

Suggested works on the Thames.

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SUGGESTED

WORKS ON THE THAMES.

by Dr. M. Hall

" THERE IS MUCH IN THE PLAN THAT IS UNQUESTIONABLY
GOOD, USEFUL, AND GRAND."



PRESENTED-BY
Dr. Marshall Hall.

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SUGGESTED WORKS ON THE THAMES.

THE writer's attention was first drawn to the subject of the following paragraphs by the consideration of the all-important SANITARY questions of the sewerage and of the drainage of London; he has been gradually led on to contemplate and suggest the more complicated project about to be described, which he submits to public opinion at a moment when the propositions for a *central* railroad station in the metropolis, for a new street in the City, and for a new bridge across the Thames, are under discussion.

The project combines the objects of such a station and of the sewerage and drainage, and especially of the purity of the river and of the atmosphere, in a plan for extensive works occupying a space within the borders of the Thames. To these objects, those of a new thoroughfare in the heart

of this great and crowded city, and of a new bridge across its river, are also added. And whilst these objects are accomplished, further projects for the *conveyance* of an abundant supply of water, and the *removal* of the sewage, and its *distribution* as manure over our fields, are laid before the reader.

Several events may, indeed, be regarded as impossible :

The *first*, that London, with its two millions and a half of inhabitants, be allowed to remain without an adequate supply of pure water ;

The *second*, that this great city be allowed to remain without a perfect system of sewerage and of drainage ;

The *third* and especially, that Southwark and Bermondsey and Rotherhithe, and other low districts, be allowed to continue entirely without *sub-surface drainage*, as distinguished from house-drainage, surface-drainage, and sewerage ;

The *fourth*, that the sewage of London and other great cities of England be permitted to *continue* to pollute its rivers and its atmosphere, to the detriment of the public health ;

The *fifth*, that this sewage *continue* to be lost to the soil of England as manure, to flow down the Thames to be replaced by an equivalent of guano—if, indeed, it

be an *equivalent*—and to be brought up the river again on board our ships, at a yearly cost of more than one million sterling ;

The *sixth*, that this Metropolis remain without a general station for its railways ;

The *seventh*, that sufficient thoroughfares be not provided through its centre and across its river.

It is the COMBINATION of these objects which characterizes the following suggestions. The aim of the writer is to *utilize* what we possess, and to *simplify* the whole question of sanitary, agricultural, and commercial arrangements in the utmost degree: the *same* railways, especially, which bring cattle and corn *from* our fields, may be made to *restore* them to the same fields in the altered form of sewage or manure, whilst the other objects which have been enumerated are also secured. These will now be very briefly discussed seriatim.

1.—*Of a Thames-Railway-Circuit.*

The *first* object which the writer has to suggest, is, not a *central*, but a *circuit station*, connected with all the railways of the metropolis. This it is proposed to accomplish by carrying two or more branches from the existing railroads, along tunnels or otherwise, to the banks of the

river; and then to connect these by means of a circuit-railway, erected on Doric (and surmounted by Corinthian?) columns WITHIN those banks, *above* high-water mark, on the north and on the south, and *across* the river on the east or west side of London bridge, and on the north or south side of Westminster bridge.

A railroad already nearly encircles London, joining or crossing the Blackwall, Eastern Counties, North Eastern, Great Northern, North Western, and Great Western railways. From any two or more of these *lines*, the *rail* may be continued to the *Thames-Circuit-Railway*, whilst they are made to communicate with each other. The southern railways are already brought nearly to the water's edge.

The objects, of course, are economy and utility. On this latter point, it may be observed that the *circuit-railway* may be viewed as CREATING *two* NEW THOROUGHFARES, and *two* NEW BRIDGES, in the heart of this great city, and as removing the carriages most pressed for speed—that is, the sources of the greatest inconveniences and impediments—from its too crowded streets; and this at a moment when directions have actually been given for estimates of the expense of making a new street, and a new bridge, at the sacrifice of immense properties :

for—"The City Improvement Commissioners have given the occupiers of the houses in St. Thomas Apostle, Bow Lane, Great and Little Distaff Lane, and the other thoroughfares lying between Queen Street, Cheapside, and the south side of St. Paul's Churchyard, notice that these dwellings will be required to come down forthwith, in order to complete *the new street from London Bridge to St. Paul's.*"* *This sacrifice need not be made.* The circuit-railroad will accomplish the end proposed.

