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PRACTICAL SUGGESTIONS

FOR

RELIEVING THE OVER-CROWDED THOROUGHFARES OF LONDON; SECURING IMPROVED MEANS OF LOCOMOTION; DIVERTING THE SEWAGE FROM THE THAMES, AND APPROPRIATING IT TO AGRICULTURAL USE;

WITH

ESTIMATE OF COST AND PROBABLE REVENUE;

ALSO

MAP, PLANS, AND VIEWS.

IN

A LETTER

ADDRESSED TO

SIR BENJAMIN HALL, BART.,

CHIEF COMMISSIONER TO THE BOARD OF WORKS.

BY

JOSEPH MITCHELL, F.R.S.E., F.G.S.,

Civil Engineer, and Member of the Institution of Civil Engineers.

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PRACTICAL SUGGESTIONS.

TO SIR BENJAMIN HALL, BART.

SIR,

The Title Page prefixed to this Letter may, at first sight, appear startling, and to promise over-much. May I claim your patient attention for a brief period, and I think I shall be enabled to show to you that all, and more than my title page proposes, may without serious difficulty be accomplished; and that these great and necessary improvements will return a good interest on the sum expended, if regarded in the light of a permanent investment, or (if the profits be accumulated), will yield a fund gradually to liquidate the expenditure incurred.

I introduce my plan to your notice with no personal object, beyond a desire to aid in the accomplishment of necessary improvements, by such practical suggestions as have occurred to my mind, as a Civil Engineer, occasionally drawn by my professional pursuits to this vast metropolis, and led thereby to reflect on the great questions which are now being agitated, in regard to its improvement and architectural adornment, increased facilities in its means of transit, and the establishment of a system of efficient drainage.

Let me first draw your attention to the imperative and growing necessity for a better means of transit from East to West, in order to save the time now wasted in toiling from one end of London to the other, and to relieve the present over-crowded state of the great arteries of thoroughfare; secondly, to an object almost as

desirable—the improvement and beautifying of the Metropolis by one magnificent street, which will at once accomplish the first great object desired, and form one grand vista, in almost a straight line, from Kensington Gardens Palace to the extreme East of London, passing through some of our finest squares, making London vie with Paris, and Londoners proud of this city, while at the same time it will make the Parks accessible to all, and, together with the Metropolitan Railway scheme, which has already received the sanction of Parliament, will give easy and rapid access to every Railway Terminus in London. Thirdly, with these measures I propose to combine a plan, which will greatly facilitate the drainage of London, without materially interfering with the existing plans, and will convert the sewage into a source of great and increasing profit.

That these improvements are imperatively called for, is apparent from the gigantic strides at which this great Metropolis increases; indeed such is the progress of building, that the London of the present day can scarcely be recognised as that which existed a quarter of a century since; and the growing facilities of locomotion, both by land and water, add to the evil, by daily pouring in thousands of additional inhabitants.

The inconvenience arising from this extraordinary increase both of size and population, is rapidly assuming more formidable proportions, and remedies must speedily be provided of a bolder and more decided character than have hitherto been attempted. The Railways, no doubt, afford the same facilities for getting out of London as for getting into it; but the privilege of locomotion is practically limited to the comparatively few possessing wealth and leisure. To the great mass of the citizens of London this advantage cannot be said to apply. They are doomed to the constant evil of a close and impure atmosphere, from which there is no escape; to the poor man there is no adequate means of communication between the centre and the extremities of the great area which London now occupies.

At the present time no less than 60,000 acres are covered by buildings and streets, and the population in 25 years has increased 51 per cent. In 1831 it was 1,654,994, in 1841, 1,948,417, and in 1851, 2,362,236, so that in the same ratio we may safely calculate that London now contains 2,600,000 inhabitants, and in

twenty years hence its population will be at least 3,372,000. Yet with all this enormous increase of population, and the consequent multiplication of every species of carriage for their conveyance, little comparatively has been done during the last 20 years to improve the thoroughfares, or accommodate them to the requirements of so great a change. The leading arteries of communication, Oxford Street, Piccadilly, and the Strand, remain very much the same, and hence the toil and struggle of a mid-day passage from West to East.

Apart from the disadvantage and great loss sustained by people in business, from the choking up of the thoroughfares of the Metropolis, the present condition of things interposes a serious bar to the ordinary intercourse of friend with friend; and the jaded and worn-out appearance of the holiday crowds who have toiled to the Parks, with the purpose of breathing for a brief space a purer atmosphere, show that, even in the matter of health and recreation, the subject demands earnest and immediate attention.

Last year it was proposed that our National Gallery should be removed from the smoke and dust of London to Kensington Gore, and one of the most formidable objections to the proposed site was its great distance from the homes of the people whose tastes it was intended to gratify and improve.

These facts are convincing evidence of the imperative necessity for the improvement of the great thoroughfares of London, on a principle adapted to the wants of the present day, and commensurate with the other elements of progress throughout this great country.

The first step I would recommend towards the accomplishment of this object would be to run a great street from the West-end right through the centre of London. If on the map a line be drawn from Kensington Palace to Shoreditch Station, it bisects London very favourably for this purpose. It will give a vast street of fully four miles in length in almost a straight line. This street, with the exception of the North side of Grosvenor Street, would pass for the greater part of its length through property of comparatively inferior value, and would interfere with no public buildings of importance. As befitting the great artery of so vast

a City, it should be of proportionate dimensions. There should be 70 feet of carriage-way, with footpaths of 24 feet on each side. Regent Street is from 50 to 54 feet, with footways of 18 and 21 feet.

This line is the more advantageous, as it would pass by the side, and cross the enclosures of several squares which, while they added to the airiness, beauty, and grandeur of this new route, would, some of them being now of little value, be peculiarly suitable as sites for public buildings, thereby giving additional beauty to this great central thoroughfare.

The proposed line of roadway, after passing from Kensington Palace, by a bridge over the Serpentine, would traverse Hyde Park to Grosvenor Gate, and striking through the North side of Upper Grosvenor Street, would pass through the South side of Grosvenor Square, from which it would receive, and to which it would add, magnificence. It would then run along the North side of Grosvenor Street, crossing George Street, near Hanover Square, and close to the church, which would thus be thrown into prominence. The line would then clear away some inferior buildings, and cross Regent Street about its centre, at the end of Canning Street. Passing through a mass of inferior and dirty little back streets, it would reach the South side of Soho Square; and thence pass close to St. Giles' Church, and clearing an ornamental and open space through the densely crowded district of by-alleys and unimprovable streets of St. Giles, now the disgrace of the heart of London, would traverse and throw open the North side of the fine square of Lincoln's Inn Fields, which it would immensely improve, while the public buildings on the South side of this square, and the magnificent New Hall of Lincoln's Inn would be seen to great advantage, and add their quota to the grandeur of this splendid street.

