO THE ECONOMIC UTILISATION OF TOWN SEWAGE.

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SIR,

BUT a few days now remain to the ratepayers of the metropolis to consider how the sewage, which is their property, shall be dealt with—whether it shall be utilised in the most profitable manner for their advantage, or "got rid of" to promote the interest of the great, wealthy, and all-powerful artificial-manure party. I shall, therefore, sir, in this and four following letters, with your permission, lay some facts before the ratepayers of the metropolis which may not be uninteresting at the present crisis.

It is a fact well known to every one acquainted with agricultural affairs that you cannot produce on any farm, from its own resources, sufficient manure to enable you to cultivate the land to the best advantage. This difference, then, between what can be produced and what is required is the quantity of sewage which you may dispose of to advantage upon that farm, provided you deliver it on the land at a reasonable rate. And it is this quantity, therefore, and no more, which those who propose to treat town sewage as an article of commerce, and not as a nuisance, desire to supply to all farms within reach of our cities and towns. But this deficiency of manure is already supplied by the importers and manufacturers of artificial manures, who naturally object to surrender their present very profitable trade.

It is evident, sir, that the more we extend around each of our cities and towns the area of distribution of the sewage, the more we shall interfere with what the all-powerful artificial-manure party regard as their "vested interests," and the more determined will be the opposition we shall receive at their hands.



That we shall receive this opposition, and, indeed, have for many years been experiencing its effects, is evident from the present position of the sewage question.

Let the ratepayers examine the speeches, letters, pamphlets, and experiments of those engaged in the artificial manure trade—(take for example, Mr. John Bennett Lawes, who clears an annual profit of £40,000 from the manufacture of artificial manure—let them look at the line taken by all those in his employment—let them note how anxiously these artificial manure men press upon us “the extreme dilution of sewage,” the “cost of pumping,” and the consequent necessity of putting enormous dressings upon very limited areas, and thus “get rid of it” out of the way of their concoctions; and when the ratepayers have done this, the inevitable conclusion will be forced upon them that the whole opposition to the economic utilisation of town sewage has either been openly conducted or secretly organised by a combination of monopolists, whose interests would be destroyed if those of the ratepayers and of agriculture were respected. But these monopolists, in their anxiety to preserve their “vested interests,” shut their eyes to the fact that the sewage of all our principal cities has been repeatedly analysed, and shown to contain in each 1,250 tons, an amount of fertilising matter which if extracted and dried, would correspond with one ton of the best Peruvian guano, and that the evidence taken by the select committee on sewage of towns has conclusively proved that the effect of any given quantity of dry manure is more than doubled on the crop to which it is applied—if properly applied—when reduced to the liquid state, consequently, that the fertilising matter found in 1,250 tons of average town sewage is, in its effects on the crops, equal to two tons of Peruvian guano. Therefore, to enable guano to compete with it, on any area where proper works of distribution were laid down, two tons must be sold at the same price as 1,250 tons of sewage. We shall presently see whether this can be done with profit. If it cannot, then the artificial-manure trade will be at once annihilated on every such area.

What man amongst us is there who will not defend his trade, business, and property? And that defence, will it not be in proportion to the stake at issue?

Let us glance for a moment at the vast interests that must be endangered by a general adoption of the economic utilisation of town sewage.

Look to Peru. We pay about £4,000,000 a year for guano. See how many are engaged in that trade, and interested with the Peruvian Government in its preservation. Can we hope that we shall not have their opposition to the economic utilisation of town sewage?

Look at home. See the princely fortunes made by the manufac-



turers of artificial manure. Can we hope that we shall not have their opposition to the economic utilisation of town sewage.

The economic utilisation of the metropolitan sewage would assuredly lead to the adoption of the same system by the other cities and towns of England—a fact which we cannot expect those engaged in the artificial-manure trade to be more blind to than the rest of the public. And that they are fully aware of the gravity of the position is shown by their present activity, directly and indirectly, in preventing the adoption of that system which must necessarily be so ruinous to them.

The disposal of the metropolitan sewage rests with the Metropolitan Board of Works, who are, however, only the trustees of the ratepayers. And it would be simply idiotic to suppose that every means within the reach of the great, wealthy, and all-powerful artificial-manure party is not brought into action to guide the decision of the Metropolitan Board of Works, so that the “vested interests” of this great party shall not be interfered with or injured in any way by the utilisation of the metropolitan sewage.

In considering, then, how we are to utilise the sewage of the metropolis, it is desirable to bear all these facts in memory; and, in examining the steps taken by the board, always to ask ourselves which has been most considered—“the vested interests” of the all-powerful artificial-manure party, or the legal rights of the ratepayers of the metropolis.

I am, Sir,

Your obedient Servant,

THOMAS ELLIS.

*Sep. 7th.*

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## LETTER No. 2.

### EXAMINATION OF EVIDENCE TAKEN BY THE SELECT COMMITTEE ON SEWAGE OF TOWNS, TO DETERMINE THE MOST PROFITABLE METHOD OF UTILISING THE SEWAGE OF THE METROPOLIS.

SIR,

THE artificial manure party cannot but admit that the sewage of our cities, containing as it does not only the excreta of the inhabitants, but innumerable other matters of a fertilising nature, is a manure. The question, then, that the ratepayers have to decide is, how are they to raise the largest revenue from the sale of this manure?



That question will be solved by determining another, which is, What is the system of utilisation that will enable the farmers to recover the largest crops with the least expenditure of sewage? Undoubtedly, that must be the system which will enable the farmers to pay the highest price for the sewage.

Let us look to Edinburgh. There barren sands, originally not worth 2s. 6d. per acre, are made to produce per acre per annum £30 worth of grass. This, we are told by the artificial manure men is "a great success." But at Edinburgh 20,000 tons of sewage per acre per annum are applied. And this sewage has been shown to contain an amount of fertilising matter in each ton, which, if extracted and dried, would be worth 2d., taking guano sold at £11 per ton as the standard of value. In other words, that at that rate there is £166 13s. 4d. worth of manure applied to each acre. Or let me put it in another way. In 1250 tons of sewage there is an amount of fertilising matter which, if extracted and dried, would correspond with one ton of Peruvian guano; consequently in 20,000 tons of sewage there are 16 tons of guano, which, at £13 10s. per ton, would be worth £216. But the agricultural value of the fertilising matter in the sewage is at least doubled on the crop, when properly applied, by being liquified in the sewage. I am, I think, therefore justified in saying that its commercial value is increased in proportion. By this we find that there is annually put on each acre at Edinburgh £432 worth of manure, and the result is £30 worth of very indifferent grass, showing a clear loss in manure alone of £402 per acre per annum.

I need scarcely add that no payment is made for the sewage, and that this loss is therefore to the ratepayers of Edinburgh. The Royal Sewage Commission, of which Mr. John Bennett Lawes, the great artificial manure manufacturer, is the soul; in their first report have informed the nation that "sewage is treated at Edinburgh with great success, considered as a thing to be got rid of."

Shall we adopt here the Edinburgh system? Shall we "get rid of" the metropolitan sewage with "great success" in the interest of the all-powerful artificial manure party? Or shall we utilise it so as to procure by its sale a great annual revenue for the benefit of the ratepayers?

At Rugby certain experiments have been carried on at the expense, strange to say, of the nation, for the Royal Sewage Commission, by Mr. John Bennett Lawes, the great artificial manure manufacturer, to determine for the nation, so far as I can comprehend them, whether or not sewage can compete successfully against artificial manure,

Mr. Lawes was examined before the Select Committee on Sewage of Towns with reference to those experiments, and stated that sewage was unfit for any crop but grass; yet the grass produced



by its application was not good for milk, and "would not feed oxen at all when used alone." But on turning to the evidence of several witnesses examined before the Select Committee we find quite another set of facts.

From amongst these witnesses I shall only refer briefly to three. Lord Essex informed the Committee that he had applied sewage over a portion of his demesne, with the greatest success, to a variety of crops; so also had Mr. Philip W. S. Miles, of King's Weston, Bristol; thus distinctly contradicting Mr. Lawes's statement that sewage was only suitable to grass.

Again, Lord Essex and Mr. Miles spoke in the most decided terms as to the extraordinary fattening properties of the sewage grass; and Mr. Miles, supported by the evidence of his bailiff, Mr. Foster, proved that when his cows were put on the sewage grass there was an immediate increase in the quantity of the milk, and that its richness was also increased to the extent of from three to four ounces of butter per quart of cream. This alone shows the fattening qualities of sewage grass, and is a conclusive refutation of Mr. Lawes's statement.

Mr. Lawes could only show a return in crop of from 2s. to 3s. per person per annum for the sewage applied, but Mr. Miles showed a return equal to £1 8s. per person per annum for the house sewage alone, which of course was weaker than the town sewage applied by Mr. Lawes, as it was entirely deficient in all the innumerable matters of a fertilising nature that we find in town sewage.

Mr. Lawes could only show a return in produce of about 1d. per ton for the sewage applied, but Lord Essex showed an extra profit of 5½d. per ton for each ton of sewage applied to his wheat. And Mr. W. Westwood showed a return of 9d. for each ton applied to his Italian rye-grass. But neither Lord Essex nor Mr. Westwood made any allowance for the extra profit derived from the manure of the animals fed on the produce, or the improvement of the land for the succession crops. Had these items been allowed for, the profit shown by each would necessarily have been much greater.

How, then, are we to account for the extraordinary manner in which Mr. Lawes's evidence has been contradicted? Are we to suppose that Mr. Lawes did not tell the truth? Not at all. Are we to suppose that Lord Essex, Mr. Philip Miles, and Mr. W. Westwood are not to be believed? If not, how are we to account for these extraordinary contradictions? Let us turn to the evidence of Professor Way before the Select Committee, and we find that nothing is more easily explained.

