**The high death rate. An answer to the question "What is to be done?" : being the substance of a paper read before the Manchester and Salford Sanitary Association, March 19th, 1869 / by J. Conyers Morrell.**




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# THE HIGH DEATH RATE.

AN ANSWER TO THE QUESTION

## "WHAT IS TO BE DONE?"

*Being the Substance of a Paper read before the Manchester and Salford Sanitary Association,*

MARCH 19TH, 1869,

BY

J. CONYERS MORRELL,

OF LEYLAND, NEAR PRESTON.

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# The High Death-rate.

THE gradually increasing death-rate of our towns is producing the general cry that something must be done to improve their sanitary condition. Whilst many are uttering this cry, few set to work in good earnest to learn the real cause of the evil, with a view to arriving at the best remedy to be adopted. Many are doubtless deterred from pursuing the subject from the unsavoury character of some of its main features. The time however is past for the exercise of too much delicacy in the matter,—life and death, health and sickness, hang on the solution of the question: "*What is to be done?*"

Of that particular disease arising from evils capable of removal, it is estimated that in England alone 150,000 persons annually suffer; of this number 17,000 prove fatal victims to the disease. Thus we find that for one death we have 8·7 cases of sickness; hence are we not only losing the healthful and cheerful labor of this number, but are sowing broadcast the germs of a disease, which, unless checked in the bud, may so fix itself in the constitutional soil as to spread itself wider and wider, doing its direful work with increased vigour from generation to generation.

Not only may this sacrifice of human life and health be attributed to these evils, but a vast annual sum is lost to the country, as will hereafter be shewn, by the improper treatment and disposal of their original causes.

Various plans have been proposed to remedy the evils, which

have had their supporters. It is much to be hoped that each will be tried on a sufficiently large scale to test its efficacy. By whom and at whose expense this is to be done it is not for me to say. It is pretty certain, however, that if the local authorities do not quickly bestir themselves, the power will be taken out of their hands and exercised by others.

Whatever plan is adopted it must be one that will strike at the root of the evil. No half measure will suffice.

When we remember that an atmosphere to be healthy ought to provide for each individual an hourly supply of 2,000 cubic feet of pure air, we readily understand how the the absence, in our towns, of lungs, in the shape of large open squares, approached by wide main thoroughfares; the imperfect ventilation of the dwellings, and the overcrowding of their inmates, may be ranked as important contributories to the alarming state of things. But the impregnation of the atmosphere surrounding the dwellings with these poisonous elements, which are the results of *the improper collection and disposal of excrementitious and other domestic refuse*, may be regarded as the worst of all the bad features of the sanitary evil, and consequently as claiming the first efforts of the sanitary reformer.

The supply of pure air and pure water are indispensable to a healthy existence. Let us therefore see how, under the present system, they are contaminated, and how they can be preserved from such contamination.

Under the old ashpit, or open cesspool system, the whole of the refuse, viz., fœcal matter, domestic vegetable refuse, house slops, fire refuse (cinders and ashes), are from time to time collected together and accumulated in one mass; meanwhile the predisposition of most of these matters, when in combination, to decompose has possessed them, and once set in decomposition proceeds rapidly,—the cinders alone never changing their nature; but, although unchangeable themselves, possessing

and continually imbibing into their composition that which encourages the change in the constitution of their neighbouring matter, and so for this purpose robbing the atmosphere of its oxygen—the exhilarating element of pure air—giving in return those poisonous gases which mingle with the air surrounding the dwelling, thus conveying disease to its inmates. But, beyond this, the porous character of this open pit not only admits of the percolation of the offensive liquid to the neighbouring wells, where any exist, and so poisons the water to be drawn from them; but, also, especially where no wells exist for it to drain into, this liquid saturates the soil and there remains until lifted by evaporation, with its nauseous smells, into the already poisoned atmosphere.

This state of things became apparent to some, but so imperfectly understood by them that, in their laudable efforts, they seized upon the first thing that presented itself in the shape of a remedy and so became advocates of a system now known as the "*Water Closet System.*" It is supposed by it that the fœcal matter is conveyed with water as a carrier along the house drains until finally it enters the main sewer, and so carried with its contents to the sewer's outlet. As a convenience to the individual its apparent advantage cannot be denied, but a little reflection will serve to show that, besides its enormous demand upon the already too limited water supply of our towns,* how difficult and unnatural a process it must be to convey away solid matter by such channels as these, and how in this way these channels are held continually in danger of being choked; and how the sewers, originally constructed to convey liquids only, may become so many elongated cesspools, manufacturing gases similar to, if not more poisonous than, those which ema-

* This demand upon the water supply does not only arise from the actual water required to wash out the closet-pan, but also from the additional quantity required to flush the sewers.

nate from the old cesspool, and consequently how they may become distributors of these implements of sickness and death, as they pass in their course like so many veins through the town.

