*Chloride of Zinc.*

If neutral chloride of zinc be treated with sulphuretted hydrogen, a very small portion of the salt will undergo decomposition, yielding with the elements of the gas sulphuret of zinc and hydrochloric acid.

The hydrochloric acid thus formed, rendering the remaining solution acid, no further decomposition of the salt will take place.

*Nitrate of Lead.*

If nitrate of lead be treated with sulphuretted hydrogen, a decomposition of the salt will ensue, sulphuret of lead and water being formed, and nitric acid set free.

As salts of lead are decomposed in the presence of free acid, the decomposition will continue as long as any nitrate of lead remains.

Mr. Glass proceeds as follows :—

*It is affirmed, that chloride of zinc is "an imperfect disinfecter of night soils, and unfits them for future employment as manure."*

"*It is a bad disinfecter,*" Professor Calvert says, 1st—"*Because sulphuretted hydrogen has no action on salts of zinc, which are acid.*"

The answer is, that Sir William Burnett's solution of chloride of zinc is not acid. It is neutral. Professor Calvert endeavours to get rid of the neutrality of the zinc salt in a singular manner. He supposes a stream of sulphuretted hydrogen (hydrosulphuric acid, as he calls it in this case) to be passed through the zinc salt, and then he says it is acid ; or he supposes sulphuretted hydrogen acts its part first upon chloride of zinc in a mixture containing hydrosulphate of ammonia, rendering the zinc salt acid, which will then act on the hydrosulphate of ammonia, and evolve sulphuretted hydrogen in torrents.

That sulphuretted hydrogen has no action upon an *acid salt* of zinc, and that an *acid salt* of zinc will evolve sulphuretted hydrogen from hydrosulphate of ammonia, there can be no question ; but Sir William Burnett's solution is neutral, and therefore decomposable by sulphuretted hydrogen, or hydrosulphate of ammonia, as I have already illustrated.

I do not affirm that sulphuretted hydrogen will completely decompose the zinc salt, but hydrosulphate of ammonia will, and that is the odorous compound we have principally to do with in night soil.

We think there can be no doubt that while of the two substances in question, chloride of zinc is the only efficient antiseptic and preservative agent, so nitrate of lead is much the more efficient agent in the decomposition of noxious effluvia, in which sulphur is a constituent.

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## M. LEDOYEN'S DISINFECTING FLUID.

In an article published in the last number of this Journal, on the above subject, we expressed our intention, which we now proceed to put into effect, of giving some extracts from the official report, which has been printed by order of Parliament, containing a statement of the evidence adduced with reference to the claim made by the discoverers of the disinfecting fluid.

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The claim preferred is, certainly, a very comprehensive one, being no less than that of having "*discovered* the means of disinfecting *all* fœtid animal substances and gases by a liquid which is very cheap, simple, and can be applied by any person with the greatest facility."

The properties of this liquid are further described by the discoverers, in the following terms:—

1st. "It disinfects night-soil, not destroying but increasing vegetation, more particularly as regards agriculture, *completely preventing the disease in potatoes*, when the land is manured with disinfected night-soil."

2ndly. "It disinfects hospital-wards of miasma, also cellars, water-closets, and buildings infected by impure gases."

3dly. "It disinfects sailors suffering from fever on board of vessels; it will also disinfect ships at sea and under quarantine."

4thly. "It disinfects patients suffering with infectious disorders and wounds, also dead bodies, so that they may be kept nearly a month; also different parts of the body can be kept for the purposes of dissection, for coroner's inquests, &c."

Finally. "This process is most effectual as a sanatory remedy for towns, &c."

Having submitted a statement, embodying the above description, to Lord Morpeth, First Commissioner of Her Majesty's Woods and Forests, with an application for assistance from the government to enable the discoverers to publish the secret "for the benefit of all, that this country may spread the beneficent works of the Creator, who has given by his wisdom to man this important discovery to prevent disease;" the following reply was received from the office of Woods and Forests:—

"*Office of Woods, &c., 2d February*, 1847.

"Dear Sir,—I am directed by Lord Morpeth to acquaint you that he has prevailed upon Dr. Southwood Smith, Mr. Toynbee, and Mr. Grainger, to witness and test any experiments which you may submit to them, having for their object the disinfection of dead bodies, ulcers, &c. &c.

I have, &c.,

"*To Colonel Calvert.* (Signed) R. J. Mackintosh."

This proposition was immediately acceded to by Mr. Ledoyen and Col. Calvert, and the referees appear to have entered upon the investigation of the subject, if not in the most methodical and scientific way, at least with a disposition to afford the discoverers ample opportunity for proving the efficacy of their disinfecting solution.