In answer to question 777, the Professor informed the Committee of the results of his discovery as to the absorptive power of soils—that the earth had power to extract from liquids, even from rain,



all the manure they contained. And in answer to questions 940, 941, and 942, he showed that this power had its limits, and that, therefore, we should not deluge the earth, as "if we go beyond a certain point the power ceases." And Mr. W. Westwood, giving to the Select Committee the results of several years' experience with sewage, in answer to question 4,453 stated that 300 tons of sewage to an acre would have as good an effect as 10,000 tons. The results, too, obtained by other witnesses fully support Mr. Way.

This power of the soil to abstract the manure from liquids gives us at once the key to the entire question of sewage utilisation, by showing how perfectly useless must be those large dressings that the artificial manure men recommend us.

Now, on referring back to the evidence of the witnesses, we find that Lord Essex, in the instance where he showed an extra profit of 5½d. per ton, applied sewage at the rate of 134 tons per acre to his wheat; that Mr. W. Westwood's profit of 9d. per ton resulted from an application to his Italian rye-grass of 240 tons at each dressing, after each cutting; and that Mr. Miles only applied the sewage of thirty persons over fourteen acres, dressing it all more than once in the year. To enable him to do so, the quantity applied each time must necessarily have been very small. But Mr. Lawes applied the sewage in enormous quantities; and we learn from his evidence that "it was always running; they did exactly as was done at Edinburgh"—*i.e.*, "got rid of it."

In the case of Lord Essex, Mr. Miles, and Mr. Westwood, the earth, not being overburthened by the sewage, had power to extract from it, close to the surface and within easy reach of the roots of the crop, all the manure it contained, giving back a rich return in produce. And I may here remark that the quantity and quality of this produce completely confirms the correctness of the experiments undertaken, at the request of the Governments of Prussia and Saxony, by Professor Hembstadt, and afterwards carefully tested by Professor Schubler. These experiments proved that, whereas the yield from seed sown without manure was threefold the quantity, it was increased twelve times by manuring with urine, and fourteen times by manuring with excreta; whilst the quantity of gluten was increased enormously. So that a pound of wheat raised on land manured with liquid excreta would be threefold more nourishing than that produced on land manured with stable litter. But, in the case of Mr. Lawes, the earth, by the application of enormous quantities of sewage, was reduced to the condition of a morass, which at once accounts for its inferior produce. And by far the greater portion of the sewage ran off the surface or sank down into the earth, carrying the manure beyond the reach of the roots, and was equally lost to the crop. Then by charging against



the crop all the sewage which by this peculiar manipulation was lost, Mr. Lawes (the great artificial manure manufacturer) was able to show very bad results with this competing manure.

In utilising the sewage of the metropolis shall we follow the example set at Rugby, where "the sewage is always running;" where "they do exactly as is done at Edinburgh;" where, as Mr. Lawes' Royal Sewage Commission tells us, in a transport of admiration, "sewage is treated with great success, considered as a thing to be got rid of?" Or shall we follow the example set by Lord Essex, Mr. Miles, and Mr. Westwood, and by its economic application increase to the utmost our home supplies of food, thus enabling the farmers to pay to the ratepayers an enormous annual income for the reduction of local taxation?

I think, sir, the ratepayers of the metropolis will perceive from the evidence that large dressings of sewage over very limited areas, as at Rugby, are invariably an agricultural mistake and a financial failure; while, on the other hand, it is incontestable that small dressings over large areas are profitable to the farmer, and, therefore, that they alone will afford a revenue to the ratepayers. Hence, then, arises the important question, What is the extent of area required for the profitable absorption of the metropolitan sewage in addition to the farm-yard manure made upon that area?

I am, sir,

Your obedient servant,

THOMAS ELLIS.

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LETTER No. 3.

THE HON. WILLIAM NAPIER'S, LORD TORRINGTON'S, AND  
MR. ELLIS'S TENDERS FOR THE METROPOLITAN SEWAGE.

SIR,

There are now before the Metropolitan Board of Works eight tenders for the sewage of the metropolis, only three of which state the quantity of land to be dealt with.

First, there is the tender of the Hon. William Napier, who proposes to put the Sewage of the north side of the metropolis on 20,000 acres of the Maplin quick-sands lying off the sea-coast of Essex, north of the river Thames, and which he proposes to reclaim by a huge embankment constructed upon the surface of the quick-sand, in water 20 feet deep, exposed to the full force of the ocean. On a reference to the report of George Hopkins, Esq., C.E., of Bedford Square, as well as other information which will be found



in the appendix to a pamphlet on "The Utilisation of the Metropolitan Sewage," published by Kent and Co., of Paternoster Row, it will be seen that the cost of the Hon. William Napier's sea embankment alone, could not be less than eighteen millions sterling. Mr. Napier proposes to pay to the ratepayers one-half of all profits after deducting 10 per cent. on his outlay.

The second tender is that of Lord Torrington, who proposes to put the entire sewage of the metropolis on "30,000 or 40,000 acres." His lordship is in doubt as to the exact amount of land required. I shall, therefore, in examining his proposition, take the larger quantity, as that will be fairest to him. His lordship offers the board "a per centage on his profits," but does not state the amount; or to "leave his rent or royalty to be determined by an arbitrator appointed by the Board of Trade."

The third tender is mine, for the economic utilisation of the sewage over a sufficient area to enable me to supply to each farm that amount of manure that may be required for profitable cultivation, and no more. This area is shown by the detailed calculations furnished to the board with my tender, and now printed and sold for the board by their printers, the Messrs. Brickhill & Smith, Newington Butts, cannot be less than 532,104 acres. But this area, for the reasons which shall hereafter be given, is in reality too small, and will have eventually to be increased. I offer to the Metropolitan Board of Works one-half of all the net profits made by the company, without any deduction whatever. And I may add that I receive the entire support of the great Liebig.

The propositions of the Hon. W. Napier and Lord Torrington are to put the sewage on lands which are to be the property of their companies. I propose merely to lay down works of distribution, to enable me to convey the sewage to the farmers on my area, to whom it will be retailed.

The available sewage of the metropolis amounts to 266,052,441 tons per annum. It has been repeatedly analysed, and shown to contain in 1,250 tons, an amount of fertilising matter, which, if extracted and dried, would correspond with one ton of the best Peruvian guano; and taking guano sold at £11 per ton (as it was when the analyses were made) as the standard of value, the fertilising matter in each ton of sewage would be worth 2d., making the total value of the sewage £2,217,104 per annum. But guano, the standard of value, is now selling at £13 10s. per ton. The total annual value of the metropolitan sewage, according to this estimate, is now £2,873,353. We, however, learn from the evidence taken before the Select Committee, that the value of any dry manure is at least doubled to the crop by being liquified. Consequently the fertilising matter in the sewage, being reduced to the liquid state, is worth £5,746,706 per annum. Of course this large figure will



at first startle people. A howl of indignant rage will at once be raised against me by the artificial manure men and their partisans, all of whom are at the present moment so anxiously engaged in depreciating the value of the metropolitan sewage—struggling to mislead the public in the hopes of perpetuating the sordid monopoly of the all-powerful artificial-manure party. I shall be spoken of again as “a visionary,” and I shall again be accused of “hood-winking and deceiving the public.” To all which I reply: Let the public consult the evidence taken by the Select Committee on Sewage of Towns, and judge for themselves. Let them ascertain whether or not the facts are as I state. Let them see by an examination of the results obtained by Lord Essex, Mr. Phillip W. S. Miles, Mr. W. Westwood, and other witnesses, whether or not, by an economic application of the metropolitan sewage, such great additions to our crops could not be obtained as would well enable the farmers to pay this large sum each year, and yet be great gainers by the transaction. For my own part, I am resolved that the truth shall be told to the ratepayers as to the value of their property. It is for them then to say whether it is worth their while to give themselves any trouble to defend that vast property against the exertions now made by the all-powerful artificial-manure party and their partisans to prevent its proper utilisation. As before shown, the object which the artificial manure party has in view, is to induce the public to believe that sewage should be poured in enormous quantities over very limited areas. And this system is illustrated for us at Rugby, by Mr. John Bennett Lawes, the great artificial manure manufacturer. There Mr. Lawes pours 3,000, 6,000, and 9,000 tons of sewage over each acre each year, or an average of 6,000 tons per acre, per annum, and we have already seen with what bad results—results which assuredly would not enable him to pay anything for the sewage. Now, on turning to the proposition of the Hon. W. Napier to put the sewage of the half of the metropolis upon 20,000 acres of land, or the proposition of Lord Torrington to put the entire sewage upon 40,000 acres, we find that those gentlemen would have to pour 6,651·311 tons of sewage = 5·321 tons of guano—or 651·311 tons of sewage per acre more than at Rugby—over each acre each year. Taking this guano, then, at the present price, we find that they would put on each acre £71. 16s. 8d. worth of manure; but as before shown, by being liquified in the sewage its value is raised to at least £143. 13s. 4d., and this without making any allowance for the farm-yard manure made on the area, which, I presume, would also be put upon the land. If then, sir, bad results were obtained at Rugby in consequence of the enormous quantities of sewage applied, does it not stand to sense that worse results would be obtained by these gentlemen in applying still greater excess?



But just in proportion as the adoption by the Metropolitan Board of Works of these plans would be serviceable to the all-powerful artificial manure party, and injurious to the ratepayers of the metropolis, so in proportion are they lauded by the public organs, the partisans of the great artificial manure monopoly. Take, for example, the following, which appeared in a leading article on the tenders, published by one of their present organs on the 10th of August:—"Two only appear to have solidity and reality about them. Mr. Napier and Mr. Hope present a feasible plan. . . . They tender only for the north side of the sewage. If Lord Torrington and Sir Charles Fox would take that of the south side . . . then the board would have two responsible parties—two strings to their bow."