Dr. Syson in his "Review" of the recent discussion has sufficiently proved the fallacy of the water-closet system. He has shewn how danger exists from the water-closet connecting one house with another; how it opens a passage for sewer gases to enter the dwelling; how, from the length of pipes to be traversed, it is a physical impossibility for any reasonable quantity of water to convey the fœces to the main sewer; the effects of a severe frost upon the water-supply box and pipes; and, also, how experience has proved that a collection of fœcal matter is always found to be lodged at the point of connection of the water-closet pipe with the drain.*

A greater objection, however, still remains. No sooner has the water-closet system assumed any proportions than a general outcry is raised against the pollution of our streams and rivers, by the discharging of sewage matter into them. Here it may be observed that we shall be told that this pollution of our streams does not arise from sewage matter, but from the discharging of works' refuse into them. In reply we may ask—whilst urging the purification of such liquid at the works before so disposing of it—how it is that no such cry has been raised until these streams have been made the outlets for our sewage? Will not the answer be?—Because the refuse of works contains so small a per-centage of solids, and that in a uniformly diluted state. An answer that cannot be made as regards sewage.

Thus we see that the result of endeavouring to escape one difficulty has been to fall into other and still greater difficulties.

Irrigation has been, in a few instances, resorted to as a

* In many instances a disinfectant is kept and used in water-closets. A friend of mine, who nearly fell a victim to Typhoid Fever last year, attributes the illness to the emanations from a London water-closet.

means of disposal of the sewage matter. This, as yet, cannot claim to be a successful means of doing so, either in a remunerative point of view or in its power of cleansing* sewage

* Mr. Phillips, of the Museum of Economic Geology, states the following as the result of his analysis of the Edinburgh sewage, before and after irrigation:—

"I have here an analysis of six specimens of water taken at Edinburgh, the first taken at the mouth of a sewer, as the water issues; there was found in a gallon 224 grains of solid matter in suspension, 87 grains in solution; there was found in the second specimen 52 grains in suspension, and 87 grains in solution; in the third, there were 31 grains in suspension, and 89 grains in solution, showing that the water was getting stronger; there was more in solution after it was passed over two lands. The fourth specimen, 15 grains in suspension, and 82 grains in solution; the fifth experiment, 2½ grains in suspension, and 67 in solution; the sixth experiment, which was on very sharp sand, just at the sea shore, before the water was allowed to pass away, having passed over all the meadows, so that all the matter in suspension was nearly deposited, only two grains of matter in suspension, and 72 in solution."

On this point Mr. Pearce says:—

"Soils, too, like other bodies, are only capable of retaining a limited quantity of those elements which constitute the food of plants, and when this point of saturation is reached, it is absurd to expect any purification of sewage. It is utterly contrary to the nature of things that, for a course of years, a limited extent of land can extract from sewage the almost unlimited quantity of manurial matter it contains, in proportion to the area it passes over, and, therefore, the greater part simply departs in the liquid as it comes. The ground, too, at the same time, is overcharged, and literally poisoned by the excess of nutriment cast on it; it becomes, in fact a simple dunghill. Every agriculturist knows that an excess of manure is more injurious to healthy vegetation than a deficiency of it: and this, added to an excess of moisture, caused by too frequent application of sewage in wet as well as in dry weather, renders rye-grass—a coarse and unpalatable food at best—the only growth adapted to such treatment." "The sewage of Croydon seems to contain 32 grains of organic matter, soluble and insoluble, when it leaves the sewers; and, after the settling of the solid particles, 22 grains of organic soluble matter still remain."

Mr. Alderman Mechi's evidence, given before a select committee on sewage, in June, 1864, further confirms the above.

water. Whilst the advantage of occasionally irrigating certain land with water cannot be denied, abundant proofs exist of the exhaustion of the soil from a continuous or over-frequent application of liquid.

The following extract from a letter by Mr. Walker, on the Rugby experience, will suffice to prove this assertion :—

"Whether the returns afford compensation for this expense is a question on which different opinions are held; the general opinion being, I believe, unfavourable. My tenant, Mr. S. B. Congreve, informs me that the money expended in *working* the system alone would, if laid out in artificial manures, produce better results. This gentleman has watched, indeed conducted, the experiment from the first, and is certainly the most competent person to give an opinion upon it. His main objection to the sewage is its extreme dilution, which renders it in his opinion quite unfit for arable land; and on grass ground he considers its effects in the utmost degree evanescent, producing one crop, but leaving the land then rather exhausted than enriched, while each succeeding year larger and larger dressings are required to produce the same result."