Numerous experiments were made to test the effect of the fluid.

1. On substances already in a state of decomposition.
2. On substances undergoing that process.
3. On night-soil.
4. On impure air.

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The general conclusions deduced from these experiments are thus expressed by the referees :—

"1. That this fluid does not possess any peculiar power in preserving the dead body from decomposition, and that, therefore, it is not applicable to any considerable extent to purposes of dissection.

"2. That it removes the fœtor of putrifying substances, vegetable and animal, by decomposing the sulphuretted hydrogen upon which that fœtor chiefly depends.

"3. That it is capable of preventing the disengagement of sulphuretted hydrogen in sick chambers, and in the wards of hospitals, and of removing it in a few minutes when it is present, not merely by dissipating the smell, but by destroying the poison.

"4. That the use of it is simple and easy, and as the occasions on which it is required are of constant occurrence, and as it has the peculiar advantage of being itself inodorous, its possession would be a comfort and blessing to private families.

"5. That by decomposing the sulphuretted hydrogen, it removes from night-soil the poison which renders such matters injurious to health and dangerous to life, and by changing the ammonia from a volatile into a fixed substance, and thereby preventing its escape and loss, it preserves in the night-soil the principle which renders it chiefly valuable as a manure, while it presents that principle to the plant in a form which is known to be highly beneficial to vegetation.

"6. That, as it renders the removal of night-soil practicable without creating a nuisance, it ought, in our opinion, to be made a matter of police regulation, that no privy or cesspool should be emptied without the previous use of a sufficient quantity of it to destroy all offensive smell.

"That its most successful application to privies and cesspools is only a palliation of their evil, and does not remove the objection to their existence; that there is and can be no safety but in the immediate removal of all excrementitious and all other refuse matters; and that the retention of such matters in and about dwelling-houses is dangerous to health and life, and altogether unworthy of a nation which has made any progress in civilization."

Now what does this report of the referees, Dr. Southwood Smith, Mr. Grainger, and Mr. Toynbee amount to? Why, merely to this, that the disinfecting solution is capable of decomposing sulphuretted hydrogen; and in as far as this gas is the cause of offensive odours, of destroying such odours or preventing their diffusion.

But is sulphuretted hydrogen the only fœtid gas, or even the only one generated by the decomposition of animal and vegetable matter? Nay, further, were it proved that Ledoyen's fluid possessed the property of destroying all fœtid animal substances and gases, could it thence be inferred that it was capable of preventing contagion?

In answer to these questions, we may quote the following very clear and sound exposition of the case, which appears to have been furnished to the referees by Dr. Leeson, Lecturer on Chemistry and Forensic Medicine at St. Thomas's Hospital.

"The decomposition of animal and vegetable substances gives rise, as it is well known, to septic or infectious miasmata. Those arising from vege-

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table putrescence, generating disease and fevers of a remittent type, whilst those arising from animal matter are distinguished by a typhoid character.

"Such miasmata, although so dangerous, are not, it is believed, to be distinguished by the smell, and are most probably composed of vegetable and animal organizations so minute and subtle, as to elude the cognizance of those methods and instruments of investigation which have hitherto been employed.

"The fœtid and offensive gases or vapours consist of combinations of hydrogen with sulphur, phosphorus, nitrogen and carbon.

"The most offensive compounds are those of hydrogen with sulphur and phosphorus, forming sulphuretted hydrogen (or, as it is otherwise termed, hydro-sulphuric acid and phosphuretted hydrogen gases.)

"The ammonia resulting from the combination of hydrogen and nitrogen, although odorous, can scarcely be termed an offensive compound, but being commonly combined with sulphuretted hydrogen, it then furnishes a highly offensive substance.

"The compounds of carbon and nitrogen forming cyanogen; of cyanogen and sulphur forming sulpho-cyanogen, and of carbon and hydrogen forming light carburetted hydrogen, may be reckoned amongst the less offensive although volatile ingredients of the putrefactive vapours, but which combine to complete the farrago of unpleasant odours.

"The compounds of carbon with oxygen forming carbonic oxide and carbonic acid, although fatal to animal existence when too largely respired, can scarcely be considered as offensive compounds.

"To recapitulate: we may divide and distinguish the elements of animal and vegetable putrescent vapours thus:

| *Dangerous, but Inodorous.* | *Odorous, but slightly offensive.* | *Most offensive.* |
|---|---|---|
| Remittent miasmata | Ammonia | Sulphuretted hydrogen |
| Typhoid miasmata | Carburetted hydrogen | Phosphuretted hydrogen |
| Carbonic oxide | Cyanogen | Hydro-sulphate of ammonia |
| Carbonic acid | Sulpho-cyanogen | |

"Two methods naturally suggest themselves to the Chemist by which such dangerous and offensive compounds may be destroyed or prevented:

"First, To alter or otherwise form their component elements into new elements, which are neither dangerous, fœtid, nor offensive.