But unfortunately for the artificial-manure men, and these gentlemen, to whom, as advocating their views, they give all their support, this very paper, on the 4th of May last—commenting on a speech delivered in the House of Commons by Dr. Brady, the chairman of the Select Committee on Sewage of Towns, in which that gentleman had advocated the adoption of the economic system of sewage utilisation and denounced the Rugby experiments and the system of enormous dressings, of "getting rid of the sewage with great success as at Edinburgh"—thus wrote: "So far is town sewage from being the worthless thing the Royal Commissioners attempt to make it, that Dr. Brady gives ample proof of its great value. . . . The seasonable discussion of this subject must be productive of great public benefit, and will tend to defeat a monstrous job in favour of guano dealers, and against the interest of the public. Dr. Brady will have done the country much good service if he has encouraged perseverance in the attempt to use the sewage of towns, as far as it will go, as a fertiliser of the ground, and at the same time lessened the dependence of our agriculturists on the powerful guano monopolists." Again, on the 15th of August, another of these organs, in a leading article on the tenders for the sewage, thus wrote:—"Messrs. Napier and Hope unquestionably know what they are about. To convert 20,000 acres of barren sands into arable land would be a grand accomplishment." But on turning back on the file of this journal I find it stated in a leading article, published on the 24th of January;—"We remarked recently that the only comprehensive scheme for the appropriation of the sewage was based on the supposition that the sewage could be had for nothing. We were referring to the proposition of the Hon. W. Napier, which we opposed at the time, on the ground that sewage is property, and must neither be wasted nor given away."

Do the ratepayers desire that their property should be "given away" or "wasted" as at Edinburgh, where, as Mr. John Bennett Lawes' Royal Sewage Commission tells us, in a perfect rapture of



admiration, "Sewage is treated with great success considered as a thing to be got rid of?"

If not, then they must adopt the large area of distribution, and the economic application of the manure. But here arises the important question—Is it possible to distribute the sewage of the metropolis over such an area by steam power?

I am, sir,

Your obedient servant,

THOMAS ELLIS.

Sept. 9.

#### LETTER No. 4.

MR. ELLIS'S PLAN.—COST OF DISTRIBUTING SEWAGE BY STEAM POWER.

SIR,

Sewage is in appearance but dirty water. In distributing then, the sewage of the metropolis over a suitable area, why cannot we follow with success the examples set to us in all directions by the water companies?

I propose to pump the sewage on either side of the Thames into a regulating reservoir placed upon land of sufficient elevation to enable me to dominate over the area to be supplied with the manure. The sewage will then descend from these reservoirs by gravitation, through pipes laid along the roads, thus bringing me into contact with every farm upon the area. Those farmers who choose to use the manure would lay down pipes over such portions of their land as they thought proper, erecting on those pipes hydrants in each field, from which, when it was required, the sewage would be delivered upon the land through flexible hoses. The sewage being always under pressure in the mains from the summit-regulating reservoirs would be delivered with a jet, and fall on the land like rain. A water meter would on each farm be placed between the pipes of the company and those of the farmers, through which all the sewage used on the farm would pass and be registered against the consumer, and as it would be charged for by the ton, would ensure its economic application. In the rear of all the works there would be an escape for the sewage into the river, if at any time from accident to the works, the sewage was not all delivered. But previously to its being allowed to escape in that manner, it would be first deodorised and precipitated.

That the sewage would always be required somewhere or other,



and certain to be used up day by day throughout the year, we learn from the evidence taken by the Select Committee on Sewage of Towns, provided that the area of distribution was of proper dimensions. Lord Essex informed the Committee, in answer to question 11, that he "put the sewage on his land daily somewhere or other." And again, in answer to question 35, his lordship stated, "The sewage is stored up as it were in the soil, and put it on when you like, it remains in the soil till it is wanted by the plants."

The area which I propose to supply with sewage would not be less than 532,104 acres. This would allow of an average of 500 tons of sewage per acre per annum, in addition to the farm-yard manure. But when the farmers had learned how to apply this manure to the best advantage, and when its commercial value was fully ascertained, it would be found that an area for the metropolitan sewage based on an average of 500 tons to the acre was too small, as in 500 tons of sewage there is an amount of fertilizing matter equal to nearly half a ton of guano, but being liquified its effects on the crop should be nearly equal to one ton of guano supplied in a dry state. Commencing, however, with the small area, I propose to extend the distributing mains as required.

To reach an area of 532,104 acres it will be necessary to lay down the works of distribution over the roads of an area of 1680 square miles, in order to make proper allowance for roads, water, houses, &c. And we must lift the sewage into reservoirs at an elevation of at least 200 feet. This brings us to the two grand points upon which the economic utilisation of the metropolitan sewage now turns. First, the cost of the works of distribution; second, the expense of pumping sewage by steam power.

Amongst the other information furnished to the Metropolitan Board of Works with my tender, and which, together with all the other tenders for the sewage, is now sold by the Messrs. Brickhill and Smith, of Newington Butts, will be found most minute calculations as to the cost of the works, and the working expenses, including pumping. Those calculations, were however, made greatly in excess of the true amount, for the reasons that will be found stated in my tender. Suffice it to say that the cost of the works of distribution will be under £3,500,000.

But what is the expense of lifting sewage by steam power?

Mr. Thwaites, who, as chairman of the Metropolitan Board of Works, and therefore, the principal trustee of the ratepayers of the metropolis, we might suppose to be more solicitous than any other man in London to promote the economic utilisation of the sewage in the interest of the ratepayers, has told the public more than once that—"there were cases where the cost of a single lift of 22 feet, added to the expense of distribution, would more than equal the value of the sewage." And he adds, "It must be remembered that



the cost of purifying is but a portion of the expense, and frequently will be but a fractional part only, which the expense of distribution will far exceed."

By a reference to the information furnished with my tender, it will be seen that the sewage will be "purified" from all matters likely to cause obstruction in the pipes, by being made to flow through a number of fine gratings, which will not cause any "expense." I presume, therefore, Mr. Thwaites means "deodorisation." But during all the cool months of the year, the sewage has no perceptible smell. And even in the very hottest weather, the sewage as it arrives at the outfall of the sewers is not really offensive. It is only the old stale sewage floating about in the Thames, or sticking on the banks of the river, or on the sides of the sewers, that causes annoyance. On referring to my tender, an extract from the report of Drs. Hofmann and Frankland to the Metropolitan Board of Works, upon certain experiments on the sewage with different deodorising materials, will be found. In that report, these gentlemen say:—"During the performance of these experiments, which, as already stated, were made during the hottest portion of a dry summer, we were surprised to find that the liquid flowing from the outfall of the sewer was by no means strongly offensive; it was only after preservation in tanks for twenty-four hours or upwards that a really powerful odour presented itself."

Now, according to the method of distribution which I advocate, the nozzle ends of the distributing hoses would represent the present outfall of the sewers. And when the sewage is applied in moderation, we find from the evidence taken by the Select Committee, that it is instantly absorbed by the earth and at once deodorised; consequently my company would not be put to any expense for "deodorising," as it will be perfectly unnecessary.

But what would be the "expense of distribution?"

According to my plan, the sewage would distribute itself by gravitation from the summit reservoirs. It follows, therefore, that the only "expense of distribution" would be the cost of pumping the sewage into the reservoirs. Added to which there would be the interest on the capital sunk in the works, and the wear and tear of those works. But when I attempt to charge against one ton of sewage lifted Mr. Thwaites's "22 feet" its proportion of these items I find it almost impossible to express it by the smallest decimal. Therefore, for all practical working purposes, when speaking of the cost of lifting one ton of sewage "22 feet," we may confine ourselves to the actual cost of pumping.

On referring to the Messrs. Hocking and Loam, of Redruth, or any other builder of the Cornish steam-engine, or to "Lean's Engine Reporter," it will be found that it is an ordinary duty of those engines to lift from 90,000,000 to 130,000,000lb. of fluid one



foot high with one bushel of engine coals, costing a little over 5d. But to this is to be added the cost of labour, oil, tallow, cotton, &c., and the cost of working additional engine power to overcome friction and for reserve power. These last two items, however, do not apply when speaking merely of the cost of lifting a given quantity of fluid one foot vertical, but must be taken into our calculations when speaking of continuous pumping to a considerable height through pipes with bends, laid on an incline. Therefore, when we make allowance for all these items, we find that the original 5d. for lifting, say 90,000,000lb. one foot vertical resolves itself into  $23\frac{1}{4}$ d. The equivalents for this duty are—

|                       |                    |       |                    |
|-----------------------|--------------------|-------|--------------------|
| 90,000,000 lb. raised | 1 foot high for    | .. .. | $23\frac{1}{4}$ d. |
| 40,178·571 tons       | „ 1 „              | .. .. | $23\frac{1}{4}$ d. |
| 1,826·299 tons        | „ 22 feet high for | .. .. | $23\frac{1}{4}$ d. |
| 1 ton                 | „ 1 foot high for  | ..    | ·000581d.          |
| 1 ton                 | „ 22 feet high for | ..    | ·012782d.          |
| 1 ton                 | „ 200 „            | ..    | ·1162d.            |
| 156·25 tons           | „ 22 „             | ..    | 2d.                |

From this we see that Mr. Thwaites entertains very erroneous ideas, either as to the commercial value of the metropolitan sewage, or the expense of pumping; as it would not cost more than the merest fraction over the one-hundredth part of a penny to lift one ton of sewage his “22 feet,” and the merest fraction over the tenth part of a penny to lift one ton of sewage 200 feet. And, assuming that an elevation of 200 feet was sufficient, and that we sold the sewage for twopence per ton, we should have a penny three farthings and ·1338 over as a profit out of each ton, amounting to £2,088,289 on 266,052,441 tons of sewage per annum, which would pay a dividend of £59. 14s. per cent. upon the capital of £3,500,000 sunk in the works. But no doubt the sewage would eventually fetch a much higher price.