The line would then proceed from the North side of Lincoln's Inn, near the upper part of Chancery Lane, which it would cross, and after clearing away a mass of inferior and tumble-down buildings, would cross Holborn in a slanting direction just below Gray's Inn Lane, again affording a magnificent vista to that which is now one of the ugliest parts of London. It would then cross the new street, Victoria Street, not yet built,

by a viaduct,* establishing in its progress a fine open magnificent street through a district, now the lowest and vilest and most unhealthy in London, to the North side of Smithfield Market. Passing on, it would then cross the open area of the Artillery Ground, near the North-west corner of Finsbury Square, and terminate in front of the Eastern Counties Railway Station, at Shoreditch. Thus would be opened out one immense vista, four miles in length, in a direct line from West to East, unequalled by any city in the world for magnificence, which would clear away a large mass of low and wretched buildings towards the East end of the line, now of comparatively little value, and the nurseries of disease and crime, and give a comparatively pure air to localities which must always, from their situation, be crowded by a labouring population.

After passing the viaduct at the Fleet, a branch line or street should be constructed in the form of a crescent to the Post Office. A line in this direction would throw open Smithfield, which would be rendered valuable for building purposes, and add to the airiness of this part of the City. This branch would not interfere with the valuable property in the heart of the City, while it would approach to within half a mile of the Bank, and afford, in connexion with the main line already described, a direct access between the City and the West-end.

The formation of these streets would afford ample scope for the architectural genius of the country. Every variety of style and construction might be introduced, and one feature, with peculiar advantage, namely, footways covered with glass, so that passengers would find shelter in all states of the weather, without depriving the shops of light. In fact the footways might form a continuous Crystal Palace, where the people might lounge and enjoy the splendid displays of our unrivalled shops.

Among the new buildings in this street, hotels might be erected at three or more convenient points, somewhat similar to the Hotel du Louvre in Paris, or those at Paddington and King's

* It is a question for future consideration, whether Victoria Street and the hollow through which it now runs, might not be elevated by the excavations from the new Street and Railway. If this were done, the *Times* would no longer have to say it was a waste in the heart of London.

Cross, where strangers might enjoy, at moderate cost, every luxury and comfort which London can afford, in houses constructed according to the best designs, and decorated in the richest style of modern art.

The roadway from Grosvenor Gate to Kensington Palace, through Hyde Park, should be broad and spacious, with rows of trees and side walks looking towards the Palace, and as a termination of the vista to the West; and on or near the site of the present Palace, but more elevated, a new Palace might be erected worthy of the country and of the people.

Part of this Palace should form the new repository for the national collections of works of art, similar to the Louvre in Paris. The other part might be appropriated, if desired, as a more airy and suitable residence for our beloved Queen. The proposed plan would accomplish the object which has so long baffled us, of providing a fitting receptacle for the National Pictures, in a pure atmosphere, which will not deteriorate or injure them, and in light, airy galleries, where their beauties may be studied with satisfaction and delight. Coupled with the charming landscape of Kensington Gardens, with its fine old trees, there will thus be provided, in the Metropolis, a National Gallery, such as even Paris with its Louvre, and the beauties of its adjacent Champs Elysées, cannot surpass.

But it will be said that the same objection, in point of distance, applies to this as a repository for the fine arts as to Kensington Gore, and the objection would hold good were it not that a remedy is provided in the new means of locomotion which form part of this plan.

It is proposed simultaneously with the construction of this great street and roadway, that a space shall be set apart and excavated for a line of railway immediately behind and parallel to the buildings on the North side, sunk to such a depth as to cause no interruption to the traffic along the cross streets to be intersected. Should an insuperable objection exist to running the Railway parallel to the great road through the Park, it might diverge at Grosvenor Gate towards the Marble Arch, and, with a curve, passing under the road by a short tunnel at this point, skirt close under the Park wall and railings, at the northern side of the Park, and terminate at or near Kensington Garden Gate on

the Bayswater Road. The Railway, which would occupy only 40 to 50 feet of space, would be partially or wholly sunk, and thus be screened from observation, from the road by the Park wall and railings, and from the Park by trees and shrubs, which mght be planted so as altogether to keep it out of sight. It would, besides, pass along a part of the Park little frequented, and interfere in no manner whatever with its beautiful drives and walks.

There should be four lines of rails provided from Grosvenor gate towards the East, two for intermediate communication, and two for passenger and commercial traffic with the various parts of the City, and the several railways whose termini are in the outskirts of London.

This space for the railways, where not intersected by the cross streets, would be one-half arched over. On this half buildings would be erected, and the remainder left open for air and light.

The first two lines of rails, as already stated, should be for passengers only, travelling from one part of the City to the other, between the Post-office, Shoreditch, and Kensington; and these lines would, to a great degree, supersede the present tedious and unsatisfactory mode of communication by omnibus from West to East; and would, at the same time, relieve the existing thoroughfares from their present overcrowded state, arising from the vast and increasing number of these public vehicles.

By means of these railways, passengers could be conveyed from one extremity of London to the other in twenty minutes, including some six or eight stoppages at different points throughout the line. This distance is gone over, in that time, every day on the Blackwall Railway with great ease; and with the improvements which might be introduced on the new route, the passage might be accomplished with still greater facility. Those who wished to visit the Palace and Picture Galleries, would alight from the railway, at the Bridge, or at Kensington Garden Gate, and would arrive there with facility after a pleasant walk through Kensington Gardens. Those who wished to drive there would pass down the New magnificent Street and Roadway, across the Park, and alight close to the verge of the centre of the Gardens, or at the gates of the Palace, as might be hereafter determined.