"Secondly, To fix certain of the elements so as to render the substances themselves no longer volatile, and consequently neither odorous nor offensive.

"First Method.—The principal re-agent heretofore made use of in the destruction of animal and vegetable miasmata and for the decomposition of the offensive compounds of hydrogen with phosphorus, sulphur, &c., is chlorine, the efficiency of which is dependent on its great affinity for hydrogen, with which it forms hydro-chloric, or, as it is commonly termed, muriatic acid. Unfortunately chlorine is itself an offensive, irritating, and corrosive substance, which will account for its not having been more extensively employed, although the cheap combination of chlorine and lime is applicable as a disinfecting agent, and might, it is believed, be advantageously employed.

"Second Method, by Fixation.—This method is chiefly applicable to the sulphuretted hydrogen, which may, as is well known, be decomposed by a great number of metallic salts. These salts consist of an acid in combination with the oxide of a metal. When sulphuretted hydrogen is passed through or added to a solution of one of the salts alluded to, its sulphur combines with the metal, forming an insoluble inodorous metallic sulphuret.

"The hydrogen combines with the oxygen of the metallic oxide, forming water, and the acid of the metallic salt is set free.



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"With regard to the particular process of M. Ledoyen, the experiments conducted by that gentleman at St. Thomas's Hospital led to the conclusion that his process was founded on the second method before alluded to; namely, that of the fixation of the sulphuretted hydrogen by a metallic salt, and that the actual metallic salt employed was ———*.

"This opinion has been frequently verified by Mr. Ledoyen himself, who, in the most candid manner, not only admitted the composition of his fluid to be such as is here stated, but also delivered a bottle of it to Dr. Leeson for analysis and further experiment.

"In regard to its efficacy as a disinfecting agent, the general result of these experiments establish the conclusion that the efficacy of this process is confined to the removal of the unpleasant odours due to sulphuretted hydrogen and hydro-sulphate of ammonia. As the sulphuretted hydrogen is the most abundant and most offensive of the various products of animal and vegetable decomposition, it is evident that although this process cannot remove the whole of the offensive odours, it is still well suited to effect a very important and extensive amelioration of the nuisance arising therefrom.

"In regard to the application of this liquid as a dressing to putrescent sores, there can be no doubt that it will be found useful, and that it possesses several advantages over those in common use, among others, that it is itself inodorous, that it corrects the fœtid exhalations arising from sores, and that it eliminates one of the most excellent applications to gangrenous sores yet known.

"In regard to the last and most important application of the disinfecting fluid to the removal of the fœtid and offensive odours arising from privies, cesspools, night-soil, &c., it will appear from what has been already stated, that so far as the offensive effluvia result from sulphuretted hydrogen and hydrosulphate of ammonia, this liquid will totally remove them.

"The odour resulting from phosphuretted hydrogen and from the other less offensive compounds; will still remain, but as these odours are neither so offensive nor so readily diffused to a distance as the sulphuretted hydrogen, a most important and beneficial improvement will be effected, particularly in the process of removal.

"It remains to consider what benefits or injuries may result from the employment of this liquid in respect to the subsequent use of the night-soil as manure.

Two important advantages will no doubt be attained: the one, the conversion of a prejudicial and poisonous ammoniacal salt; viz. the hydrosulphate of ammonia into an inodorous and highly fertilizing compound; viz., the nitrate of ammonia. The other advantage is, that by removing that poisonous and injurious compound, thereby saving the long and offensive exposure of the night-soil to the air, which would be otherwise necessary, and which is not only disagreeable, but, by the consequent loss resulting from the volatility of the ammoniacal salts, is also injurious.

On the other hand, there is one problematical objection to the extensive applications of this fluid as a manure to land; namely, that the small quantity of the metal employed may possibly, by its accumulation, be productive of ultimate mischief; but this requires further investigation and experiment.

"The above suggestions are made without any desire to detract from the merit due to Messrs. Ledoyen and Calvert, in having thus directed public attention to the use of chemical re-agents as a means of removing a very serious and dangerous impediment to the sanatory condition of towns.

This comprises the material substance of the whole of the evidence and correspondence, which occupies forty-six folio

* This omission occurs in the Report, as here printed.