Now, when it is recollected that in 1250 tons of sewage there is an amount of fertilising matter which, if extracted and dried, would be equivalent to one ton of guano worth £12 10s. and that being liquefied in the sewage its agricultural effect <sup>have</sup> crop is at least doubled, if properly applied, 1250 tons of sewage would be really worth £27. But if instead of selling it at this rate we only ask £11 for it, which would be at the rate of 2d. per ton, and at that price can pay a dividend of £59. 14s. per cent. upon our outlay, it will at once be seen that artificial manure cannot compete with sewage upon any area where proper works of distribution are laid down unless the present prices are reduced at least one half, which would be a commercial impossibility.

This is the secret of the desperate efforts of the artificial manure party to prevent the economic utilisation of town sewage, and to



induce us to believe that sewage is "so extremely diluted," and that "the expense of lifting sewage by steam power" is so ruinous.

It will, therefore, at once be seen how great was the service rendered to the wealthy and all-powerful artificial manure party by the chairman of the Metropolitan Board of Works in endorsing their fallacies. But Mr. Thwaites is not an hydraulic engineer; neither, perhaps, is he much acquainted with agriculture, or with agricultural chemistry; and, fully occupied with the onerous duties of his responsible position, he has not been able to devote his time to mastering those sciences. He has, therefore, been obliged to trust to others for information, and has been betrayed—possibly by some agent of the all-powerful artificial manure party—into the expression of an opinion entirely erroneous, and calculated, unless at once recalled, to shake all confidence in the Metropolitan Board of Works.

I am, Sir,

Your obedient servant,

THOMAS ELLIS.

Sept. 10.

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#### LETTER No. 5.

VARIOUS OPINIONS AS TO THE MANNER IN WHICH THE SEWAGE SHOULD BE DEALT WITH BY THE BOARD. THE LINE WHICH IT IS FOR THE INTEREST OF THE PUBLIC THE BOARD SHOULD ADOPT.

SIR,

The truth is at last dawning upon the country with reference to the great question of sewage utilisation, and people are now beginning to see that the method at Edinburgh and at Rugby, under Mr. John Bennett Lawes, of "treating sewage with great success, considered as a *malum* to be got rid of," is not exactly the course which should be adopted, notwithstanding the self-evident fact, that unless sewage is so treated, the present price of artificial manure cannot be maintained. In this emergency, in this crisis of the artificial-manure trade, is it not natural that every exertion should be put forth by all engaged in that trade to check the growth of an opinion so hostile to their interests? Thus, at the present moment, in every grade in society, almost from the highest to the lowest, we hear the servants, the agents, and the partisans of this wealthy, unscrupulous, and all-powerful party pleading the cause of the artificial manure monopoly. But the press of England—that bulwark



of truth and honesty and manly independence—is, with few exceptions, open to expose their false teaching.

Mr. W. J. Christy, who is in the employment of Mr. John Bennett Lawes, the great artificial manure manufacturer, mourns over the fact with an amusing simplicity, and tells the public with tears in his eyes, that “it is astonishing how averse the press is, generally speaking, to publish facts connected therewith, detrimental to schemes for utilising the sewage.” Unfeeling press!

The cause, sir, of the artificial-manure monopoly is all but lost, yet still these monopolists are not without hope, and clearly look to the Metropolitan Board of Works for help in their present distress.

On the 29th of August, Dr. Gilbert, who is also in the employment of the indefatigable Mr. John Bennett Lawes, in a letter which appeared in the *Agricultural Gazette*, thus pleads:—“I would suggest that a mixed commission of engineers and chemists, in whom all might have confidence, be appointed to superintend the guaging, sampling, analysis, and calculations in such a manner as really to settle definitely the approximate average composition of the metropolitan sewage.”

Is not the deep anxiety of Mr. John Bennett Lawes, and those in his employment, to determine for the ratepayers, whether or not the metropolitan sewage is to be utilised and thus brought into competition with his artificial manures, intensely funny? And yet, dispassionately viewed, what could be more encouraging to the ratepayers than this “deep anxiety?” Assuredly if sewage was the worthless thing those manure men represent, they would long since have left it to its fate.

But Dr. Gilbert, as Mr. Lawes’ representative, tells us that in this “mixed commission” which he asks for “all might have confidence.” Might I, however, venture to inquire, Who are “all?” The owners of the sewage do not ask for this “commission.” The capitalists who are ready to stake their money in utilising the sewage in the interest of the heavily-taxed rate-payers do not ask for this “commission.” Both of these parties are satisfied with the evidence taken by the Select Committee on Sewage of Towns. It is the artificial manure monopolists, then, who would lose confidence in this “commission,” simply because it would give them, as they think, another chance of deluding the public; and at the worst, would postpone the economic utilisation of town sewage, and thus prolong their monopoly. But what right have they to be consulted as to whether or not the sewage shall be utilised? Why should we appoint a “mixed commission in which they should have confidence?” Such a suggestion coming from these men is but another illustration of their immeasurable audacity. But will the Metropolitan Board of Works consult the interest of these unscrupulous artificial manure monopolists by appointing this hopeful “mixed commission?” We shall see.



Pending the appointment of this "commission" in the interest of this all-powerful party, their organs in the public press would appear to have received instructions to advise the Metropolitan Board of Works upon various points. These urge the Board not to grant a concession to any one who is not in a position to commence at once to lay down the works; or, in other words, who has not formed his company, raised his capital, and obtained his Act of Parliament. Now, on consideration, it will be seen that it would be difficult for the Metropolitan Board of Works to hit upon a line of conduct more calculated than this would be to paralyse all attempts to utilise the sewage, when it is considered that to enable this great question to be brought properly before Parliament and the country a very great expense must first be gone to in making surveys and taking the levels over an area of not less than 1,680 square miles—in procuring evidence, both agricultural and chemical, from abroad as well as at home. And after all this was done, how could any one go, with any hope of success, to Parliament for an Act empowering them to deal with the Sewage, without having first obtained the consent of the Metropolitan Board of Works? Or would the public subscribe the capital for the works, unless the nature of the security offered them was first clearly ascertained?

Now, all I have ever asked from the Board was distinctly to define the nature of that security, and thus to justify me, and those who acted with me, in making the large outlays necessary to carry the matter successfully through Parliament.

The conditional concession for which I have applied would only be made an absolute concession upon my successfully carrying out all the clauses in the agreement within a specified time. Failing which, the conditional concession would be forfeited. And I cannot but think the ratepayers of the metropolis will agree with me in saying (spite of the advice of the artificial-manure men and their friends) that it would be for their advantage that such provisional agreement should be entered into with me by the Board.

Again, these same journals of the artificial-manure party urge upon the Board not to grant a concession of the sewage unless on payment of a fixed rent. Now, when we consider the vast amount of the sewage—when we find that at 2d. per ton it is worth £2,217,104 per annum—when we see from the evidence taken by the Select Committee on Sewage of Towns that the manure contained in that sewage is at least doubled in value on the crops by being diluted, and therefore, that its commercial value must also be increased—when we find that the heat in sewage stimulates vegetation, giving an earlier and a later produce, which must necessarily increase the commercial value of the manure—when we find from the testimony of the great Liebig that the commercial value of the sewage may at once be doubled by the addition of a little superphosphate of



lime, which can easily be mixed with it at the pumping stations—when we recollect the experiments of Hembstadt and Schubler, and the results obtained by Mr. Phillip W. S. Miles, Lord Essex, Mr. Westwood, and others—when, finally, we consider that this manure will be delivered to the farmers on their very fields, thus saving them all expense of carriage,—can we have any doubt but that it must command a high price? Surely all these facts should, in justice to the heavily-taxed ratepayers, be borne in mind by the Metropolitan Board of Works, when they, as the trustees of the owners of this property, enter into any agreement for its utilisation.

Now, it appears to me that, as the main-drainage works will cost the ratepayers about as much as the works of distribution will cost the company, the profits should be divided equally between both. But how can we now say what the sale of the sewage will realise a few years hence? Will it be sold at 2d. per ton, or 4d., or even at a higher figure? How then can the rights of the heavily-taxed ratepayers be properly protected except by a fluctuating rent equal to half the profits, such as I have proposed?

Should, however, the Board insist upon a fixed rent, what is to be the amount? Shall it be £900,000 a year? That is what the ratepayers would receive under my proposition, after deducting working expenses, if the sewage was only sold at 2d. per ton.

But if there is to be a fixed rent, and secured, would the public in the face of such a liability subscribe the capital? And who is there, even in wealthy England, that would venture to enter into such a security? If he did, who could pay it unless from the profits of the speculation? From this we see that if the ratepayers are to receive a fair profit from the utilisation of their property it can only be under such an agreement as I have suggested, which would throw no impediment in the way of raising the capital, and leave no cause hereafter for disputes between the ratepayers and the company. And, further, that the only real security the ratepayers can have, in consequence of the vastness of the property, is from the sale of the sewage.

The public, however, are told that the Board cannot agree to this proposition, because it would make them “partners in a speculation.” This is a mistake; for, in the agreement I have submitted to the Board for consideration (and which, of course, can be altered if further protection is considered necessary), I carefully guarded the Board from any sort of liability; and they will be still further protected in a special Act of Parliament, which is to be approved of by them before being applied for.