So that even assuming that the conformation of the land surrounding our towns admits the running of our liquid refuse on to it, we shall find it only an inefficient mode of disposing of and utilising the sewers' contents, when charged with excrementitious refuse; and more especially are we convinced of this when we learn that, in all irrigation arrangements, engineers now find it necessary to make provision for precipitating the solid matter contained in the sewage before distributing it over the land. This preparation for precipitating the solids I would call special attention to, as it not only confirms the above but also forms an important argument in favour of the scheme to be brought before you in this paper.

These indisputable imperfections of the "*Water System*" appear to me sufficient to force us to the conclusion that it does not furnish an answer to the question, and accordingly to seek a remedy in what is known as the "*Dry System.*" This system

has its numerous advocates who, whilst uniting in the main, propose very different means for arriving at the end, as the following epitome of each will shew:—

Captain Lienur's system of removal by pneumatic force I will leave as disposed of by Dr. Syson, concluding with him that it is impracticable for many reasons.

The "Goux" system of collecting in barrels, internally lined with some foreign absorbent matter, besides being imperfect in a sanitary point of view, involves too much labour for it to command attention.

The Manchester scheme is simply the old cess-pool, or a large pit made water-tight and roofed over; into this all the solid and semi-solid refuse of the old cess-pool or ash-pit is thrown, with the cinders. A provision for the escape of the noxious gases generated from the accumulation of such matters being made in the shape of a large chimney, or what is called a ventilator, fixed against one of the house walls, which is also said to serve as a ventilator to the sewers. The liquid refuse of the house is provided for by a large receptacle placed in the yard and communicating with the sewer. This receptacle, and the roofing over of the pit, are to my mind the peculiar merits possessed by this plan.

Mr. Beech's plan provides a pit similar to the Manchester plan, except that the pit is limited to the area of the privy building, the seats and floor of which being on hinges are capable of being raised for removing the contents, which in reality are an accumulation of matters similar to those entrusted to the old cess-pool or ashpit. A ventilator is also provided for carrying off the offensive gases from this pit. This plan is a very compact one, but as will hereafter be seen is, along with the Manchester plan, an inefficient and comparatively wasteful one.

Both of the latter plans admit the danger of the generation of noxious gases from the accumulation they provide for—which it must be remembered includes the cinders—hence we have a right to conclude, on the evidence they themselves present, that these systems are also far from being perfect.

Any system to be perfect ought so to deal with the refuse matters as to arrest the formation of any poisonous vapours, and so prevent the necessity of any ventilator for carrying off such vapours. To my mind it is very doubtful whether even by a rarefied shaft such gases can be carried off without external pressure beyond that of the ordinary atmosphere; and, even if they can, it is obvious that the very means adopted to rarefy such a shaft, viz., heat, are such as to promote the decomposition of the refuse matters.

The Rev. Mr. Moule has, by his untiring energy, clearly established the fact that earth, when dried, is capable of acting as a deodoriser of the human excrement. Whilst his dry earth system is in a sanitary point of view more perfect than any of those already referred to, it cannot be looked upon otherwise than as utterly impracticable in large towns; on the one hand from the difficulty of finding the land from which to collect the earth; and on the other from the enormous cost that must be incurred by carting it into, and, as a consequence, out of the town again. This has been an unanswerable argument in its competition with water.

Such have hitherto been the competing plans. To the casual observer, in such a competition it must be confessed that, theoretically, the *water system* has had the best of it. Let us assume that this system is free from the objections already urged against it, that it is accordingly so perfect in its operations that the moment you lift a handle the basin is cleared of its contents, and these carried direct, without staying in their course, to the sewer's outlet, and there vanish without offence or injury to any

one or anything. We shall find ourselves then only partially relieved of the source from which danger arises—for our ashpits are still charged with the contents they previously held, *minus* only the human excrement; contents, including cinders, ashes, domestic vegetable refuse, house-slops, &c., an accumulation which, when gathered miscellaneously together, I contend is capable of producing almost, if not quite, as serious results as when excrementitious products form a portion of the mass. The water-closet advocates could therefore only claim to have very partially removed the sources of evil.

Now a little reflection will serve to convince us that nature has thrown into our laps all things that we require; our almost wilful ignorance prevents our using these things aright.

For, when we dissect these accumulated matters, we find that the very substances which in combination form such a source of evil, when separated become so many sources of good. The *fire refuse*, commonly known and spoken of as *ashes*, is composed of two-thirds of unconsumed fuel or carbon, and one-third of fine dust or ash, which is equal in deodorising power to dried *earth*, inasmuch as it is really the *earthy portion of the mine.* Of these two very distinct and in character very opposite substances the former, viz., the *carbon* or *cinders*, from a calculation based upon the lowest average consumption of fuel by the cottage occupier, representing a value of twopence per week—8s. 6d. per year—per five persons, or to the (200,000) cottage population of Manchester the annual sum of £17,000; the latter, viz., the *fine dust* or *earth*, representing an almost inappreciable value, not only if applied as a deodoriser of the human excrement, but also as a manure on its own merits, as will hereafter be shewn. As to the vegetable refuse, it is obvious to those who are providentially inclined that this ought to be collected and used as pig-food, and so made to represent its real value.