The railway-circuit will be less expensive and more efficient than any central station. The space for its erection is free. The extended station will be more convenient to persons residing in different and distant parts of the metropolis; and there will be less crowding of carriages.

It is to be remembered that any *central* railroad must *add* to the crowding of thoroughfares already too crowded; an inconvenience which no new *street* can avert.

2.—*Of a Thames-Border-Cloaca.*

The *second* part of the writer's proposition is, that all the *sewers* of the metropolis be made to terminate in a

* See "*The Household Narrative*," vol. ii, p. 256.

cloaca placed *under* the level of low-water, and as much lower as may give the necessary *fall*, extending along each bank of the river; *e. g.* from Chelsea to Limehouse. These cloacæ must be of dimensions to receive all the more solid parts of the sewage of twenty hours. They may consist of cylinders of iron, divisible into compartments, so as to admit of being cleaned and repaired separately; for which purpose also they must be placed within sufficiently spacious mason-work, which may also constitute the *foundation* for the Thames-railway-circuit.

3.—*Of Sewage-Railroad-Carriages.*

The writer's *third* proposition is—to institute a *night-service* along the railways, to commence its operations after the departure of the evening mails; to empty the cloacæ of their more solid contents into covered waggons, and to carry these contents to parts of the kingdom more or less remote, their more solid matters having been allowed to subside in the cloacæ, whilst the sewage-water only is allowed to flow into the river. (See § 9.)

These waggons may be constructed in some degree on the model of those used to empty the cess-pools of Paris, of which a sketch is given by Mr. Rammell, in the Report of the Board of Health, App. No. IV, p. 10. They may be

taken along the railways to any desirable distances from the metropolis, and then along *offsets* from those railroads to any desirable spots to suit the convenience of the agriculturist, and even to the *fields* themselves. See Note, p. 23.

4.—*Of a Sub-surface Drainage.*

House-drainage and surface-drainage, and the sewerage, have abundantly occupied the attention of the Board of Health. There is one most important topic which has, I think, been overlooked : it is that of *sub-surface drainage*.

It is impossible, even on a cursory glimpse of Mr. Grainger's interesting map of the devastations produced by the late cholera in London, not to be struck with the dark and fatal region, comprising Southwark, Bermondsey, and Rotherhithe, in which the mortality was 164, 189 and 203 in 10,000 respectively, that of Hampstead being 8 only ! Is it possible that regulations for remedying such an evil should still be neglected ? And yet, in *one* particular, they are *entirely* neglected !

It is true that this district is partially supplied with *sewers*. These carry off the excreta of man and animals, and the *surface* filth. But this district was, and indeed is still, a marsh ; it is situated as low as high-water

mark; and yet, strange as the assertion may appear, it does not possess a single *drain*—a single *sub-surface* drain of its marshy *soil*!

The great question then arises—How is this extensive and populous district to be *drained*?—for until this be accomplished, the *very first step* towards its sanitary improvement is not taken, and it will present as DARK a spot on each future map of cholera as ever! That darkness is chiefly in proportion to the *lowness* of the district, that is, to the level of the sub-surface water.

A sub-surface *drain*, as distinguished from a sewer, consists in pipes so arranged as to allow the water of the soil to pass into them and be carried away. *Such a drain does not exist in London.* That is—London is not drained!—the marsh of Southwark, Bermondsey, Rotherhithe, is not drained! The higher districts do not require such drainage; their sewerage is sufficient; but the marshy districts, to which I have adverted, require sub-surface or land drainage as much as any land to be reclaimed from the marshes in England.

It may be a question, whether a new system of sub-surface *drains* must be established in the districts marked *black* in the cholera maps; or whether the present *sewers* may be replaced by pipes with a slit at their upper

surface, and so calculated to perform the double office of sewerage and land-drainage.

It is also impossible not to be deeply interested in the researches and illustrations relative to the sanitary condition of the districts north and south of the Thames, by Mr. Farr. They are perfectly admirable.

To the topics noticed by Mr. Farr, one other must be added. It is the *sub-surface* high and low water marks, observed in cellars, wells, and especially in borings made for the purpose. The result would, I think, yield numbers which would give the mortality from cholera directly, more nearly than those of the "elevation of the ground in feet above Trinity high-water mark," inversely. Thus, in the following table, in which e represents this elevation, Rotherhithe and Bermondsey are each on a level with high-water mark; the mortality from cholera, marked c , is 205 and 161, respectively, as given by Mr. Farr; and whilst the height, or rather depression, of Newington is 2 *below* high-water mark, the mortality from cholera is only 144. The distance from the river, and especially the sub-surface water-mark, may possibly give the explanation of these facts. The general mortality between 1838 and 1844 is denoted by the letter m .