Finally, sir, before closing this correspondence, I would wish briefly to draw your attention to the position in which the Metropolitan Board of Works are now placed with reference to the utilisation of the sewage.



Certain tenders are before the Board. Two of them, Mr. Napier's and Lord Torrington's, are based on the Rugby system of "getting rid of sewage." From neither of these can any return be made to the ratepayers, as proved by the evidence. And there is my tender for the economic utilisation of the sewage based on its proved value. I offer also more liberal terms to the Board than any other person.

What are the Board to do? Are they to ignore the evidence as to the value of the sewage which was given before the public by the Select Committee, and "get rid of" the metropolitan sewage, as at Rugby, by granting a concession to Mr. Napier or Lord Torrington?

I think the ratepayers and the public would more than question such a decision.

Are the Board to rush into the other extreme, and grant to me that conditional concession for which I have applied, and thus enable me to go at once to the public for my capital? An outcry would at once be raised against the Board by the unscrupulous and all-powerful artificial manure party; and the Board would, perhaps, be accused of assisting me to "hoodwink and deceive the public." I think, sir, that a safer course is open to the Board, and one to which no legitimate objection can be raised. It is this. Let the Board grant me the conditional concession for which I have asked, with the proviso that I do not apply to the public for my capital until I have first taken the question before Parliament; until I have established beyond all dispute the value of the sewage, its innocuous character when treated on the economic system, and the facility and profit with which it may be distributed over a suitable area. If the Board will consent to this arrangement I shall be prepared to produce such a mass of evidence as shall settle the question once for all, and silence even the artificial manure monopolists. But to do so will entail on me a great expense, and in proof of my ability to meet that expense I beg to direct the attention of the ratepayers of the metropolis to the letter of Messrs. Payne, Eddison, and Ford, the well-known solicitors of Leeds, a copy of which will be found at foot. And, although such a sum as £60,000 is enormously in excess of what will be required, I beg to add that should the Metropolitan Board of Works not agree with me in that opinion, I shall be prepared to lodge £100,000 more, if they consider such a sum necessary for preliminary expenses. And, further, that after I have proved in Parliament the value of the property of the ratepayers, and have obtained my Act, I will surrender that Act to the Metropolitan Board of Works, unless my private supporters shall subscribe for shares in my company to the extent of one million sterling before the issuing of a single advertisement.



Thus may this great question be fairly tested (which it never yet has been) in the face of the country, and without risk or expense to the Metropolitan Board of Works or the ratepayers.

If, then, I fail to prove my case—which is that also of the heavily-taxed ratepayers of the metropolis, and the ratepayers of all our cities, towns, and villages, as well as of the agriculture of England—I, and those alone who are acting with me, will be the sufferers. But if I succeed, as succeed I shall, what a triumph for the Metropolitan Board of Works! What a triumph for the ratepayers! What a triumph for the country!

The economic utilisation of the metropolitan sewage will be at once followed by that of every town in England; and the agriculture, trade, manufactures, and commerce of the nation will receive a stimulus before unthought of. The proper utilisation of the metropolitan sewage is then a matter of national importance. I therefore make my present proposition, not alone to the Metropolitan Board of Works—not alone to the ratepayers of the metropolis—but to the nation.

Let me, at my own hazard, plead the cause of the country before the representatives of the nation.

I am, Sir,

Your obedient servant,

THOMAS ELLIS.

September 11.

[COPY.]

“70, Albion Street, Leeds, June 30.

“Sir,—We beg to inform you that our clients are prepared to place in bank, to the credit of your local trustees, a sum of £60,000 as a fund for promoting and carrying out your plan for the economic and profitable utilisation of the metropolitan sewage, upon the Metropolitan Board of Works granting to you the concession on satisfactory terms. We cannot, however, advise our clients to lodge so large a sum, and keep it idle, until known that you have obtained the conditional concession that you have applied for, and the terms upon which it will be granted; for although we apprehend there would not be any difficulty in disposing of the entire stock, provided a liberal concession be made, yet we think it would be impossible to establish the company unless the Board were disposed to act towards you with satisfactory liberality.

“Yours truly,

“PAYNE, EDDISON, & FORD.

“To Thomas Ellis, Esq.,

“76, Warwick Square, Belgravia,

“London.”



## LETTER FROM BARON LIEBIG TO MR. ELLIS.

Munich, 22nd June, 1863.

SIR,

The pamphlet which you have sent me, and your letters, have given me much pleasure, by showing me that there are many excellent men fighting to promote that great national question, the economic utilisation of sewage. I have sent to-day, to Mr. Mechi, an article written to be printed in *The Times*, which I hope will contribute to forward and realize your views.

The enemies most to be feared to the application of Sewage are undoubtedly the manufacturers of artificial manures, particularly of superphosphate of lime. The manufacturers are a very stupid set of people, because the application of Sewage to agricultural purposes must necessarily increase tenfold their trade. This I tried to show in my article, and to fix all the money value which the sewer water of the metropolis may have.

In my new work, "The Natural Laws of Husbandry," you will find many arguments to convince people of the necessity of the employment of sewage.

The most important for men like you is not to lose patience, and to persevere in that good cause. I can tell you that my doctrine has very often received, as people believed, its death-blow, but it was always fresh and growing; and yet in the present moment there is not a single farmer in Germany and France who is doubting the truth of it. And if your endeavours arrive at their end, and you are successful, people will in ten years not believe that there was a great struggle to establish the application of sewage.

Believe me,

Yours very truly,

J. LIEBIG.

To Thomas Ellis, Esq.,  
London.

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"SOMETHING TO BE GOT RID OF."

*Leading Article from "The Star" of September 14th.*

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"SOMETHING to be got rid of" is the most flattering description which the artificial manure manufacturers can find it in their hearts to apply to the sewage. That is the phrase used by Mr. John



Bennett Lawes, the principal fabricator of the rival commodity, who was most improperly appointed on the Royal Commission, and still more improperly entrusted by his colleagues with the superintendence of the experiments at Rugby. There he certainly acted up to his avowed doctrine, by throwing away this valuable fertiliser after the most reckless fashion. The liquid was kept always running—the necessary result being that the land was converted into something very nearly approaching to a morass. Regarded as a means towards an end—that end being the depreciation of sewage and the consequent glorification of artificial manure—the manœuvre of Mr. John Bennett Lawes deserves praise for its ingenuity. He poured upon the land an inordinately excessive quantity of the fertilising agent, and then charged the whole amount of it against the crop, which was absolutely crippled by this preposterously lavish irrigation. By this means it was of course very easy to show a profit so very small as not to be worth mentioning. That was the end to be desired, for any other result would have touched the pockets of the concoctors of artificial manures. Throw the sewage into the sea, or give it away to a few individuals, and they will be content. All they demand is that you shall not throw it into the market. The moment that is done they must go to the wall. Every cultivator of the land stands in need of more manure than is produced on his own farm. Give him sewage at a moderate rate, and he will have nothing more to do with high-priced artificial compounds. He will even be able to dispense with some natural stimulants of the soil, for which he now pays very dearly. England spends annually £4,000,000 in the purchase of Peruvian guano, and sewage worth more than that amount is thrown away by London alone every year. But the population of the metropolis is only an item in that of the whole kingdom, and every man, woman, and child is a daily producer of sewage. London is wealthy, no doubt; but can she afford to cast away two hundred and sixty-six millions of twopences per annum, or to dispose of their equivalent in any save the most cautious and economical manner? Mr. John Bennett Lawes speaks with admiration of the success which has attended the mode of dealing with the sewage in use at Edinburgh. It is quite true that ground not worth half-a-crown an acre has been made to produce upon that area a crop of grass worth twenty pounds. But is this really a success? Certainly not, for the waste of power has been enormous. The unimpeachable analysis of Messrs. Hofmann and Witt shows that 1250 tons of sewage contain as much fertilising matter as one ton of guano, and have twice the potency if applied in a liquid state. Over each acre of land at Edinburgh there were poured twenty thousand tons of sewage, representing a value of £432, and a crop worth £30 was the fruit of this enormous outlay. But then we are told the sewage has



been "got rid of" No doubt it has ; and the consequence has been that many Scotch farmers, who might have obtained the natural manure at a low price if it had not been so lavishly squandered, have been obliged to pay more money for the artificial manure made by Mr. John Bennett Lawes and his brethren in the craft. Nobody would dream of blaming these gentlemen for taking legitimate care of their own interests. We must expect in this world to find every man ready at any moment to do battle in defence of his pocket. But this very tendency on the part of each individual to favour everything that augments his own pecuniary gains, and to discourage all that will diminish them, ought to have warned the Executive against placing in the position of judge in this matter a man to whom the utilisation of the sewage of the metropolis must necessarily mean the loss of some thousands of pounds of annual income. The lunacy which led to the placing in his hands of the entire direction of the experiments, the result of which must largely influence the decision of this important issue, really passes all comprehension. But we must deal with the matter as it stands. At Rugby the efforts to use sewage as a manure, made under the direction of Mr. John Bennett Lawes, and under the immediate supervision of officials taken for the purpose from his own factory, have proved unprofitable. Is there nothing significant in the circumstance that similar attempts have proved highly profitable when made by gentlemen, who, like Lord Essex and Mr. Philip W. S. Miles, had no interest in the matter beyond the natural desire of a landlord to make as much money as possible out of his soil? Is there nothing instructive in the fact that, while Mr. John Bennett Lawes has boldly enunciated the doctrine that sewage, declared by men of the highest scientific eminence to be worth twopence per ton, and proved by practical agriculturists of sound judgment and ripe experience to be a richly profitable manure, is "something to be got rid of," two of his servants, Dr. J. H. Gilbert and Mr. W. J. Christy, who work in his trade laboratory and were also on his Rugby staff, have been eagerly striving to quibble away the most patent facts, and have even had the audacity to attribute to Messrs. Hofmann and Witt a course of proceeding in contradiction to their own explicit statement—doing all this to safeguard the imperilled interests of artificial manure? The ratepayers of the metropolis are not to be talked out of their property by the devices of those ardent partisans. The sewage is not "to be got rid of," save for an adequate pecuniary equivalent. Such a determination will put out of court the schemes of Messrs, Napier and Hope, and of Lord Torrington, Sir Charles Fox, and Mr. Thornton Hunt. The former contractors propose to use the half of the sewage on an area of twenty thousand, and the latter the entire of it over an area of from thirty