I know it will be said that there are many and insuperable

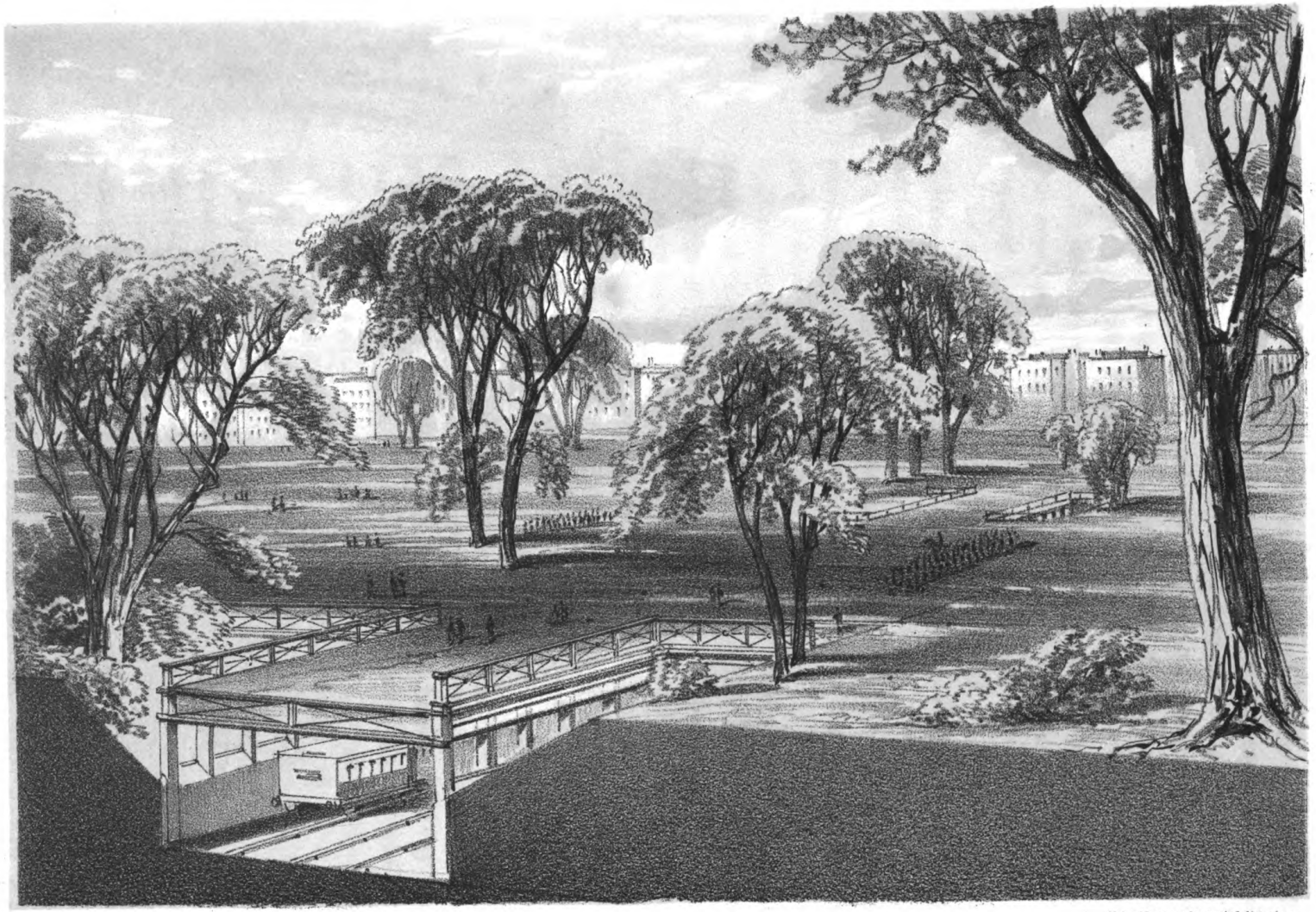
objections to the proposal for entering Hyde Park with a Railway. Many will look upon it as a kind of desecration, and conjure up every possible kind of evil result from such a modern innovation. It is proposed, however, so to construct it that it shall in no way whatever interfere with the appearance of the park or with the pleasure and recreation of those who frequent it. It will, as I have said, be either wholly or partially sunk and covered and screened with shrubbery, with foot bridges over it where required

The railway, if constructed properly, would be invisible from Kensington Gardens and from the Palace, and from almost every part of the Park.

The terminus might be low, ornamental, partly of glass, and passengers might emerge from the railway to the gardens, as is now done at the Crystal Palace.

It is needless to enlarge on the great accommodation such a means of transit would be to the vast and increasing population dwelling on either side of Hyde Park. These are the two greatest outlets for the wealthier classes of London, whose avocations compel them every day to visit Westminster or the City, whose time is of great value, and who are now driven to resort to slow omnibus and cab accommodation. I need not add also, that the value of property in these neighbourhoods would be immensely increased were this plan carried out.

But it is not only those engaged in business, or professional pursuits, whose time is of value, who will be benefited by the proposed improvement. The advantage will extend to every class, and to the individual members of every family. For one moment let us trace the progress of the proposed railway. Commencing at the branch station at or near Kensington Garden Gate, it is proposed that the first stopping station shall be at or near Grosvenor Gate, accommodating all who reside near Grosvenor Square, or those who wish to make calls in that neighbourhood. The next station will be at or near St. George's Church, in George's Street, Hanover Square, accommodating those who wish to get to the centre of Regent Street or Oxford Street, or who may have occasion to visit the shops there. The next stopping station will be near St. Giles' Church; near this station the



Joseph Mitchell. F.R.S.E. Civil Engineer.

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SECTIONAL SKETCH

SHEWING PROPOSED RAILWAY THROUGH HYDE PARK

two greatest arteries of thoroughfare converge at the corner of Tottenham Court Road and Oxford Street, and from near this station it is proposed that a branch shall pass to Waterloo Bridge for the South Western Railway Station. The next station will be near the top of Chancery Lane, accommodating those who have business in the neighbourhood of Lincoln's Inn, or the Law Courts. The next station will be near Smithfield Market; and the branch proposed to be made to the Post Office will accommodate those who have business in the City, or near the Bank. The next station will be at the North West corner of Finsbury Square, which is a densely populated district; and the last station will be at the terminus of the Eastern Counties Railway, in Shoreditch; in all, six stopping stations. It is almost needless to enlarge on the immense public benefit which a rapid, easy, and comfortable means of communication, to and fro, at all these various stations, would be to the immense population of London. Consider for a moment what a journey from Kensington Garden Gate to the Bank now is! It means an hour consumed in a dirty, uncomfortable, close omnibus, and a journey to a lady so disagreeable as to be almost impossible; and taken in a cab, it occupies, at the least, three-quarters of an hour of time, and costs the passenger 3s. Of course, those who have carriages of their own do not fare so badly; but how few are these compared with the mass of the community; and, even to those who have carriages, a three miles' drive along a magnificent wide street, without obstruction, in place of a five miles' drive along crowded, narrow, tortuous, dirty thoroughfares, continually blocked up with traffic, would be no slight advantage.