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pages of the Parliamentary paper before us. It might have been summed up in a few words to the following effect:—

We have made numerous experiments with the view of determining the effects of the liquid, called *Ledoyen's Disinfecting Fluid*, which is represented to possess the properties,

Of disinfecting water-closets, night-soil, and all fœtid animal substances and gases;

Of disinfecting sailors suffering from fever, ships at sea and under quarantine, and patients suffering from infectious disorders and wounds;

Of disinfecting hospital-wards of miasma;

Of preserving dead bodies, or parts of the body, for the purposes of dissection; and finally

Of completely preventing the disease in potatoes.

The results of our experiments have shown, that the disinfecting fluid readily effects the decomposition of sulphuretted hydrogen when brought in contact with that gas; that it has no influence on phosphuretted hydrogen, carburetted hydrogen, and other noxious gases; and that it possesses little or no antiseptic properties, and is therefore inapplicable for the preservation of animal substances from undergoing decomposition. We have obtained no evidence to show the effect of the fluid in destroying or decomposing miasma, or preventing the spread of *infectious* disease, nor has any evidence been given or obtained, sufficient to prove that the fluid has any effect in *preventing the disease in potatoes.*

Having thus failed to verify the representations of the discoverers, on the most important points, we proceeded to have an analysis of the fluid made, and find that it consists merely of a solution of nitrate of lead, in the proportions of one drachm of the salt to a fluid ounce of water.*

Instead, however, of finding in the report, anything definite or conclusive, with reference to the points in question, it is, as a whole, diffuse and unsatisfactory, containing a great number of statements which are inconsistent with each other, and much irrelevant matter, which tends only to render the subject obscure, and to leave the reader in a state of uncertainty as to the real opinions of the writers.

What, we would ask, could have been the object of introducing into the report such matter as the following?

"*London Fever Hospital, King's Cross, 12th May*, 1847.

"Mr. Sankey, the resident medical officer of the Fever Hospital, will feel obliged by Mr. Davis sending five gallons of Mr. Ledoyen's disinfecting liquid."

* This statement of the composition of the fluid is not derived from the Report, but is the result of our own analysis.



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"*London Fever Hospital, 4th June*, 1847.

"Sir,—Will you oblige us by sending, at your earliest convenience, four gallons of Mr. Ledoyen's disinfecting fluid; also one gallon to Dr. Southwood Smith.

"I am, &c.,

"(Signed) H. H. O. SANKEY.

"*To Mr. Davis, Colonel Calvert's, Deptford.*"

"*London Fever Hospital, 10th June*, 1847.

"Sir,—Will you have the goodness to send to Mr. Davis, at Colonel Calvert's, Deptford, as we have unfortunately lost the address, for five gallons of your disinfecting liquid for the use of this hospital.

"I have, &c.,

"(Signed) F. BURTON, M.D.

"*To Monsr. Ledoyen, 72, Lombard-street.*"

No doubt Col. Calvert could say, most emphatically,—

"The happiest moment of my life (which has been a long one, near seventy years) will be when I see this fluid in general use; I only hope that all and every one that I have been engaged with in making this fluid known are satisfied that I have done it openly and honourably; it will add to the great pleasure I have in being favoured by their approbation.

"I have, &c.,

"(Signed) A. C. CALVERT."

Especially with the following testimony before him, from Dr. Carmichael, of Dublin:—

"As to its power of disinfecting contaminated places, I could not positively vouch, without an extended system of experiments fairly conducted; but I think that there is a strong presumption that it does possess this power, from the fact, that while it removes the most offensive odours, it leaves none in their place, which is the case with other purifying agents, such as the solutions of chloride of lime and soda and nitrous acid gas, *for the use of which, in ships of war, Dr. Carmichael Smith received, many years ago, from Parliament a reward of £5,000.*"

We think the "discoverers" of Ledoyen's fluid are as much entitled to reward as was Dr. Carmichael Smith, whose *panacea* has, we believe, never been used since the payment of the £5,000, and is now only heard of in consequence of its insertion, as if with the object of ridicule, in some foreign formularies, under the title of *Suffumigatio Smithii.*

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## ON THE STATE OF PHARMACY IN ENGLAND,

### AS COMPARED WITH THAT IN PRUSSIA AND GERMANY.

### BY PROFESSOR HEINRICH ROSE.

[WE have received the following paper from Professor Rose for publication in this Journal. It has already appeared in one of the German periodicals*.

The opinions of this philosopher, who is equally eminent as Professor of Pharmacy, and as the first Analytical Chemist in

* The *Medicinische Zeitung*, herausgegeben von dem Vereine für Heilkunde in Preussen, 1847, No. 16.

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