	London.	North Side of the River.	South Side of the River.	Hampstead.	Rotherhithe.	Bermondsey.	Newington.
<i>e</i>	39	51	5	350	0	0	- 2
<i>c</i>	62	41	120	8	205	161	144
<i>m</i>	252	251	257	202	277	264	232

It is, in reality, the want of *drainage*, not merely the defect of *sewerage*, which renders Southwark and other *low* localities, so liable to the ravages of cholera. And yet, on *this* point, not a word has been said *distinctly*.

To the tidal sub-surface inundation must be added the *waste* water, the escaped sewage, &c.—the effect of imperfect house-drains, sewers, &c. The influence of all this on the well-water, on the cellars, on the lower kitchen; on the foundation brick-work; on property and on health, may be readily imagined.

An examination of this question experimentally, comparing the sewerage, the surface levels, the sub-surface soil, the height of water constant and tidal in borings, the hygrometer at various heights above the surface, &c. is imperative on those who have the direction of our sanitary arrangements.

5.—*Of a Tide-excluding Wall.*

Nor will mere drainage be sufficient: at each high tide the sub-surface soil is inundated by the waters of the river. This must be prevented; an object which may be accomplished by a WALL, having its foundation deep beneath the surface of the lower clay on which this soil and subjacent gravel repose. The mason-work of the cloaca or cloacæ may be made to serve this essential purpose. It may be designated the *Tide-excluding Wall*.

To construct this wall is *the essential preliminary step* towards draining the lower districts of London, whether we refer to sub-surface-, surface-, or house-drainage; and the writer is not aware that such a step has ever been contemplated!

6.—*On the Quantity of the Sewage.*

The quantity of cattle, of corn, of green vegetables, &c. introduced into London, must approximatively represent the quantity of the sewage. If that of the former be not too great to be introduced, that of the latter cannot be too great to be exported. And the number of vehicles bringing the former will afford an idea of the number of closed waggons which will be required for removing the latter.

The solid sewage of Paris is conveyed to two principal '*voiries*,' at Mountfaucon and Bondy. That of London may be conveyed to any number of *voiries*, at any distance from this metropolis, and thence to the fields of England, without the unnecessary change into *poudrette*.

7.—*Of Railroad Water-Pipes.*

Whatever may be the *new* sources of water brought to the metropolis, it may, henceforth, be conveyed along pipes, the level and foundation for which may be found ready constructed in those of the railroads themselves, which may thus become aqueducts as well as viaducts.

8.—*Of Sewage-water Pipes.*

Whatever the *quantity* of water brought into London, by the present or future arrangements, it may be removed by constructing return pipes in sufficient number and of sufficient size; and for these the *foundations* are also already prepared! For every '*artery*,' a corresponding larger '*vein*' (on account of rain, &c.) must be provided. The former may bring the supply from each nearest source; the latter must be discharged into reservoirs sufficiently remote and the most convenient to the agriculturist. The questions of the supply of water and of the

sewerage are thus combined, and may be consolidated;— results so emphatically recommended by the Board of Health; see *Report* for 1850; p. 323; &c. (See § 9.)

The difficulty, in this matter, is to dispose of the sewage-water, when reconveyed into the country. Fields irrigated by this fluid would become fertile beyond all imagination. But how is this to be accomplished? The quantity of this sewage-water is immense, being 45,000,000 of gallons per day (of which, indeed, two thirds, at present, are *waste*)—*Report of the Board of Health*; 1850; p. 127;—and the rain-fall. It may be impossible to dispose of it on our fields. It *must* then, I fear, after the subsidence of the solid matters, be still allowed to flow into the river! “Neither the scheme of Mr. Robert Stephenson, nor any one of the others, adverts to the means of carrying away the soil-water, as a subject which had at all entered into consideration.”—*Report, &c.* p. 270. (See § 9.)

If then, as I fear, the sewage-water must continue to be lost to agriculture, it may be allowed to flow from the surface of the contents of the cloacæ, by means of pipes arranged along and above them, at different points, especially low down the river, *e. g.* below Shadwell, and into the middle part of the river.