to forty thousand acres. As its fertilising power could be brought to bear with advantage upon considerably more than a million of acres, the acceptance of either of these tenders would be equivalent to "getting rid of it" most unprofitably. The scheme of Mr. Thomas Ellis is the only one submitted which appears to us to possess practical value. He proposes to distribute the sewage by a system of pipes over an area of half a million of acres, which can easily be extended when the need arises, and over the whole of this district it will travel by gravitation. By sending out the manure in a liquid state he will not only diminish vastly the cost of distribution, but will at the same time deliver it to the farmer with a fertilising power twice as great as if it were in a solid form. He offers half the profits to the ratepayers—whose share, upon a fair computation, will amount to seven hundred thousand pounds a year when the system of pipes over the area with which he proposes to start is in full working order. He gives ample guarantee for the needful funds for preliminary expenses, and asks only for a provisional concession until he shall have proved his case before the House of Commons and obtained for the company the sanction of an Act of Parliament. This is a straightforward, business-like tender. It provides for the utilisation of all the sewage, and offers a fair remuneration in return; and, moreover, the success of the scheme does not depend upon the validity of any scientific crotchet. The data upon which Mr. Thomas Ellis bases his calculations are furnished by chemists of the highest repute, and no one impugns them save those who are interested in the manufacture of artificial manure. The ratepayers of the metropolis will be mad if they lose so excellent an opportunity of lightening their local taxation, and should make their will clearly known to the Board of Works, which is their trustee. It would be an everlasting disgrace to London if it suffered itself to be forestalled by other places in the conversion into hard cash of precious though hitherto neglected property—and the risk is not imaginary. Already the question is being stirred in important provincial towns, and if we do not take heed we shall become the pupils, instead of the teachers, of our country cousins. The sewage is not "to be got rid of;" but there is something else which might advantageously be thus treated—the pertinaciously exercised, craftily sophisticated, and sordidly interested intermeddling in the matter of the artificial manure manufacturers.

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## APPENDIX.

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### EXPOSURE OF MESSRS. CHRISTY AND GILBERT'S ATTEMPT TO FALSIFY THE ANALYSES OF THE LONDON SEWAGE MADE BY DR. HOFMANN AND MR. WITT.

*Letter to the Editor of "The Star," published September 7th.*

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SIR,

FROM a letter which appeared in the *Star*, of the 4th inst., signed "J. H. Gilbert," I learn that the artificial manure manufacturers are still sanguine of success in their attempt to mislead the public as to the value of the Metropolitan Sewage. They now affect to believe that the report of the Messrs. Hofmann and Witt was grounded only upon an analysis of the sewage taken "in dry weather," without any admixture of rain or drainage water. And thus that the well-known estimate of value of the London sewage by the Messrs. Hofmann and Witt, at 2d. per ton when guano, their standard of value, sells at £11 per ton, has reference only to the "dry-weather sewage," and not to the average total sewage of the metropolis.

I have, sir, ceased to be surprised at any statement which may emanate from the artificial manure manufacturers, or their servants, with reference to the agricultural or commercial value of sewage, which they well know would push their artificial concoctions out of the market, did it get the slightest fair play. But the public, who have not so carefully watched their proceedings as I have done, will witness with some astonishment the persevering and cool attempts of the Messrs. Christy and Gilbert (both of whom are in the service of Mr. John Bennett Lawes, the great artificial manure manufacturer, and doubtless acting in this matter under his orders), to pervert the meaning and distort the expressions of a published document, open to everybody, and requiring only common sense and common honesty in its interpretation.

The report of the Messrs. Hofmann and Witt upon the Metropolitan Sewage is addressed to Captain D. Galton, R.E., J. Simpson, Esq., C.E., and T. E. Blackwell, Esq., C.E.—the referees appointed to consider all plans for the main drainage of the metropolis, and



who were especially directed to place themselves in communication with the Royal Sewage Commission, which was then just formed, with a view to their specially considering whether it was possible to utilise the sewage of the metropolis.

The report of Messrs Hofmann and Witt is embodied in the report of the referees, which was ordered by the House of Commons to be printed 3rd August, 1857, and should at the present moment be in the possession of every vestry in the metropolis.

The referees in their report, after stating that the Royal Sewage Commission was not able to afford them any useful information as to sewage utilisation, proceed to say, at page 21.—

“We, consequently, made inquiries respecting, and visited several towns, where works have been established for the utilisation and deodorisation of the sewage. But we were not satisfied with the success of these undertakings. And we also soon came to the conclusion that the example afforded by deodorising works in a town of ordinary size, such as Leicester, even if perfectly successful, was not a safe guide to be followed in the case of the metropolis, because the magnitude of the metropolis, the variable volume of the sewage, and the alternation in its character from dilution, are such as to render the circumstances under which the sewage would be received at the works entirely different from those of any other town.

“We therefore requested Dr. Hofmann and Mr. Witt to report to us upon the value of the sewage and upon the practicability of utilising it. Those gentlemen have entered most fully into the subject, and have furnished us with very complete and valuable information, which will be found in their very able report in Appendix 1.”

Nothing can be more precise than this language. The referees, we see, did not overlook the self-evident fact that rain falls even in London, and therefore that the sewage must be more or less affected by it; and they directed Messrs. Hofmann and Witt to determine the value of that sewage, and the possibility of utilising it; and further, they were perfectly satisfied with “their very able report.”

Could, then, the Messrs. Hofmann and Witt have fulfilled their instructions by merely analysing and reporting upon a fancy specimen of sewage taken in “dry weather” only, without having also fully considered the effect upon the sewage of additional dilution?

On turning to Appendix 1, page 1, I find the report of Messrs. Hofmann and Witt to the referees, which they preface by the letter of instructions they had received from the referees, signed by their secretary, “Herbert C. Saunders,” in which the following occurs:—

“Without going into all the minute details of analysis of the various objects to which they will have to call your attention, I may state generally that they will require a statement of your views. . . . Secondly, as to the actual agricultural value of the London sewage, determined from specimens collected for that purpose.”



Can anything be more precise than this language? "The actual agricultural value of the London sewage," and not the value of a fancy sample, was to be determined "from specimens collected for that purpose." These "specimens" were, as we learn from the report, furnished to the Messrs. Hofmann and Witt by the referees. Are we to suppose that they were not fair "specimens"—that the referees desired to mislead the public as to "the actual agricultural value of the London sewage" (their own words), and therefore furnished for analysis merely fancy "specimens" of sewage of more than average strength?

Impossible. The public assuredly will not believe such to have been the case until the referees shall have told us so, and in so doing annihilated their own characters.

At page 14 of the report of the Messrs. Hofmann and Witt, I find "Table B, Analysis of the Sewage." And with reference to this table, they state at page 15—

"The preceding table gives the results obtained at different times at the Falcon-brook sewer, the Earl sewer, the Fleet sewer, the King's Scholars' Pond sewer, and the Northumberland-street sewer, the experiments being made partly under ordinary circumstances, and partly after heavy rains, which, as has been pointed out already, induce an abnormal condition in the composition of the sewage. The table shows that the variations in the composition of the sewage water are very great indeed, not only at different hours of the day, but also at different seasons, the minimum quantity of solid constituents being as low as 44.14 grains (in the Falcon-brook sewer); whilst on one occasion, after the thunderstorm in the night of Friday, June 19, 1857, the total solid matter in the Savoy-street sewer rose to 296.97 grains to the gallon, of which 188.49 were mineral and 108.48 organic matter. But if we exclude the observations made under the last mentioned circumstance from consideration, and limit ourselves merely to the experiments made under normal conditions (viz., those in the columns 5, 6, 7, 8, 10, 11, 13, 14, and 15), we arrive at average numbers which agree with those we have adopted as well as may be expected."

From this we see, sir, that the Messrs. Hofmann and Witt carefully considered every condition of the sewage, and not its aspect only in "dry weather," when determining for the referees "the actual agricultural value of the London sewage."

At page 10 of their report the Messrs. Hofmann and Witt, under the heading of "Mean Composition and Agricultural Value of London Sewage," state—

"Considering, however, that the object of this inquiry was nothing more than to obtain a general idea of the value of the sewage, we believe that we were not very far from the truth in adopting the mean of the two experiments given above as a starting-point for calculation. We shall have an opportunity in the latter part of this chapter of uniting in a table a number of analyses of sewage water, which in the prosecution of this inquiry were made for different purposes. It will be found that



a correct interpretation of these experiments leads to nearly the same result. We shall also quote a number of observations made by other inquirers, which, with a few exceptions, are likewise in favour of the number deduced from our own experiments."