Let it not be supposed that the railway, in its passage through the squares and streets, would be a disfiguring object. It is proposed, where it passes through the squares, to build a terrace walk over it, supported by open arches, made ornamental, or by pillars; thus giving those in the carriages air and light; whilst the raised terraces, it is proposed, should be converted into promenades, decorated with shrubs and flowers, and rendered at the same time attractive for exercise, and ornamental to the squares in which they were built.

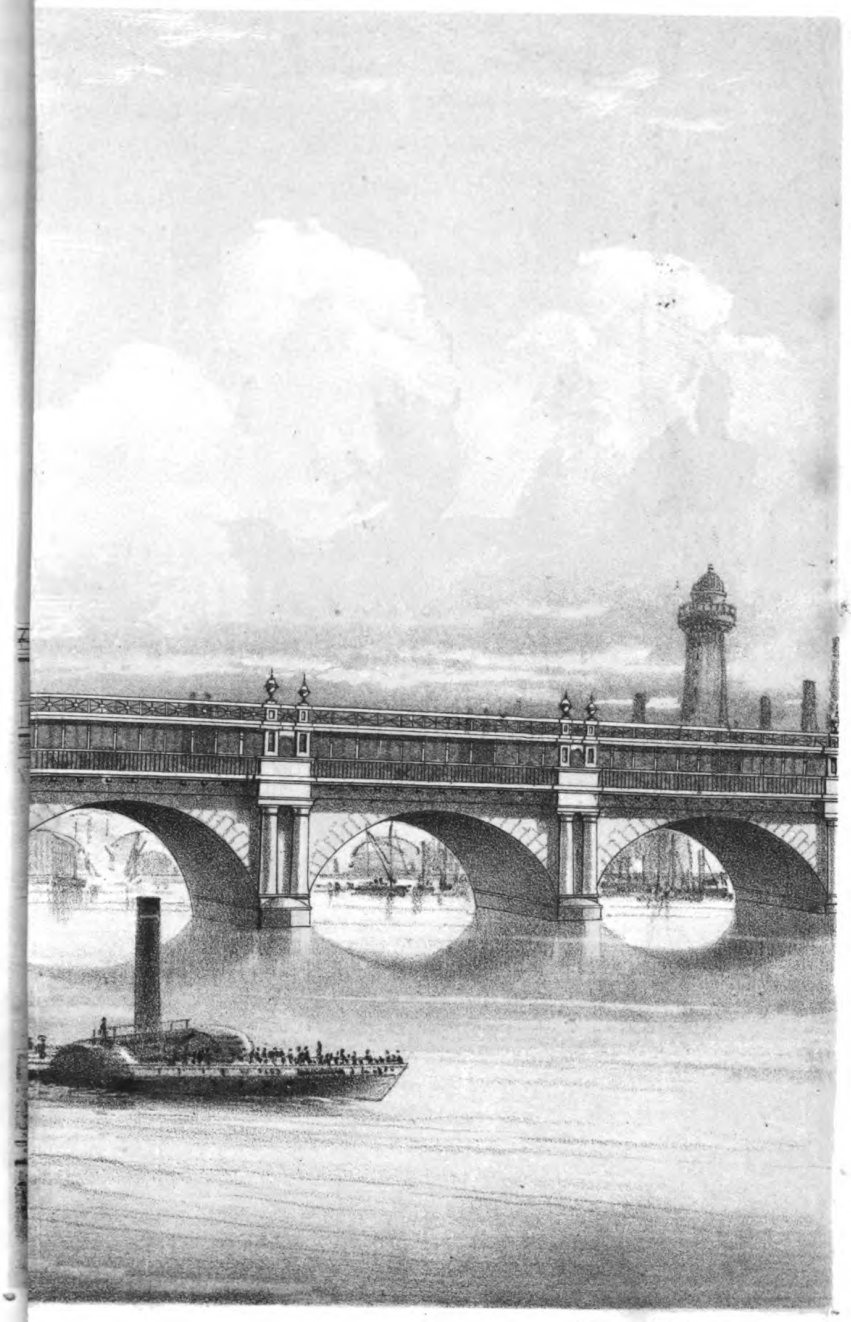
These, however, are matters of minor detail, noticed only to

meet objections and difficulties that may possibly be raised by those who only give a cursory consideration to the plan.

Towards the North of this proposed line of street and railway, Parliament has already granted power to construct a railway called the Metropolitan, which is meant to connect the City at the Post Office with the termini of the three great Railways, the Great Western, the London and North Western, and the Great Northern, situated on the North side of London. A Company is now formed to carry out this Railway. It is somewhat in abeyance at present, owing to the state of the money market; but the power of connecting it with the works here described would very speedily secure its completion (somewhat modified in Plan); at any rate, that portion of it from Euston Square and King's Cross, 1½ mile in length, to the main line where it crosses the Victoria Road.

As regards communication with the Surrey side, I propose that near to Lincoln's Inn Fields, a line of railway, branching from the main line here described, should be constructed to Waterloo Bridge and the station of the London and South Western Railway. The fall of the ground is favourable for this arrangement; but of course the difficulty here is crossing the river and the great thoroughfare of the Strand. The construction of a new bridge would involve serious expense, apart from the time occupied, and the uncertainty of the foundations; but the crossing might be accomplished, simply by erecting an iron frame-work over the Strand, and over the roadway of the present bridge, somewhat similar to the upper arching of the High Level Bridge at Newcastle. Such a structure would be striking and ornamental in combination with the present bridge, the solidity of which leaves no doubt of its being sufficient to bear the weight; and the levels of the ground are such as to admit a gradient of 1 in 70 from the bridge, to form an easy connection with the South Western Railway.

I think it will be apparent that if these improvements were carried out, they would, as I have said, go far to relieve the overcrowding of our present thoroughfares, and obviate the difficulty of locomotion now felt. The new thoroughfare from East to West, with its branches, would become the main artery for commerce and communication, as well as recreation throughout London.



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LOO BRIDGE.

A street of unrivalled magnificence, skirting, as it does, the open spaces and squares, would offer facilities for every variety of architecture. The new Palace would terminate the vista to the West through Hyde Park. The gardens and grounds of the Palace at Kensington are already laid out; and, should these improvements be realized, would be still further embellished. In regard to the Palace, it will be the fault of the architectural genius of the country if this structure does not rival, or rather surpass in grandeur and beauty any regal residence now known.

Only one Railway Station—the London Bridge Station—would be unconnected with the Metropolitan Railway Company's line and the plan I propose. But from the Waterloo Road Station to the London Bridge Station is but one mile in a direct line, through an inferior description of property, and a railway communication between those two stations might be effected with great facility at some future period.

