

**Report of the commissioners appointed to examine into plans for
embanking the Surrey side of the River Thames within the metropolis with
plan and appendices : presented to both Houses of Parliament by
command of Her Majesty.**

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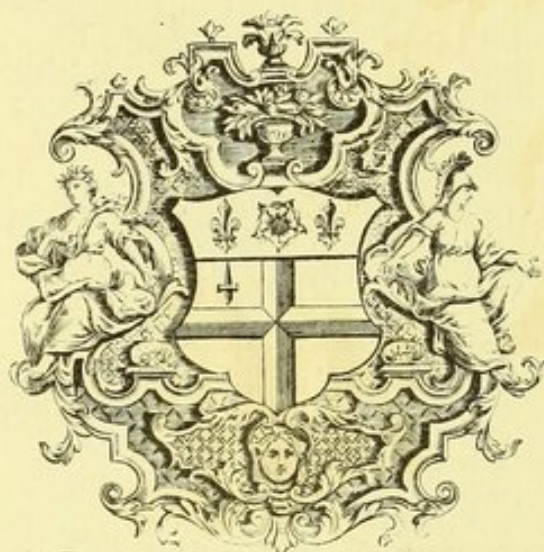
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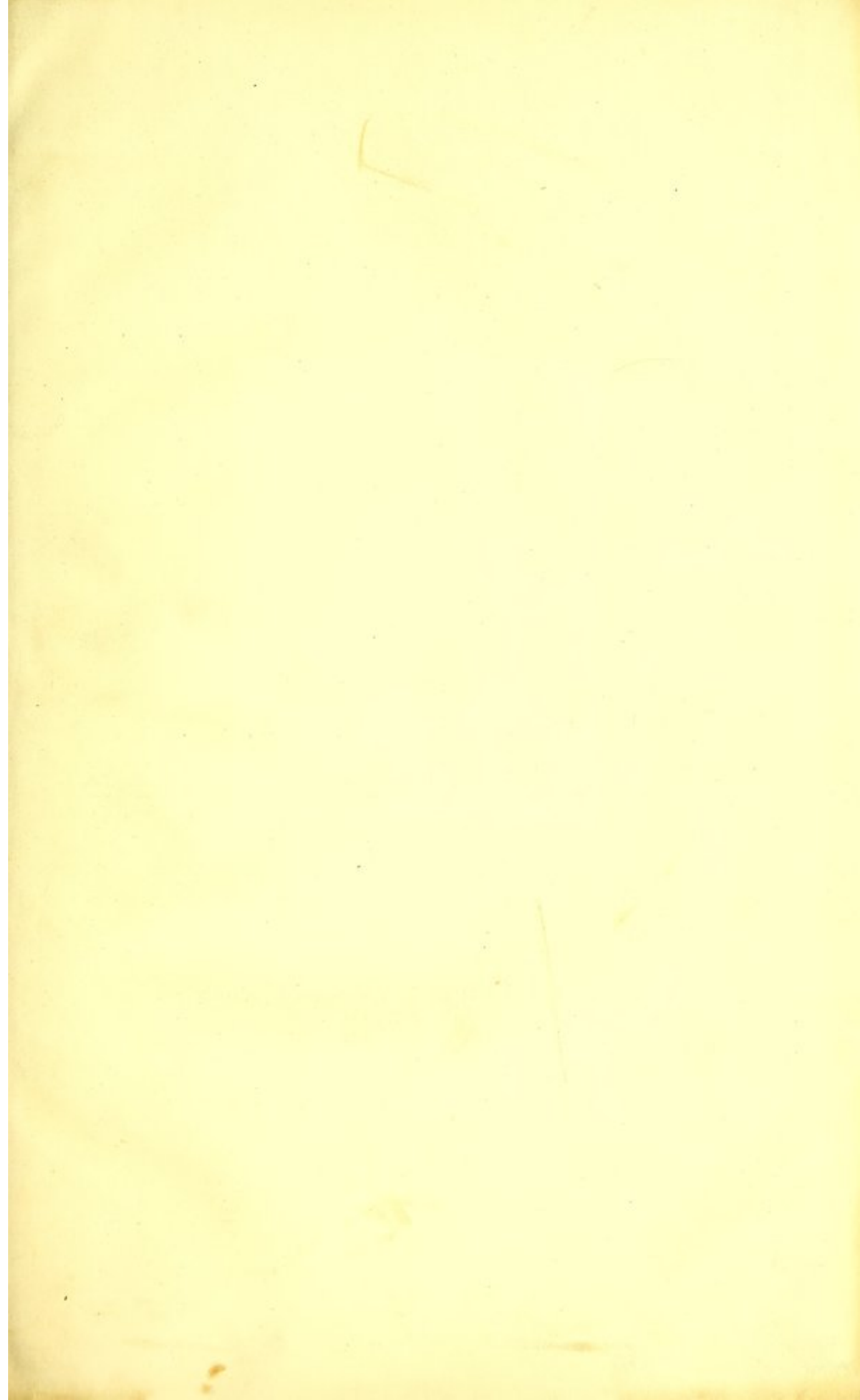
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THAMES EMBANKMENT COMMISSION (SURREY SIDE),
1861 and 1862.