Having, for the sake of argument, assumed the *water system*

perfect, I will ask you now to concur with me as to the value I place upon the substances above-named. I will then further ask you to follow me whilst I endeavour to shew you how I propose to treat these in order to convert them into sources of value—sanitary and otherwise,—by such means promoting and encouraging a disposition for order and cleanliness in the habits of those to whom we, I venture to say, unjustly attribute a preference for wallowing in filth,—a charge which, if true, may with equal justice be said to have its origin in the neglect that has hitherto been displayed in the promotion of the comforts of these our labouring people.

Having proved the injurious character of domestic refuse when in combination, and the reverse when separated, and having now established the fact that *fine ash-dust* will deodorise, I venture to leave the following to explain the mode I propose to adopt for arriving at the great end to be achieved, thus:—

A privy of the ordinary kind is to be provided for receiving the excrementitious refuse with a *water-tight* pit, or a *water-tight* vessel, this latter easily removable. In lieu of the ordinary excrement and ash-pit, an apparatus forming a complete substitute for the latter is attached to the outside of one of the walls of the privy, at the side or rear as may be best suited. This apparatus is provided with an agitating screen of *fine net-work*,* for the separation of the fine ash from the cinders, which may either have its own cover or be covered by an overhanging roof to keep the cinders and

* In some few cases screens, composed of bars of iron, fixed at an incline, are used; a rake being required to pull the cinders and ashes down. They are defective, from the fact that the distance of the bars from each other does not procure a perfect separation of the dust from the cinders; they also soon lose their screening power, owing to the cinders fixing themselves between the bars, and so widening the space between some and jamming other bars together. The fine ash-dust cannot, therefore, by such a primitive arrangement be procured alone, nor can it be concentrated for sanitary uses.

ashes dry when thrown into it. By the opening of the privy-door, or as may be preferred by the attention of an assistant nuisance inspector or other official, the screener is brought into motion, when the cinders thoroughly cleansed of the ash fall into the yard for re-use; the ash being conveyed into the excrement receptacle, or, if considered desirable, into a storing measurer fixed in the wall. In the latter case the seat orifice will be covered by a lid working horizontally on a pivot. In the act of opening or of closing this lid, it measures out into the excrement receptacle a quantity of ash sufficient to deodorise the contents of the receptacle.

In this way are procured the thorough separation of the cinders and the ashes, the cinders as fuel representing the value already shewn to the occupier of each cottage-house,—the ash being then a fine powder efficiently fulfilling the work as a deodoriser for which it has been separated.

So we make use of that which nature appears to have provided on the premises for averting decomposition, and preventing the escape of noxious gases and the generation of animalculæ.

We reduce to a minimum the quantity of refuse to be removed by the scavenger,—the cinders being re-consumed until nothing but ash is left.

We greatly increase the value of the refuse to be removed as a manure, and make it available for immediate use or for storing until required.

I may here observe, as to the apparatus forming the substitute for the ash-pit, that from the frequent motion of the screener and consequently the continual disposal of the cinders and ashes it can never be overcharged, although only of small dimensions, and occupying a much smaller space than the ordinary ash-pit.

Should it occur that in summer-time—an emergency I do not apprehend—that there is not sufficient ash-dust to be had from the fire-refuse, it is easy to supplement it by throwing on to the screener some of the fine street-sweepings,—they are at hand, and will therefore incur little or no cost to apply; their removal being made in combination with excrement, in lieu of being made alone. In

case of unusual danger the ash may be further supplemented by a disinfectant being thrown upon the screener.

The solid domestic vegetable refuse may either be burned on the ordinary fire—a plan recommended by Dr. Whitmore and adopted by some—or it may be collected in a separate box in the yard and disposed of for use as pig-food, or it may be removed to the night-soil store-house and there allowed to rot and become part of the manure.

The liquid refuse—the liquid only—I propose to pass into and away by the sewer, and for this purpose place in the yard a receptacle for it similar to the one proposed in the Manchester scheme.

For buildings requiring conveniences in the higher stories I propose to substitute the water-closet by having a wide tube brought to the ground-fioor by which all refuse would be conveyed direct to a receiver plaeed there; or by a self-contained disinfectant closet, of good and inoffensive appearance containing a receptacle in the form of a movable vessel. The latter are especially applicable to hospitals and public buildings. Some prejudice would doubtless exist at first against them, but when the sanitary benefit was realised this prejudice would soon vanish.