Then follow "Calculations of value of Mean Sewage as a Manure," which at page 12 are thus summed up:—

"From these data we readily ascertain the money value of a certain weight or volume of the sewage itself. 100 tons of sewage contain:—

|                         | lb.    | per ton.         | value.    |
|-------------------------|--------|------------------|-----------|
| "Suspended matter ..... | 82·72  | at £3 0 8½ ..... | £0 2 2½   |
| Dissolved matter .....  | 245·95 | at ... ..        | 0 15 4½   |
| Total .....             | 328·67 | £6 0 3           | £0 17 7." |

Again, at page 41 of Messrs. Hofmann and Witt's report, I find it stated there, under the heading of "Mean Composition and Agricultural value of the Sewage,"—

"(A) According to experiments made on specimens which represent its mean composition, the London sewage contains on an average 102·8 grains per imperial gallon of total solid constituents, of which 72·1 grains are mineral and 30·7 grains are organic matter.

"(C) The total solid matter, when entirely separated from the water with which it is diluted, would have a money value of £6 0s. 3d. per ton; that of guano being at £11.

"(D) Of the valuable matter, six-sevenths are present in the liquid portion, and only one-seventh existing in the insoluble or suspended form.

"(E) From the knowledge of the quantity of these valuable constituents contained in a given volume of sewage, it has been calculated that the money value of 100 tons of sewage, supposing all those bodies capable of separation, would be in its original condition 17s. 7d., or 2d. per ton."

Again, at page 43, under the heading of "Utilisation with Sewage in a Liquid State," I find these gentlemen to say—

"In order fully to appreciate the proposal which has been made of using sewage for the purpose of irrigation, it is necessary to recollect that 100 tons of London sewage contain 2s. 2½d. worth of valuable constituents in the solid, and 15s. 4½d. worth in the liquid form, and that in order to supply a meadow with valuable matters corresponding in quantity to those contained in one ton of guano, it is necessary to irrigate with 1250 tons of sewage."

It will, I think, sir, be unnecessary that I should give further extracts from the report of the Messrs. Hofmann and Witt—a report alike remarkable for its laboured research, for its talent, and for its beautiful simplicity—a simplicity which renders it impossible to be misunderstood. And yet this is the report which the artificial manure manufacturers (through the instrumentality of the Messrs. Christy and Gilbert, the servants of Mr. John Bennett Lawes, the



great artificial manure manufacturer), seek to induce the public to believe is based solely on an analysis of "dry-weather sewage," and therefore affords no guide to "the actual agricultural value of the London sewage." And these artificial manure men have had the folly as well as the baseness to attempt to brand me as "hoodwinking and deceiving the public," because in my efforts to secure the economic and profitable utilisation of the metropolitan sewage, I have grounded my calculations upon the report of the Messrs. Hofmann and Witt, and told the heavily taxed ratepayers that their property was worth at least 2d. per ton.

But now we learn from the last letter emanating from the artificial manure manufacturers, and bearing the signature of "J. H. Gilbert," that they have referred the matter in dispute to Captain Douglas Galton, R.E., one of the referees, who "after kindly referring to the report to refresh his memory, has given them permission, on his authority, to state that their view of the matter is correct," *i.e.*, that the Messrs. Hofmann and Witt having been, as we have seen, specially instructed to report upon "the actual agricultural value of the London sewage," did so upon an analysis simply of "dry-weather sewage" alone, without taking into account its condition during rain!

It is difficult, if not impossible, to believe that Captain Douglas Galton has allowed his name to be used in the manner it has been applied by this party; or I must suppose that he has been entrapped into a hasty expression of opinion by some ingenious misrepresentation. Otherwise I feel assured that he never would have lent his name to contradict and stultify his own report, or that he could hope to invalidate such a report as that of Dr. Hofmann and Mr. Witt.

I am, Sir,

Your obedient servant,

THOMAS ELLIS.

Sept. 5.

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"THE ARTIFICIAL MANURE MANUFACTURERS ARE NOT FIGHTING  
A FAIR BATTLE."

*Leading Article from "The Star" of September 8th.*

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THE artificial manure manufacturers are not fighting a fair battle. No one desires to prevent them from obtaining a full hearing and sustaining their own views by honest arguments. — They have large pecuniary interests at stake, and it is but natural that they should



be anxious to defend them against all assailants, If the sewage, of which we now throw away in London alone some two hundred and fifty millions of tons every year, could be utilised as a fertilising agent, it must necessarily drive out of the market the wares by the sale of which they realise many thousands of pounds of annual income. Of course they are uneasy, and struggle energetically against the threatened rivalry. It is not in human nature to act otherwise, and these gentlemen have a valid claim to be listened to so long as they confine themselves to stating facts and urging plain arguments. Their facts may be shown to be worthless, and their arguments may be shown to be inconclusive; but these are results to be arrived at by free discussion, It is necessary, however, that an arbiter should step in to prevent the ratepayers from being deluded when it is sought to convince them that a valuable portion of their property is worth nothing by means of actual misrepresentation. This can scarcely have sprung from inadvertence. The culprits are educated men, who are not to be supposed ignorant of the meaning of very plain English words, and they are specially conversant with the matter in hand. Dr. J. H. Gilbert and Mr. W. J. Christy, who have laid themselves open to this grave imputation, are both in the employ of Mr. John Bennett Lawes, who makes £40,000 per annum by the manufacture of artificial manure. The sewage question is consequently one which may be presumed to be specially familiar to them. They are the last people in the world who can be supposed likely to mistake the meaning of straightforward statements bearing upon this topic. These two gentlemen have, in letters which have been published in our columns, publicly accused Mr. Thomas Ellis, one of the contractors who have tendered for the metropolitan sewage, of hoodwinking and deceiving the public with regard to the value of that commodity. This, according to their allegations, he has done by stating that the estimate of its market price arrived at by Messrs. Hofmann and Witt was based upon an analysis of the dry weather sewage, and that these eminent chemists took no account in their calculations of the depreciatory effect upon its worth per ton which is produced by rainfall. Thus they charge Mr. Thomas Ellis with either egregious blundering or gross dishonesty, and at the same time strive to persuade the ratepayers that the sewage is really worth much less than the twopence per ton at which he rates it, and that his calculations with regard to the profit which may be derived from its sale are altogether illusory.

The issue involved in this controversy is not simply one of personal competence or credibility. If that were the case, we should assuredly not deem the matter worthy of serious attention. But the pecuniary interests of all the inhabitants of the metropolis are vitally at stake. Mr. Thomas Ellis, basing himself upon the



data furnished by Messrs. Hofmann and Witt, assumes that the sewage has an average value of twopence per ton, and hence estimates at about £700,000 per annum the half share of the profits which he offers to the ratepayers if the concession is granted to him. Now, the reliability of his calculations of course depends upon whether Messrs. Hofmann and Witt arrived at their conclusion by the analysis of really average samples, or by that of choice specimens, unadulterated with rainfall. Upon this point they are unquestionably the most trustworthy witnesses, and, fortunately their evidence is so clear as to be wholly incapable of misapprehension. In the first place there can be no manner of doubt as to the nature of the duty which they were appointed to perform. In their instructions from the referees chosen to consider all plans for the main drainage of the metropolis, they were directed to report "as to the actual agricultural value of the London sewage, determined from specimens collected for that purpose." This language is certainly plain enough, "The actual agricultural value of the London sewage" must obviously mean its marketable worth, taking the rich with the poor, and striking a fair average. The referees cannot have supposed that it was never going to rain again within the metropolitan limits, and they showed their appreciation of the importance of taking into account the rainfall by alluding in their report to "the variable volume of the sewage, and the alternation in its character from dilution," as considerations which must be constantly kept in view. Their instructions, then, were sufficiently explicit. Are we to conclude that Messrs. Hofmann and Witt departed from them and rendered their elaborate report utterly worthless by basing their estimate of the nature of the sewage upon choice samples taken in dry weather, and consequently affording no indication of the average composition of the entire mass? It would be a gross affront to their reputation as scientific men charged with a well-defined public duty, to suppose that they pursued so inane a course; and their own account of their proceedings is so clear and precise that it is impossible that any one who reads it with his eyes open should honestly suppose that they did anything of the sort. In their report they distinctly state that their experiments were "made partly under ordinary circumstances, and partly after heavy rains, which, as has been pointed out already, induce an abnormal condition in the composition of the sewage." And yet in face of this plain declaration, Dr. J. H. Gilbert and Mr. W. J. Christy have the audacity to assert that the estimate of Messrs. Hofmann and Witt was based solely upon the analysis of the dry-weather sewage, and to accuse Mr. Thomas Ellis of hoodwinking and deceiving the public because he has imperilled the gains of their employers by bringing into prominence the simple truth.



The ratepayers of the metropolis will do well to be upon their guard against the manœuvres of these artificial manure manufacturers. They have already done much to prejudice the public mind upon this important question, not only by perversion of facts and disingenuous reasoning, but by active intervention. The experiments with sewage manure at Rugby, under the authority of the Royal Commission, failed, whereas those undertaken elsewhere have been crowned with complete success. Will any unprejudiced mind fail to find an explanation of this in the fact that the former were placed under the superintendence of Mr. John Bennett Lawes, the artificial manure manufacturer, who drenched the land with liquid sewage until he made it a morass, and thus obtained results highly favourable to the ingeniously concocted compounds by the sale of which he realises a princely income—while private agriculturists like Lord Essex, by using the same natural manure in moderation, largely enhanced the productive power of the soil? The government farm at Rugby was a little nest of individuals personally interested in the artificial manure business. There was Dr. J. H. Gilbert, the right-hand man of Mr. John Bennett Lawes, to superintend the operations—there were Mr. W. J. Christy and Mr. G. Gifkins, assistants in the laboratory of Mr. John Bennett Lawes, at Rothamstead, to keep the records and make the calculations and tabulations—there were other persons employed in the laboratory of Mr. John Bennett Lawes to assist in the preparation of specimens for analysis. Can any one wonder that the Rugby experiments were a failure? Can any one comprehend why their management was ever entrusted to a man upon whom their success might entail an enormous pecuniary loss? Now we have the same Dr. J. H. Gilbert and Mr. W. J. Christy endeavouring to delude the public into the belief that the sewage is almost worthless, since the estimate of Messrs. Hofmann and Witt was based only upon the analysis of the dry-weather product. This is really more than can be endured. We have the distinct statement of Messrs. Hofmann and Witt that they made their experiments in all weathers, wet and dry, took specially into account the depreciating agency of the rainfall, and fixed the average value of the London sewage for agricultural purposes at twopence per ton. The question which now remains for the consideration of the metropolitan ratepayers is whether, in order to save from diminution the incomes of certain artificial manure manufacturers, they are willing to sacrifice an annual revenue of seven hundred thousand pounds.