I do not propose as a part of this plan to carry a line from Waterloo Station to the Station at London Bridge; but it is a part of its future capabilities which ought not to be overlooked.

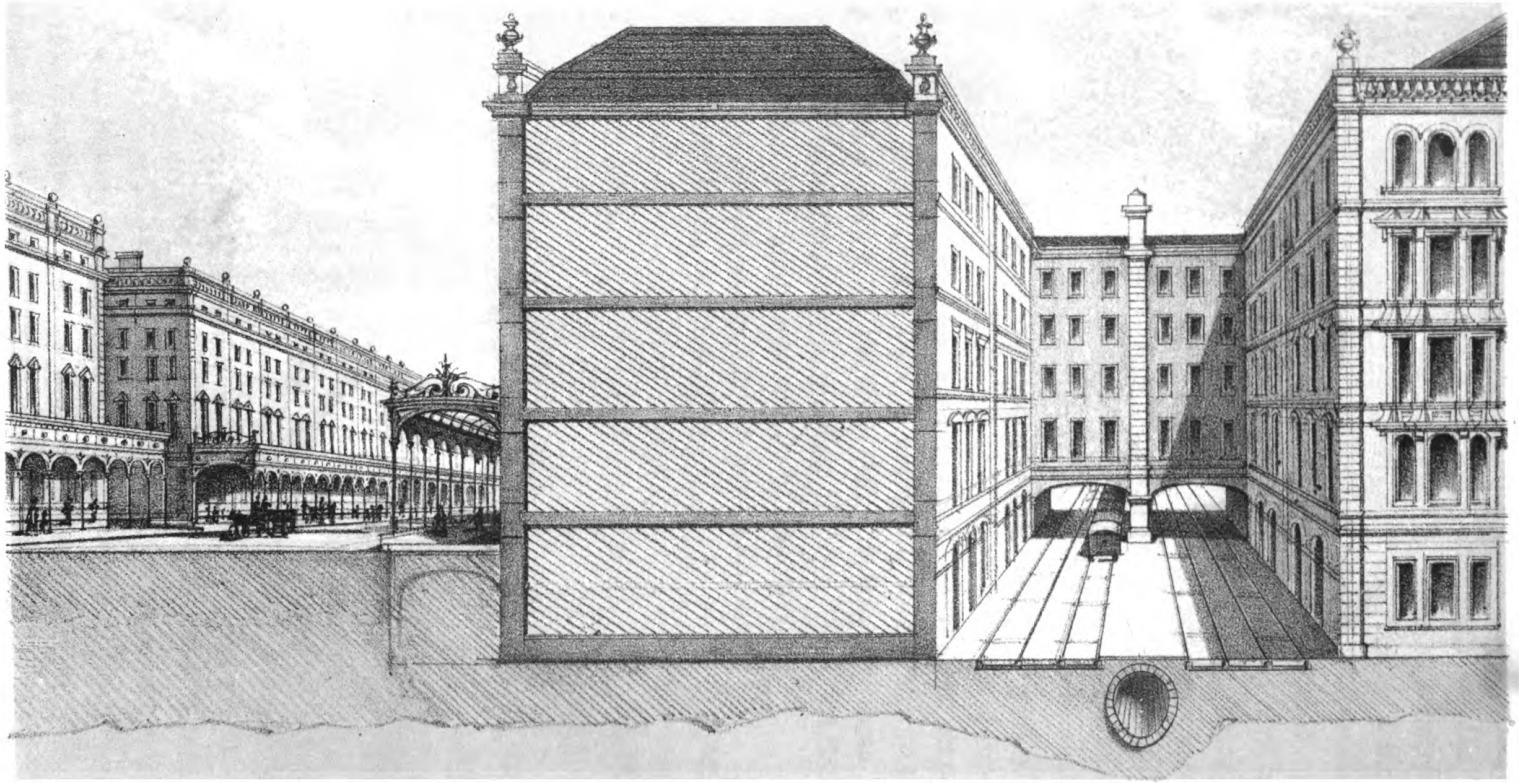
Thus we connect together every Railway Station, by Railway communication, with almost every part of London, giving ready access to, and means of communication with, the country from all parts of London, and that in a space of time which even the humblest individual could occasionally command; but even when that time could not be spared, the purer air of these spacious streets and squares would be at all times within reach of a very large portion of the population to whom such advantages are at present wholly denied. Perhaps it may be urged that so great an innovation would be injurious to the value of property along the existing great thoroughfares of Oxford Street and Piccadilly; but such an apprehension is little supported by past experience; for the traffic of Bond Street has not been sensibly diminished by the construction of Regent Street, nor has the business of Cheapside been affected by the new thoroughfare of Cannon Street. Indeed, the present over-crowded condition of those streets is rather a barrier to the free development of business.

I have, I hope, established the two first propositions of my plan, that it would, if carried out, vastly improve and accelerate

the means of transit, and beautify and adorn the Metropolis; and I will now endeavour to approximate to an estimate of the cost of these works. The expense of the actual works to be constructed can be ascertained with facility, but there is greater difficulty in arriving at the probable estimate of the value of land and buildings, and the vested interests of business to be indemnified. The most accurate mode in so large and complicated a work will be to take the cost of similar works, under like circumstances, as data by which to arrive at the probable outlay. We have various examples to guide us in the recent partial improvements which have been made in London. The greatest of these improvements were effected between 1813 and 1823 in the West-end. Regent Street was then formed between Pall Mall and Portland Place. The cost of this street, measuring 1½ miles, including the purchase of property, vested interests, sewers, law charges, and every other expense, amounted to £1,533,582. Now, assuming the cost of the proposed new street and branch to the Post Office to be at the same rate, say 4 miles in length, it will amount to . . £4,089,552

And add for the additional width of the street, Railway, &c., required, being 59 per cent. more than the width of Regent Street	2,412,835
Will make a total cost of	£6,502,387
Expense of Railway along main line of communication, and branches to Post Office and Waterloo Station	1,976,330
New Palace and Improvements at Kensington .	1,500,000
Total	£9,978,717

There are two sources of Revenue from which to defray the cost of these works. One, the ground rents along the main street, and the other to be derived from the railways. As there is no doubt this would form the great central street of London, it would be immediately run upon and occupied. The communication by railway must necessarily attract the moving masses of the population in this direction, and where these are, the tradesmen will go to supply their wants. This has been proved in Regent Street,



INTERCEPTING SEWER.

Joseph Mitchell. F.R.S.E. Civil Engineer.