As to removal: If the water-tight *pit* is adopted the removal of night-soil will take place as now, but of course much less frequently, and certainly with less offence from the equally absorbed and deodorised character of the mixture. If the vessels are used as receptacles they will doubtless require more frequent removal, but this is of little consequence as the work can only require to be done once. A circular vessel, two feet deep and one foot nine inches in diameter, will contain the ash and excrement refuse from one house, with five occupants, for twenty days. Removal once a week, or once each fortnight, for such a house will therefore be sufficiently frequent.

In lieu of carrying the whole night-soil to one depôt, I propose to divide, say, such a town as Manchester, into four, five, or six, portions; at the outside of each of these portions I would erect store-houses, internally provided with pits raised above the ground

floor, much similar to a hot-house forcing-pit; at one side of this I would have a road at its higher level for the convenience of the night-soil cart disposing of its load, and at its lower level a road for the farmer's cart to load from. To this depôt I would bring the street sweepings and cleansings of sewer shafts, as well as the night-soil, and maybe the vegetable refuse; all of which, under the treatment proposed, would form one mass of inoffensive matter, and would be so appreciated by the farmer as to command a ready sale.

As to sewers: It is now almost useless expressing my advocacy of a double system—one for rainfall, and the other below it for domestic liquid refuse; both so combined as to permit the occasional flushing of the latter by the contents of the former. The advantages of this system will be palpable to all when I state that the rainfall to house liquid is as *ten* to *six*.

I will let it suffice to say that I feel so convinced of the importance of pouring into sewers nothing but liquids, that I would carefully provide for the interception of the solids at the various grated inlets for the street surface-water. Several good plans have been proposed for this purpose, which do not appear to have received the attention they merit. By preference an evil is first allowed to make its appearance and then a remedy is sought, not for the prevention of this evil, but rather for the dealing with some of its consequences; and so we find it necessary, at an enormous cost, to use charcoal or some other means for oxidising our sewer gases.

Thus does the *Dry Ash Sanitary Scheme* I advocate claim to provide a more perfect answer than any yet given to the question—"*What is to be done?*"

Its remunerative powers I leave to be gathered from the following figures which give the comparative values of three systems as applied to Manchester, viz:—

1.—The Manchester Ash-pit.

2.—The Water-closet System.

3.—The Dry-ash Sanitary Scheme.

### 1.—Manchester Scheme.

| | | | |
|---|---|---|---|
| Cost of removing, say, 90,000 tons of refuse | £9,000 | 0 | 0 |
| Value of this refuse as now realized, say | 4,500 | 0 | 0 |
| Nett loss | £4,500 | 0 | 0 |

### 2.—Water System.

| | | | |
|---|---|---|---|
| Cost of removing Ash-pit contents, less excrement, say | £7,000 | 0 | 0 |
| Cost of water to remove excrement by water-closet—acknowledged estimate in Liverpool being five gallons per head per day = 1,500 gallons per year per head; or, for 300,000 people, 450,000,000 gallons per year, at, say, sixpence per 1,000 gallons | 11,250 | 0 | 0 |
| | £18,250 | 0 | 0 |
| Profit on this can be derived only from irrigation works, and this a very doubtful source of profit, at present nil | 0 | 0 | 0 |
| Total loss | £18,250 | 0 | 0 |

### 3.—Dry Ash Scheme.

| | | | |
|---|---|---|---|
| Cost of fine ash | 0 | 0 | 0 |
| Cost of removal of refuse—cinders being previously extracted say | £6,000 | 0 | 0 |
| Value of produce (being a good manure) calculated at the rate of 1s. 6d. per head, or 10s. per ton at repositary | £22,500 | 0 | 0 |
| Deduct cost of removal | 6,000 | 0 | 0 |
| Nett gain | £16,500 | 0 | 0 |

| | | | | |
|---|---|---|---|---|
| Value of Dry-ash Scheme over No. 1, thus, nett gain | 16,500 | 0 | 0 | |
| Add loss on No. 1 | 4,500 | 0 | 0 | |
| Nett gain to ratepayers | | | | £21,000 0 0 |

| | | | | |
|---|---|---|---|---|
| Value of Dry-ash Scheme over No. 2, thus, nett gain | 16,500 | 0 | 0 | |
| Add loss on No. 2 | 18,250 | 0 | 0 | |
| Nett gain to ratepayers | | | | £34,750 0 0 |

*The Total Annual Advantage in favour of the* Dry Ash Scheme: *thus—*

| | | | | |
|---|---|---|---|---|
| Over No. 1.—Nett gain to ratepayers | 21,000 | 0 | 0 | |
| Add fuel saved | 17,000 | 0 | 0 | |
| | | | | £38,000 0 0 |
| Over No. 2.—Nett gain to ratepayers | 34,750 | 0 | 0 | |
| Add fuel saved | 17,000 | 0 | 0 | |
| | | | | £51,750 0 0 |

The following extracts each add their testimony to the value of the products saved :—