REPORT
OF
THE COMMISSIONERS

APPOINTED TO EXAMINE INTO

PLANS FOR EMBANKING THE SURREY SIDE OF THE
RIVER THAMES WITHIN THE METROPOLIS.

WITH

PLAN AND APPENDICES.

Presented to both Houses of Parliament by Command of Her Majesty.



LONDON:
PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1862.

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REPORT

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REPORT.

TO THE QUEEN'S MOST EXCELLENT MAJESTY.

WE the undersigned members of Your Majesty's Commission appointed to examine plans for embanking the Surrey side of the River Thames, within the metropolis, and to report "which of the said plans of embankment will, in our opinion, conduce with the greatest efficiency and economy to the improvement, embellishment, and convenience of that part of the metropolis, improve the navigation of the river, and provide a public thoroughfare without stopping such trade as must be carried on upon the bank of the river, and also upon the cost and means of carrying the same into execution," beg to submit the following remarks.

The nature of the inquiry entrusted to us was made known by advertisements in the newspapers, and twenty designs were submitted for consideration. A short description of each is appended. The authors have attended, given full explanations, and stated their respective views, as will be seen in the evidence hereto annexed.

We must here express our opinion of the excellence of many of the plans submitted to us; and although we cannot recommend any one plan for adoption in its entirety as meeting all the requirements of the case, yet the principal features of some of them are embodied in the plan we have the honour to suggest.

Some of the plans comprise the whole length of the Surrey shore from Deptford to Battersea Park; and we have accordingly directed our inquiries to that extent.

We propose to divide this district into three sections; the first extending from Deptford to Westminster Bridge; the second from Westminster Bridge to Vauxhall Bridge; and the third from Vauxhall Bridge to Battersea Park.

With respect to the first section, as the existing thoroughfares with the new street now being made between Southwark and Blackfriars Road will, in our opinion, afford sufficiently convenient and direct means of communication for the traffic,—and as the flooding of the low-lying districts could be obviated by a more efficient system of drainage,—there does not appear to us any public necessity for an embankment and roadway between Deptford and Westminster Bridge. The formation of such a roadway would involve a vast expenditure of money, and cause a great disturbance of the trade and commerce of that part of the metropolis. If, however, the owners and occupiers of such wharf property should be desirous at any time of constructing an embankment, which, whilst increasing their own accommodation, would ensure uniformity of design, and improve the navigation of the river, we are of opinion that every facility should be afforded them for so doing, although we are unable to recommend that the cost should be defrayed by the public.

With respect to the second section, namely, from Westminster Bridge to Vauxhall, we are of opinion that a new and improved communication is necessary, and this, we think, may be effected by constructing an embankment and roadway between those points. The property adjacent to the river between Lambeth Church and Vauxhall Bridge is of an inferior character. The wharf walls are insufficient to keep out the water at high tides, hence many of the streets are at times flooded, causing distress and sickness to the inhabitants, who are for the most part of the poorer classes.

Between Vauxhall Bridge and Battersea Park, which comprises the third section of our inquiry, an embanked roadway would afford access to the Battersea Station of the South Coast Railway, and to the Goods Station of the South-Western, and Chatham and Dover Railways, would improve and embellish that part of the metropolis, and afford a convenient and agreeable approach to Battersea Park from the densely populated districts of Lambeth and Southwark.

We, therefore, humbly submit to Your Majesty that an embanked roadway of about two miles in length should be formed between Westminster Bridge and Battersea Park, commencing at the east abutment of Westminster Bridge, on a viaduct of an ornamental character opposite the Houses of Parliament, as far as Bishop's Walk; thence on a solid embankment to the north side of the London Gas Works, continued under Vauxhall Bridge as far as Nine Elms on a viaduct, and thence upon a solid embankment, passing under the land arch of the railway bridge, and terminating at the approach road of the new suspension bridge at Battersea. The plan and section, which are

appended to this Report, show the direction and levels of the intended road, and the arrangements proposed for accommodating some of the occupiers of the most important of the water-side premises; and in suggesting viaducts we have endeavoured not to interfere, more than is absolutely necessary, with the trades which must be carried on upon the banks of the river.