Manure Macdonald & Macgregor Lithograph
47 Walker Street

SKETCH

which was very soon occupied after its construction, and mainly because it formed the chief thoroughfare from North to South. The traffic by the railway would necessarily be enormous; the facility of access to the Parks would draw incalculable crowds daily to that favoured locality; and if the Metropolitan line connecting the termini of the three great railways on the North side of London were completed, the whole goods' traffic of these several lines to the heart of the City, and to the railways on the South side of the Thames, would necessarily pass along it. As the traffic on the existing railways has exceeded all calculation, so I feel confident, the traffic on this railway would exceed the most sanguine estimate. The annual Revenue from the Blackwall Railway is now upwards of £70,000, and it is not too much to calculate the clear Revenue of the proposed line at £180,000.

On these principles, therefore, the Estimate of Revenue may be set down as follows:—

The Annual Revenue derived from the construction of Regent Street, 1½ mile, amounts to £39,000, and a like sum for the New Street to Shoreditch and the Post Office, would yield	£97,500
To which may be added 10 per cent., as the New Street will be a greater thoroughfare, and more attractive than Regent Street	9750
	107,250
Revenue from Railways	180,000
	£287,250

Being nearly 3 per cent. on £9,978,717.

I now beg to direct your attention to the third part of my plan —the drainage of London—which the above improvements will greatly facilitate, and to a plan for the disposal of the sewage to profitable account for agricultural purposes.

This subject has separately attracted the attention of many able and ingenious men. The whole question hitherto has been how to get rid of the sewage; it has not been treated in combination with other improvements, nor with the view of turning it to profitable account, nor does it appear to have been considered how far the projection of new thoroughfares, and the works

connected with them, might facilitate those objects. It is admitted on all hands, that this is a most necessary measure. It is clear that the inhabitants of London have made up their minds that to accumulate and discharge the sewage of this vast Metropolis into the Thames, no matter how far down, is not to be thought of. It is not sufficient to say that if this sewage be discharged at a certain distance below London, it will not return. The public feel that, notwithstanding the theories and calculations promulgated, this cannot be depended on as a practical result; and, at any rate, if permitted to flow into the river at all, it would be an intolerable nuisance to passers by, and an ungrateful welcome to the numerous strangers who approach by this route the Emporium of the World.

Moreover, as a practical people, we cannot divest our minds from the belief, that to dissipate the sewage of London in the sea, would be a great waste. We know its value as a manure, and the vast sums that agriculturists now annually pay for manure less economical and productive. Yet this subject is surrounded with difficulty. Unless the sewage is permitted to fall into the Thames, it cannot be wholly removed by gravitation, and any other mode involves a serious complication of machinery and expense. Still the subject can no longer be trifled with. The health of the population of London is at stake. If there is no direction by which it will naturally gravitate, it must be removed by artificial means. Our Chemists have devoted much time to the consideration of this subject, with the hope of purifying the sewage, and converting it to profitable use, and they have been so far successful, that they are able to deodorise it, to separate the solid from the liquid portion, and to discharge the water so separated in a comparatively unmixed state. Unfortunately, this process has not enabled them to fix in the solidified manure the ammoniacal salts which form the valuable portion of the sewage. Hitherto, indeed, we may assume that all their efforts have been practically a failure; and we have a striking example of this at the town of Leicester, where, after much scientific manipulation, and great expense, the solidified manure produced yields only from 2s. to 4s. per ton, a sum scarcely sufficient to cart it away. The cost of this process, moreover, although purifying the sewage,

and rendering it innoxious to health, is so great as to render it practically impossible on the large scale which would be necessary in London. Here, then, is the dilemma. We cannot purify and dispose of the sewage by chemical process; at any rate, such a plan has not yet been discovered; nor can it be permitted any longer to fall into the Thames, as it now does, converting that noble river into a monstrous open drain.

To be effectually removed from London, it is clear that the sewage accumulated in the lower districts, and on the South side of the Metropolis must be pumped to a higher level; and, indeed, pumping has formed part of the plans of the several able scientific men who have of late years given the subject their careful consideration, aided by all the necessary data and sections at their command.

As part of a plan for intercepting the sewage, by which the complete drainage of London would be very much facilitated, it is proposed here that a Main Sewer should be constructed, parallel to the great street, and under the railway, already described, so laid out as to receive all that can be made to fall into it from either side by gravitation. This sewer, owing to the favourable nature of the ground, will drain all London North of this line. Hitherto the sewage of towns has gravitated to some adjacent stream, and its quantity has borne comparatively so small a proportion to the stream, that the disadvantage and annoyance have been little regarded; but the population of London has so far outgrown ordinary calculation, that a new and peculiar mode of appropriation must be provided.

However formidable the difficulties of the removal of the sewage from London may, at first sight appear, I am satisfied they are not so serious as to be insuperable in practice. If we come to the conclusion that pumping is the only alternative of removing it from the lower districts, we then know, as a matter of cost, to what height, and can determine in what direction the sewage may be distributed; and this arrangement enables us with facility to appropriate it for agricultural purposes.

It is well known among agriculturists, and there is no doubt of the fact, that land irrigated systematically with liquid manure, is capable, at the least, of yielding four or five crops of grass,

two feet high, instead of one crop, so that land so treated, even with greatly diluted manure, is increased in value four or five fold. This result has been proved over and over again; and the accumulation of manure in its liquid state, and its application on land, is more and more attracting the attention of those interested in land culture in all parts of the country.

The most striking instance of the value of town manure, in this country, is to be seen in Edinburgh. On the East side of that City the sewage of the Old Town, and part of the New, comprising a population of 50,000, is applied on the low grounds between the City and Portobello, which are irrigated to the extent of from 500 to 600 acres, and such are its fertilizing effects, as now applied, that the lands so irrigated are let from £16 to £45 per acre, producing from four to six crops in the season. The grass raised by this irrigation is considered unequalled for its capability of producing abundance of milk, and, mixed with chopped straw or meal, is equally well adapted for the fattening of cattle.

The rent, we find from the lands irrigated by the sewage of 50,000 of the inhabitants of Edinburgh, may, therefore, be reckoned, on an average, at £30 per acre, which for, say 500 acres, is equivalent to £15,000 per annum. Assuming the population of London at two-and-a-half millions, this would produce 50 times this amount of sewage; and if it could be with equal convenience applied on the land, a large revenue might be produced, after deducting an ample allowance for profit, to the proprietors and farmers whose land would be subjected to this process of irrigation.