This flow being continual, no putrefactive fermentation will have taken place—a fact, the inference from which will occur to every one.

The more solid matters will gradually subside and accumulate at the lowest part of the cloacæ, whilst the more fluid are continually flowing into the river.

In this manner, although *all* that is desirable is *not* accomplished, yet the plan is defective only by a comparatively very small quantity; and this defect may one day be removed by some happy suggestion.

9.—*Separation of Excreta from Drainage.*

This difficulty remained, until it was removed as the writer believes entirely, by the suggestion of his son. This suggestion is—‘to keep the excreta entirely separate from the drainage, causing them to flow from the water-closets through distinct pipes to the cloacæ, whilst forty millions of the forty-five millions of gallons of water introduced into London daily, are allowed to flow separately into the river; in a word, to keep the water-closet system and the sink-system, the sewage and the drainage, *distinct*.’

This appears, indeed, to be the one great, essential and effectual principle of the sewerage!

10.—*Of a Thames Carriage-Road.*

One thing still remains to be suggested. It is the establishment of a *carriage-road* within the Thames railway-circuit, by adding to the width of the structure on which the proposed railroad-circuit is placed, towards the middle part of the river, and forming a *road* for light carriages. Whilst the railroad passes *under* the side arch of each bridge, this street-road may rise and join the level of its upper surface, effecting at once a transit across it, and a communication with the streets leading to it and from it! This arrangement will apply to Waterloo, Blackfriars, and Southwark bridges, if the railroad pass on the west side of London and the north side of Westminster bridges; or the carriage-road may join, without crossing, London and Westminster bridges, if the railroad pass along their eastern and southern sides respectively, which is, of course, most desirable.

This is, however, no essential part of the writer's plan. But it is one worthy of the most serious consideration.

A space may be left between the otherwise connected railroad and carriage-road for the admission of light; &c.

11.—*Of a Consolidated Work and Fund.*

In the effectual accomplishment of these objects, *travelling*, and especially *traffic*, on and over the river, will be induced to an almost incredible extent, and create a revenue which alone would pay interest on the capital employed, and gradually refund, if desirable, that capital itself. To this revenue, that accruing from the manure, and now expended in guano, will be added, and the outlay may be refunded in a very moderate space of time, after which the profits, like the advantages, will be immense.

Or, the whole arrangements of water supply, of sewerage and drainage, of manure, of travelling, and of traffic, may form one unique consolidated work and FUND and constitute a secure investment of property, which will be of great advantage to the public. At the same time, an efficient supply of water to our cities and of manure to our fields; the purity of our atmosphere and of our river; the sub-surface drainage of every low district; and the conveniences of an extended railroad station in London and of new thoroughfares, will all be secured.

12.—*General Observations.*

The great *railway-circuit* will connect all the railways and distant parts of the metropolis for travelling and for traffic, far more effectually than *any central terminus*. The *cloacæ* will receive the sewage and preserve both the atmosphere and the river pure and free from filth and pestilence. The night-service will not only convey such offensive matters away, but lead to their being spread as manure over our fields, augmenting their fertility and producing corn and herbage!—preserving from waste a vast source of national wealth, the extent of which may be learnt from the works of Liebig*.

This manifold object will be accomplished, too, without augmented expense: at the station itself, not a house need be removed; the outlay and the cost of repairs will, as has been stated, be repaid by the conveyance of passengers and of merchandize, and by the value of the manure to our agriculturists.

There need be no nuisance even: the *cloacæ* may be emptied into *close* waggons, by means of *close* pumps and pipes (worked by the same steam-engines which

* See Note, p. 23.

move the trains?) between the times of the *down-* and the *up-*mail trains—consequently during the night.

The proceedings on the Thames and its banks need not be interrupted, nor need any property or present advantage be sacrificed. The *rail-circuit* will be constructed *above*, the cloacæ *below*, the surface of the water, and both sufficiently *within* those banks. The former may constitute a beautiful COLONNADE and *healthy* promenade, making our river peerless in the world. The latter may present a specimen of the useful in Architecture not to be found elsewhere,—not equalled by the famed cloaca maxima of Imperial Rome.

The preceding pages have been submitted to one of our first engineers, and I have been favoured by a note containing the following paragraph :

“ I think there is much in the plan that is unquestionably good, useful, and grand.”

But the same high authority suggests the difficulty of carrying railways, roads, or quays along the banks of the river, on account of the vast interests involved.