Value of cinders, as shewn by following—

THE DUST BIN.—There is not one particle in the heap the scavenger removes from our houses that is not again put in circulation and profitably employed. No sooner is the dust conveyed to the yard of the contractor than it is attacked by what are called the "hill-women," who, sieve in hand, do mechanically what the *savant* does chemically in his laboratory—separate the mass, by a rude analysis, into its elements. The most valuable of these items are the waste pieces of coal, and what is termed the "breeze," or coal-dust and half-burnt ashes. The amount of waste that goes on in London households in this item of coal can hardly be conceived, unless the spectator sees the quantity that is daily rescued in these yards. It may be measured by the fact that, after selling the larger pieces to the poor, the refuse "breeze" is sufficient to bake the bricks that are rebuilding London. Most of the dust contractors are builders as well, and the breeze is used by them for the purpose of embedding the newly-made bricks into compact square stacks, which are seen every where in the suburbs of London. The breeze having been fired, the mass burns with a slow combustion, aided by the circulation of air, which is kept up by the method of stacking; and in the course of two or three weeks the London clay is converted into good building material. Thus our houses may be said to arise again from the refuse they have cast out; and not only are the bricks baked by their aid, but they are built in part with mortar made from the road scrapings, which is pounded granite, and combines very well with the lime and ashes of which the mortar is composed. Nay, even the compo with which some of the smaller houses are faced is largely adulterated with this particular refuse.—*Quarterly Review.*

Value of manure produced proved by—

UTILITY OF COAL ASH IN AGRICULTURE.—A correspondent of the *Paris Journal of Agriculture,* seeing the amount of ashes thrown away annually, and considering that Sir Humphrey Davy and other chemists have found by analysis that ashes contain many substances which contribute to vegetable life, such as sulphate of potash and lime, various compounds of acids and minerals, carbonate of lime, alumini and silici, has made some interesting experiments. In the autumn he filled three flower-pots with coal ashes, without any admixture with any other substance: in the one pot he sowed wheat, in the other oats, and in the third strawberry seeds. The pots were then placed in a garden bed, and left to themselves. In the month of March

the plants were in a very thriving condition, and in April were luxuriant. The wheat and oats ripened perfectly, the grains being large and heavy, and the straw, in the case of the wheat, fifty-five inches, and that of the oats forty-three inches high. The strawberry plants continued to flourish until October, when it was necessary to transplant them; and after being planted out on the open ground, they succeeded so well that the writer says they surpassed all other seedlings. The experiment is an interesting one.

On the exhaustion of guano supplies. Hence the necessity of resort by farmers to such manure as that to be obtained from a combination of fine ashes and human excrement—

Bad News for Farmers.—A correspondent of the *Times*, who has for some time been officially connected with the Chincha Islands, says that "the guano at Chincas is done, the few shiploads remaining requiring but a few weeks to complete the work calculated to have required fifteen or sixteen years to come." He asks what has become of the 7,200,000 tons officially stated to have been there a little over two years ago? He replies that he could a tale unfold which would show how miserably the persons who lent the Peruvian government money on the security of the guano deposit have been deluded. What will the farmers say? Fortunately for them our towns are now beginning to ask themselves if it would not have been more economical to use the manure close at hand, instead of throwing it away and importing other manure, at a great expense, from several thousand miles away. The exhaustion at the Chinchas is likely to hasten the solution of the town sewage problem.

I leave these facts and figures to speak for themselves, and will simply recapitulate by summing up the advantages of the Dry-Ash Sanitary Scheme, which I so warmly advocate, by briefly enumerating them as follows:—

1.—The procuring of a great sanitary object from the separation and use of materials already on the premises, and which, if not so treated, become sources of evil by their improper combination.

2.—The saving of cinders for re-consumption as fuel by the occupant of the house.

3.—The reduction in the cost of scavenging, by the reduction in the bulk of material to be removed.