The question arises, how this valuable manure, now so great a nuisance in London, is to be collected and distributed on the land. We have paid within the last three years upwards of £5,000,000 for Peruvian guano. The sewage which the Commissioners of Sewers have now at their disposal, is a guano worth more than one fourth part per annum of this importation, yet this guano was, by the late plan, proposed to be dissipated in the sea. It is surely worth while to consider how so valuable a product might be saved.

In a recent return of the Board of Health, it is stated that 81 millions of gallons of water are daily pumped into London, and Mr. Bazalgette, the Engineer of the Commissioners of Sewers,

states that the annual sewage at the present time to be removed amounts to 7,250,000 cubic feet, that is, 6,000,000 cubic feet for the North, and 1,250,000 cubic feet for the South side, in all, 45,182,000 gallons.

By a calculation I have made, I find it to be 62 millions of gallons.

This quantity of sewage in one stream would form a brook 12 feet wide by 3 feet deep, running with a current of little more than two miles in an hour.

It is obvious that the engine power which night and day labours to supply the vast population of London with water, may with the same facilities discharge that water after it has rendered its services to man. In short that which is pumped into London may, by similar means, be pumped out of London, together with the rain-fall over the Metropolitan area.

The main sewer contemplated to be constructed along with the street and railway already alluded to, extending from Hyde Park to Shoreditch, by being carried along and near the Eastern Counties Railway, beyond the river Lea, would, as has been said, intercept the whole of the sewage of London North of this line, and lead it by gravitation to the East bank of that river. At a fixed point near this stream the whole of the sewage of the lower part of the Metropolis as well as the sewage on the South side of the Thames, collected as proposed, according to the plan of the late Mr. Frank Foster, and adopting all the recent improvements of Mr. Bazalgette and others (with the exception that the sewage on the South side of the Thames would be brought across the river, and into the sewer which will drain the Isle of Dogs), might thus be concentrated at any fixed point on the East bank of the river Lea. At this point it would be conducted into a conduit with a continuous fall into the sea. That which cannot fall into this channel by gravitation must be pumped, and that to such a height as will secure an efficient and continuous flow.

Mr. McClean, C.E., has shown by his plans and sections (and he is entitled to the merit of demonstrating that another outlet, apart from the Thames, may be obtained) that a continuous fall of 23 feet can be got from West Ham to the German Ocean, where the sewage would debouche into the Rivers Crouch and Blackwater.

These sections show that an artificial channel may be constructed from London to the sea, along which the sewage of the upper half of the Metropolis will flow by gravitation, and into which the sewage intercepted and collected along the lower portions of it may, with ease and facility, be pumped. The formation of such a channel to the Sea appears to be a work of no very formidable character, extending as it does over 48¼ miles, and with a branch in all 52¾ miles. But Mr. McClean would indicate by the sections as laid down, that if the sewage is to be used at all for agricultural purposes, it would have to be pumped in the localities where it was wanted; whereas, it would be desirable—indeed necessary—that the conduit for carrying it should be so constructed as to distribute the sewage on the land by the opening of sluices at the places where required. Hence, while Mr. McClean's plans show the practicability of such an arrangement, and that the conduit would pass through a vast extent of agricultural country, just suited for the reception and use of the sewage, it will be found in carrying out the works that it would be desirable to have the main sewer elevated above the level of the adjacent country, and this it appears may be done at no very great extra cost, as the excess of expense in embankment may be set against the tunnelling and cutting works shown in Mr. McClean's sections. Moreover, it will be desirable that the line of sewers should be as near to the railway as possible, with a view to the proximity of markets for the vast supplies of milk and other dairy produce which would be created by the new system of irrigation.

It is of course essential that the outlet to the sea should be made because the sewage cannot, at all times, be taken off for agricultural purposes. While it is most valuable during spring, summer, and autumn, it is of little or no use in winter, during which season even the solid portion which is collected in Edinburgh, is estimated at a value of only some six shillings per ton.

The sewer, however, running through this vast extent of land, will not fail to produce the same fertilising effects as are now experienced at Edinburgh, and agriculturists will draw from the main channel their supplies in such quantities as they require, and at such times as may suit their convenience.

By this arrangement, also, it ceases to be a nuisance, for it is

found to be one of the peculiar properties of sewage manure, that the moment it comes into contact with the earth, it becomes completely deodorised.

I am aware that that eminent engineer, Mr. Wickstead, has endeavoured to show by calculations that it is impracticable to apply sewage profitably in its liquid state, by pumping it on the land, and the failure of the Sewage Manure Company, at Fulham, may be quoted in support of this view; but Mr. Wickstead's calculations are based on the assumption that it must be forced through a system of piping, as was done at Fulham; and with an engine of 100 horse-power, he appropriates 10 horse-power to the lifting, while 90 of the horse-power of the engine are required to overcome the friction of its passing through the pipes required for distribution. By the plan here suggested, the pumping of such portion of the sewage as requires to be pumped, is merely a simple lift. The fall and the distribution between the pumping apparatus and the land on which it is to be distributed, is done wholly by gravitation.

I have stated that the sewage arising from 50,000 of the inhabitants of Edinburgh, irrigates 500 acres (Scots), or 630 acres imperial of land, and the returns are from £16 to £45 per acre, the average being about £30 per acre. The London sewage, distributed in *the same way*, would irrigate 31,500 imperial acres, which, at £15 (allowing a like sum of £15 an acre for agriculturalists' profit), would yield a clear revenue of £472,500; but it is well known in Edinburgh that a much larger area of land could be irrigated by the same sewage, were there sufficient means for its application. Indeed my belief is that the sewage of London is capable of fertilising ten times this extent of land, so that there is no calculating, with our present experience, what might be the possible returns from such a manure. We know the result in Edinburgh, with the Edinburgh process applied in the rudest manner from the sewers; but when applied diluted, or in certain proportions, or in any particular manner which experience may recommend, it is possible that a system of fertilisation may be discovered, producing advantageous results beyond even our present expectations.

There can be no doubt about the value of this manure, as now

used; the results are patent to any one, and, by the plan suggested, the sewage would be conducted in a direction unobjectionable, and over a country on which it may be applied to any extent.

It will be argued that all this may be very true; but will the agriculturists of Essex avail themselves of these great advantages, and will they pay for them a rent, and such a rent as is here set down? No doubt, the sewage passing through this district of country will not be taken up at once. Cautious men will wait to notice the experiments of their more adventurous neighbours, as was the case with the use of guano, before they attempted its application; but, ultimately, and, in due time, the sewage will be wholly taken up.

The great strides which have been made of late years in agricultural improvement, show that agriculturists are quite alive to their interests, and readily adopt every means to increase the productive powers of the soil, and they will soon see the advantage of availing themselves of the benefits which this great fertiliser, passing through their country, is capable of producing.