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“THE ARTIFICIAL-MANURE MONGERS, AND POOR UNFORTUNATE  
LAWES!”

*Leading Article from “The Builder’s Weekly Reporter,” of Sept. 14.*

“SKIN for skin; yea, all that a man hath will he give for his life.” And truly, the artificial-manure mongers of the metropolis are fighting for life—wrestling for it with a temerity and tenacity inexcusable under less imperative circumstances. Never yet was there a glaring rampant evil, but its removal was opposed by the shrine-smiths of Diana! The people and ratepayers of the metropolis have been for years wasting their substance at the mouth of the sea; but now that our folly is exposed, the benefitters thereby are naturally agrieved. We have spurned nature and courted art at great expense, and the return to first principles has necessarily brought its punishment at the hands of the manure concoctors. Science has demonstrated, investigation has proved, arithmetic has clearly established the fact, that the liquid and solid sewage of our inhabitants is worth some millions per annum; but notwithstanding, with the convulsive gasp of the dying, and in the hope that at least some of the mud of misrepresentation may stick where it is desired, to discredit the evidence of impartial scientific men—the gentlemen who have hitherto reaped such golden harvests from chemical ignorance and perhaps excusable prejudice, now essay to prove the report of Messrs. Hoffman and Witt unworthy of reliance, as based on imperfect calculations.

We will suppose that our despondents are open to argument—which we don’t believe—and that they have read the report to which they reply. Then opthemia or obtuseness is their affliction. From the instructions given to the investigators, and the cause of their election, no doubt can be entertained that their report was made on sewage chosen in wet as in dry weather. The deodorising works at Leicester were not considered by the referees as a fair guide by which to judge of the value and capabilities of the London sewage, “because of the magnitude of the metropolis, the variable volume of the sewage, and the alternation in its character from dilution,” and therefore Messrs. Hofmann and Witt were appointed to report on the sewage under all and every of its aspects—to ascertain its *actual* agricultural value from specimens collected for that purpose. This course they followed. They were evidently supplied with specimens from the Falcon Brook, the Earl, the Fleet, the King’s Scholars Pond, and the Northumberland-street sewers, or they could not have reported on them, the “experiments” (as they state) “being made partly under ordinary circumstances, and partly after heavy rains.” They then deduce therefrom the mean composition and agricultural value, viewing the manure in its solid and liquid state, separate and combined—giving its minimum value at 2d. per ton.



The only other difficulty is that connected with Captain Douglas Galton, R.E., one of the referees, who has turned round, it is reported, in favour of the assertions of the manure manufacturers. The change is inexplicable. If Messrs. Hoffman and Witt did *not* report on sewage specimens taken in wet as well as in dry weather, how came it that the referees as a body,—Captain Galton amongst them—were very satisfied with their very able and complete report? The Royal Sewage Commission were not able to give the referees the information needed, and the referees found that their Leicester investigations might not apply to London, because of the variable volume of the sewage here, and the alteration in its character from *dilution*—why then did they supply unfair and “fancy” specimens, knowing them to be worthless as criterions?—why did they receive and applaud a report that failed in the very thing for which it was required? Again, is it likely that Messrs. Hofmann and Witt, after stating in their report—(Table B. “Analysis of the Sewage,” p. 15)—that heavy rains produce an abnormal condition of the composition of the sewage, and that therefore specimens had been taken in wet as in dry weather—that they should then report only on “fancy” specimens taken under the most favorable circumstances? Poor unfortunate Lawes!

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THE METROPOLITAN SEWAGE AND THE CLIQUE OF MR. JOHN BENNETT LAWES.

*To the Editor of “The Star,” published on 15th September.*

SIR,

In a letter which appeared in this day's *Star*, bearing the signature of “James Arch. Campbell,” the public are informed not only that he is “a practical man,” but also “an old soldier.” He tells us also that he is “no great artificial-manure manufacturer, nor has he any pecuniary interest in the sale of that article.” And, above all, he “has no interest in any scheme for utilising the sewage.” He has used sewage for years in large and small dressings; and he adds, “I can have no object but to let the public know the true value of town sewage.”

Surely, sir, before such a witness as this—so disinterested, so unconnected with all interested parties, as he gives us clearly to understand—we should all bow down low in silent adoration

Surely he must be the true oracle!

But who and what is our oracle? He tells us what he is not, but forgets to tell us what he is. Let me then, sir, briefly supply you with some information on that point.



Mr. James Arch. Campbell, of Rugby, is the gentleman who, with one voice, every journal in the interest of the artificial manure party demanded should be examined before the Select Committee on Sewage of Towns.

Now, why should all these journals, and these alone, have been so anxious upon this point?

Mr. James Arch. Campbell is the gentleman who, not having, as it appears, been summoned to give evidence before that Committee, published a pamphlet to enlighten the nation upon the subject of sewage utilisation; in which he asks himself and answers twenty questions, that he says "might, could, should, or ought to have been put to me, had I been examined before the Committee of the House of Commons."

Now, why should Mr. James Arch. Campbell take all this trouble, and put himself to the expense of publishing a pamphlet, which, as there is no price marked on it, was of course only intended to be given away? In this pamphlet will be found embalmed all the fallacies of Mr. John Bennett Lawes and the artificial manure monopolists.

Take as a sample the following:—"It is clearly more advantageous to supply large quantities of sewage over a small surface than small quantities over a large surface," says Mr. James Arch. Campbell; and so say Mr. John Bennett Lawes and other artificial manure monopolists.

"As a general rule town sewage cannot be applied with advantage to grain crops," says Mr. James Arch. Campbell; and so say Mr. John Bennett Lawes and other artificial manure monopolists.

"Town sewage does not improve land for the succession crops," says Mr. James Arch. Campbell; and so say Mr. John Bennett Lawes and other artificial manure monopolists.

"Sewaged grass will not fatten cattle or sheep," says Mr. James Arch. Campbell; and so say Mr. John Bennett Lawes and other artificial manure monopolists.

"Town sewage is not, at the outside, worth to a farmer more than  $\frac{1}{2}$ d. per ton under the most favourable circumstances," says Mr. James Arch. Campbell; and so say Mr. John Bennett Lawes and other artificial manure monopolists.

"Finally, I hope to see the time when none of it" (town sewage) "shall be wasted," says Mr. James Arch. Campbell; and so say Mr. John Bennett Lawes and other artful and unscrupulous artificial manure monopolists, who have been so long struggling to "get rid of it" according to their own plan.

I need scarcely remind you, sir, that upon all these points, upon which there is such a remarkable agreement between Mr. James Arch. Campbell, "the practical man," and Mr. John Bennett Lawes, the great artificial manure manufacturer, they are both



contradicted in the most positive manner by Lord Essex, Mr. Philip, W. S. Miles, of King's Weston, Bristol, Mr. W. Westwood, and several other witnesses, who were examined before the Select Committee, and who had all used sewage as well as our "practical man," and who could have no temptation to deliberately make false statements to the Committee.

But how comes it that there is such a remarkable agreement of opinion between this "practical man," who gives us to understand that he is not interested in artificial manure manufacturers, and Mr. John Bennett Lawes, who clears his £40,000 a year from the manufacture of artificial manure—an income which would be all but lost was there a general adoption of the economic system of sewage utilisation?

You will perhaps smile, sir, when I tell you that it is on the land of this "practical man" that the burlesque experiments of Mr. John Bennett Lawes have been carried on for the Royal Sewage Commission, to determine for the country whether sewage can compete with the ingenious concoctions of Mr. John Bennett Lawes, and which that commission gravely assures us they cannot; and so in effect says Mr. James Arch. Campbell, the "practical man." On a reference to the return of the Sewage Commission, ordered by the House of Commons to be printed, 14th April, 1863, I find that this "practical man" gets a good rent from the Sewage Commission for his land, and that he then purchases from the Commission, at a reasonable price, the grass grown on his own land, to feed his own cows, which are the identical animals experimented on by the Commission. And, further, that it is this "practical man's" son, Mr. Duncan Campbell, who is employed at a salary by the Commission "to superintend, under Dr. Gilbert, the application and guaging of the sewage, the cutting and weighing the crops," &c., &c., &c

In short, sir, Mr. James Arch. Campbell, the "practical man"—this "old soldier," this gentleman unconnected with the manufacture of artificial manure, this independent witness in favour of the artificial manure monopolists—is, like Mr. W. J. Christy and Dr. Gilbert, simply our old friend in another shape, the indefatigable Mr. John Bennett Lawes. It is therefore by no means surprising to find him reiterating the exposed fallacies of Mr. W. J. Christy and Dr. Gilbert with reference to the analysis of the metropolitan sewage made by Messrs. Hofmann and Witt, or stigmatising my statements as to the value of the sewage as "ludicrous." But as my "statements" are based simply upon that analysis and the evidence of untainted witnesses, I can afford to laugh at the attacks of Mr. John Bennett Lawes and his clique.

I am, Sir,

Your obedient servant,

THOMAS ELLIS.

Sept. 14.