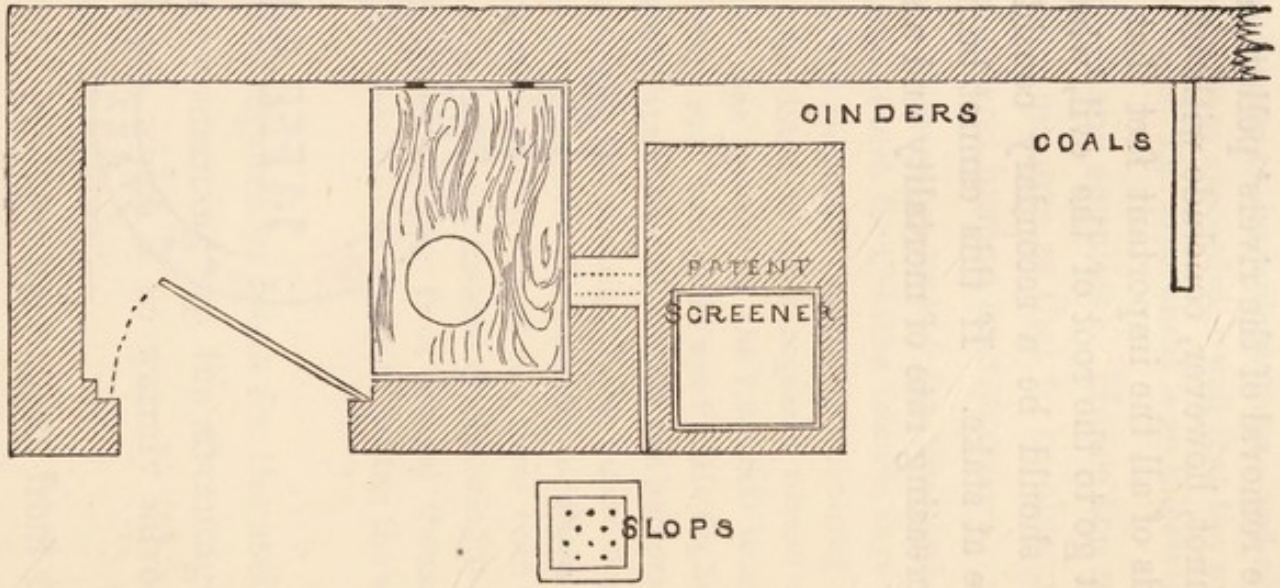
4.—The production of a valuable manure which, of itself, would soon repay the outlay of the first cost.

5.—The passing into the sewers of nothing but liquids,—hence the removal of the rivers' pollution difficulty.

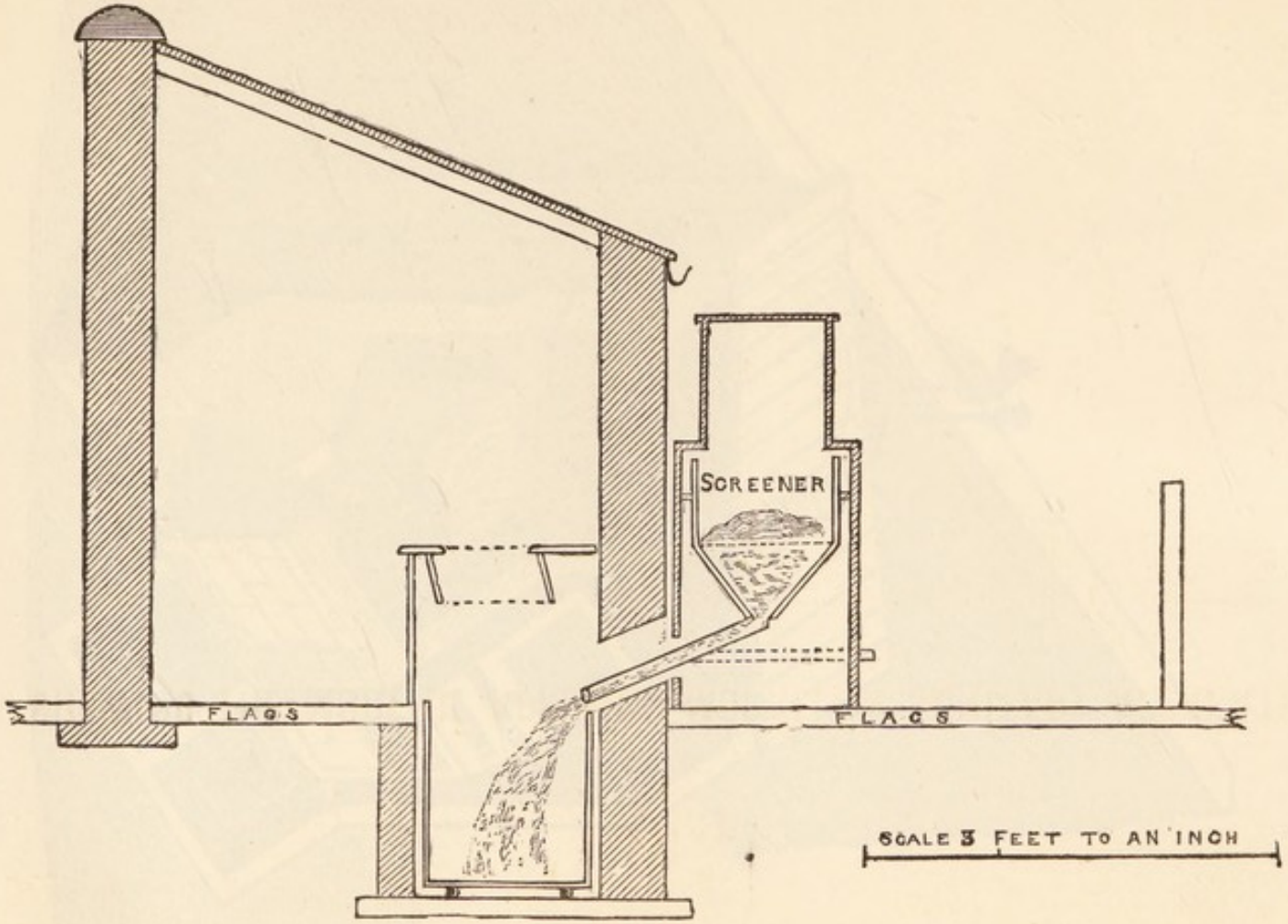
I cannot, however, conclude without again impressing upon the minds of all the important fact that any remedy to be perfect must go to the root of the evil, whatever may be the cost. £ s. d. should be a secondary consideration when life and death are at stake. If this cannot be, then let us be resigned to an increasing rate of mortality and a sickly population.