The fact of being able to increase the Rental of the land from £2 to £12, or £15 per acre, at no great outlay of cost, in adapting it to the reception of sewage, is a sufficient stimulus to its being universally used. But if the sewage were not taken up at all, the plan of disposal here contemplated secures at any rate its immediate and entire removal from London and from the Thames, the great objects in the first instance to be desired; and now as to the cost of effecting these objects.

According to the estimates by Mr. Frank Foster, the intercepting sewers for the North side of London are set down at £1,080,000; but as the upper main sewer for 4 miles through London would be brought in the line of the new street, and as nearly parallel as possible to the Eastern Counties Railway, a great saving of cost would arise from that circumstance. The intercepting of the South side is estimated at £241,297, making a total of £1,321,297 which includes all the pumping apparatus, tanks, &c. Mr. McClean's estimate for his extension to the sea is £1,600,000, in all, £2,921,297, or say £3,000,000, but I would add, for altering the elevation of the sewer leading to the sea, £500,000, making a total outlay of 3½ millions sterling.

The pumping of sewage 60 feet high may be estimated at one halfpenny per 1,000 gallons, for which for 62,000,000 gallons, the quantity of sewage to be discharged in 24 hours (and this is a much greater quantity than will require to be pumped), would amount to £47,146, or say to an annual charge of £50,000. *

From the above statement and calculation it will be seen that London may be effectually drained, and the sewage entirely removed from the Thames for a first cost of 3½ millions of money, and an annual charge of less than £50,000, and that the sewage if applied, as it is now in Edinburgh, will yield at the lowest calculation a clear annual Revenue of £472,500

From this sum deduct interest at 4 per cent. on £3,500,000 of capital	£140,000	
and annual working charges	50,000	
other repairs and contingencies . . .	20,000	
		210,000
showing a profit of		£262,500

notwithstanding the magnitude of the works here described.

If to this surplus Revenue from the Sewage be added the estimated Revenue from the rents of the proposed new Street, and from the Railways . .	£287,250
The Revenue to be derived from the whole of these improvements will be	£549,750

Or about 5½ per cent. on the capital required of £9,978,717.

Of course if it be determined that the sewage shall be removed from the Thames, and conducted in some such new direction as is here described, it will be necessary to adapt to this change the construction and direction of the internal sewerage of all London. This need not incur much change; but all the channels of sewerage will be directed to the main intercepting drains. The sewage

* The above calculation assumes that the whole sewage is to be lifted 60 feet, which is done with the view of being quite safe, and to allow an ample fall; but there appears, with our present information, sufficient fall to drain half of London by gravitation.

will have an appreciable value, and it will be found that it will be profitable and advantageous (apart from the considerations of health), along with the additional water supply promised to London, and in some localities so much needed, to establish a system of drainage for the dwellings of the poorer classes at the present time unknown.

In fact, it will soon be found that a perfect system of water supply, drainage, and scouring, in whatever locality, will not only be sanitary but profitable to the community.

As a practical man I think this estimate, both of Expenditure and Revenue, will be found to come near the truth. The calculation of the former is regulatedby the expenditure on similar works at a more expensive period; and as to the Revenue which may be derived from the sewage there can be no doubt; we have ample evidence of its value throughout the country, if it can be brought on the land, the perfect practicabilityof which I have demonstrated. At any rate there is sufficient proof of a reasonable Revenue (if funds from other sources should fail) to warrant the Government or the Municipality of London in coming forward, if necessary, with a moderate guarantee for the outlays contemplated.

When one reflects on the vast sums of money which have been expended on public works, on railways and harbours, throughout Great Britain, as well as on the cost of the armaments of the country, it is difficult to conceive how there should be any hesitation in securing for the Capital of this great Empire all the practical advantages and aids to be derived from the full application of every modern improvement. It seems an anomaly, that with our unbounded wealth and untiring enterprise, we should not provide for ourselves, in the first instance, all the comforts and conveniences which modern art and science have demonstrated as necessary for the prolongation and rational enjoyment of life.

I have now gone through and explained the plans I propose for the improvement and drainage of London. Briefly to recapitulate what they will accomplish:—They will beautify and improve the Metropolis, in an architectural and sanitary point of view; they will greatly facilitate traffic, and convey passengers from one end of London to the other, at railway speed, with great economy, comfort, and convenience; they will relieve the thoroughfares

from their present overcrowded state; they will render the Parks easy of access for health and recreation to all London, and London and Westminster easy of access to those who reside in the neighbourhood of the Parks; they will increase the beauty of Kensington Gardens, and solve the problem, hitherto so difficult, of finding an appropriate site for a new National Gallery, in a Palace of unrivalled magnificence, placed in a pure atmosphere, and easily accessible. In connection with the Metropolitan Railway about to be made, they will render every railway terminus easily and speedily accessible, from almost every part of London; they will render every suburban district of London, to which there is a railway, practicable for residence, they will facilitate the drainage of London, and enable vast tracts of country to be fertilised with its sewage, which may be thus profitably used up, instead of being, as now, wasted and a nuisance; and all these objects may be attained, at a comparatively moderate expenditure of capital, which will yield at a reasonable calculation, at least 5 per cent. return on its outlay.

I have to apologise for this lengthened statement, which is necessarily less complete than it might be, from want of data to which I have no access. It pretends to nothing particularly novel, for most of the suggestions have, from time to time, and in different shapes, been promulgated by other parties; but I consider that, if London is to be made the desirable residence that all would wish, it should have the improvements and changes here suggested, or others of a similar character, and on a scale suited to the existing and still rapidly increasing population.

We cannot shut our eyes to the fact that, unless new thoroughfares are made, or a different mode of locomotion adopted, a further lapse of twenty or thirty years, with the same increase in population, must render the streets, which are now almost at a dead lock, wholly impassable.

No doubt, the process proposed for obviating so extreme an evil may create individual hardships, and some discontent; but these would, of course, be fairly compensated; and we must not compare

the inconvenience of a few thousand persons, for a short time, with the permanent advantage to the present and future generations inhabiting the Metropolis.

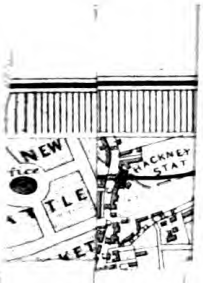
I have the honour to be, Sir,

Your most obedient Servant,

JOSEPH MITCHELL.

Inverness, 4th February, 1857.

W. H. Collingridge, City Press, 1, Long Lane, E. C.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