It must be repeated—that it is not ‘*along*’ the banks, but entirely WITHIN the banks of the river, that

it is proposed to erect the *railway-circuit*, and to place the great cloacæ; and that not a house, or wharf, or interest of any kind, need be sacrificed; that the value of all this property and of all these interests will, on the contrary, be *augmented* in proportion to the increased facility of transport, a collateral result of the plan of great value. The railroad circuit may be erected so much *within* the banks of the Thames, as to admit of the action of *cranes*; &c., and so much *above* high water, as to admit of the passing of *barges*; &c.

The writer has caused several inquiries to be made of persons having property or works on the banks of the river. It has been uniformly stated that the project which has been detailed would add to the value of the former and facilitate the operations of the latter. It may be carried out, indeed, with especial attention to these as collateral objects, a survey of the banks of the Thames being first made.

13.—*Appeal to Government.*

Finally, the objects are so important in a hygienic, an agricultural, and a commercial point of view, that the author trusts they will excite due consideration, and that promptly. That the plan—the *only* one which has been

proposed effectually to *remove* and *apply* the sewage of London—must ultimately be carried out, unless some other and better one can be devised, is inevitable. The writer concludes by earnestly calling the prompt attention of GOVERNMENT to the vast and important subject.

14.—*Of a Society of State Medicine.*

One proposition remains to be made. It is that of a Society for the investigation of the subjects of the foregoing pages, in their relation to the health of our cities, our rural districts, our army and our navy, to be designated *The Society of State Medicine.*

Of this society, the writer begs to propose James Ranald Martin, Esq. F.R.S., &c. the author of the first great Sanitary Movement, the first Government System of Sanitary Regulation for British India and its Dependencies to the Eastward, and originator of the Sanitary Improvements of Calcutta, as its first President.

NOTES.

“ Thousands of hundred weights of phosphates flow annually into the sea with the Thames, and with other of the British rivers.

“ Thousands of hundred weights of the same materials, arising from the sea, annually flow back again into that land in the form of guano*.”

“ If a rich and cheap source of phosphate of lime and the alkaline phosphates were opened to England, there can be no question that THE IMPORTATION OF FOREIGN CORN MIGHT BE ALTOGETHER DISPENSED WITH after a short time.” !!

“ According to these premises, it cannot be disputed that the annual expence of Great Britain for the importation of bones and guano IS EQUIVALENT TO A DUTY ON CORN†.”

“ To restore the disturbed equilibrium of constitution to the soil, —to fertilize her fields,—England requires an enormous supply of animal excreta‡.”

The author does not venture to enter into any details. But he may remark, that both the original cost of guano, and that of its transport to this country *and* to its *fields*, will be saved. A part of the sewage may be floated, in closed cloacæ or barges, up, and a still greater part down, the river, to supply the adjacent counties of Middlesex and Surrey, Essex and Kent, with manure.

* *Chemistry in its Application to Agriculture and Physiology* ; by J. Liebig, M.D. &c. Ed. 3, 1847 ; p. 165.

† In 1849, it was £504,262 ; in 1850, £707,632 ; and already, on November 5, 1851, it amounted to £1,175,272, for guano alone !

‡ *Familiar Letters on Chemistry*, by J. von Liebig ; Ed. 3, 1851 ; p. 522—524.

These and many other questions will require to be considered, if this *suggestion* should become a *project*. The plan must be generalized over the British Empire.

In Paris, perhaps a single cloaca may be sufficient. It may constitute one grand cess-pool, instead of the many, and preserve the individual dwellings themselves from such nuisance. It may be emptied during each night into the close waggons now in use, and these may be taken and placed on trucks on the existing railways, and conveyed to any desirable distance.

The sewage-water alone may, as in London, be allowed to flow into the river. (See § 9, p. 16.)

The nuisance of the cess-pools and of the *voiries* will be removed from the metropolis and its vicinity; the sewage-waggons may be employed to carry the manure wherever it may be required.

The sewage-waggons may even be taken to the very fields themselves, both in England and elsewhere, not by the farmer, but by distinct sewage-officers, according to well-devised arrangements; a scheme, the value of which will be well understood by those who are acquainted with the intellectual inertia of some of our country people.

∴ It is necessary to state that § 9, although introduced at p. 16, is a *Postscript*. The writer has left § 8 and other paragraphs unaltered, in order that the value of the suggestion may be rendered the more apparent.