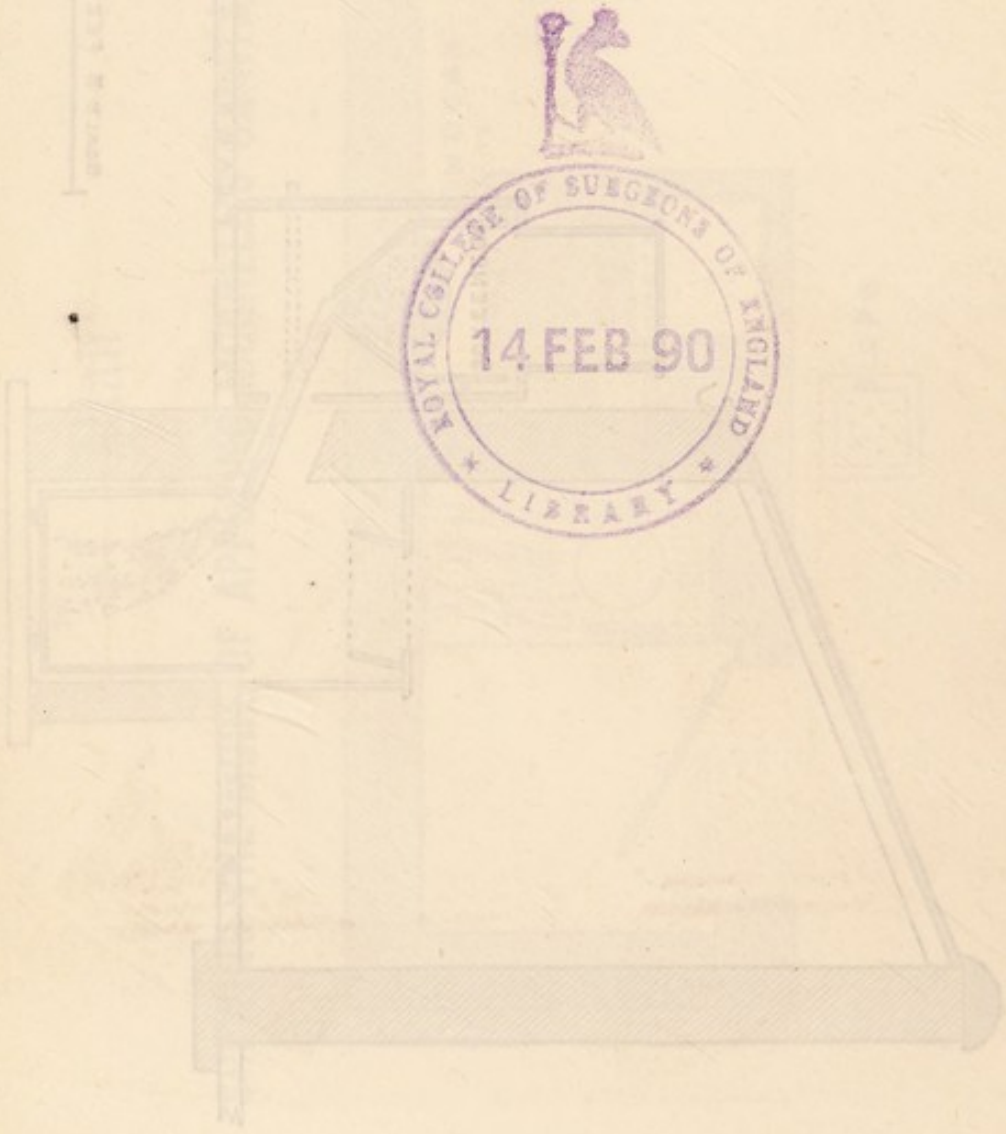
# Plan

## SHEWING THE MODE OF APPLYING MORRELL'S SANITARY APPARATUS.



# SECTION.





## ANOTHER MODE OF APPLYING THE APPARATUS.