The dredging of the foreshore in the front of the embankment to a level of five feet below low water will (particularly at Lambeth and Nine Elms) improve the navigation, compensate to a great extent for the loss of tidal water displaced by the solid portions of the embankment, and as the foreshore will be formed, under the viaduct, of solid material, and on a suitable incline, it will tend to prevent accumulations of mud, where the shores are flat or uneven.

Communications with the embankment would be made at Stangate, by prolonging Palace New Road, and widening Bishop's Walk on the western side, Church Street, Broad Street, Vauxhall Row, High Street, Battersea Road near Nine Elms Goods Station, New Park Road leading to Wandsworth, and the Station of the London, Chatham, and Dover Railway Company.

The estimated cost of this work, including land and compensation, is 1,100,000*l.*; but it is important to observe, that if the present favourable opportunity for carrying out this great work be not at once embraced, the cost will necessarily be much greater, by reason of the increasing demand for land and buildings for trade purposes in and near to the metropolis. This scheme would be a metropolitan improvement; and with reference to the means by which the cost is to be defrayed, we consider that the coal and wine dues should be appropriated for such a further period as may be necessary for the purpose.

All which we humbly report to Your Majesty.

Witness our hands and seals this 29th day of July 1862.

WILLIAM CUBITT. (L.S.)

JOSHUA JEBB. (L.S.)

DOUGLAS GALTON. (L.S.)

EDWD. BURSTAL. (L.S.)

HENRY A. HUNT. (L.S.)

JOHN ROBINSON McCLEAN. (L.S.)

HENRY KINGSCOTE,

Secretary.

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PLAN & SECTION REFERRED TO IN THE R





THAMES EMBANKMENT COMMISSION (SURREY SIDE), 1861 & 1862.

APPENDIX A.

TABULAR STATEMENT OF PLANS AND DESIGNS for the EMBANKMENT of the RIVER THAMES, SURREY SIDE, presented for the Consideration of the COMMISSIONERS up to the

No.	Name.	General Description.	Roadway.	Railway.	Docks.	Extent of Encroachment on River.	Estimated Expense.	Mode of defraying Expense.
95	1 WM. AUSTIN	- Proposes a 30 ft. or 60 ft. embankment wall, with conduits, into which all sewers may discharge from each side the length of river fronts.	Drives and footways -	None - -	Between Embankment walls and shore banks.	Varying with commercial requirements.	Varying with width of walls and tunnels, and length (of work) executed.	Sale or lease of river frontages, producing 10 per cent., minimum profit.
71	2 H. H. BIRD	- A new river frontage, between Nine Elms, Vauxhall, and Southwark Bridges, with an intercepting sewer.	Public road 50 ft. wide from Lambeth Church to Bankside, Southwark.	- - -	Inside Embankment from Bishop's Walk to Bankside, with entrance gates 35 ft. wide.	90 ft. at Lambeth Church; 160 ft. at Westminster; 2 arches of Waterloo Bridge, 1½ of Blackfriars Bridge.	£469,000.	
79	3 T. H. HARTLEY	- Embankment in midstream from London Bridge to Battersea Bridge.	- - -	Railways on both sides, joining with London and South Western and Great Western.	- - -	- - -	£5,000,000.	
81	4 THOS. MORRIS	- "Causeway" on piers 100 ft. apart from Nine Elms to Southwark, crossing Vauxhall and Westminster Bridges at a level, and passing under Hungerford, Waterloo, Charing Cross Railway, Blackfriars, and Southwark, curtail the shore 150 ft. at Fore Street, Lambeth, and 80 ft. at Bankside, near Southwark Bridge.	60 ft. wide	- - -	The tide flows beneath the Causeway up to the old limits, leaving the superficial area of the River undiminished.	100 ft. at Westminster; 1 arch of Waterloo Bridge; 2 arches of Blackfriars Bridge; abutment of Southwark Bridge.	£500,000.	

No.	Name.	General Description.	Roadway.	Railway.	Docks.	Extent of Encroachment on River.	Estimated Expense.	Mode of defraying Expense.
100	5 H. H. FULTON	Embankment from Victoria Suspension Bridge to Southwark Bridge, curtailment the shore at Fore Street, Lambeth, 90 feet; with land set apart for building from Hungerford Bridge to midway between Waterloo and Blackfriars Bridge.	Low level road 60 ft. wide from Chelsea to Vauxhall, with high level road from Vauxhall Bridge to Lambeth. From Lambeth to Southwark 80 ft. wide, making a new street to the rear of the premises at Stangate from Lambeth Church.	-	Small dock opposite Richmond Terrace; dock 90 ft. wide between Hungerford and Waterloo Bridges outside present embankment; 2 docks of 100 ft. wide outside the River side premises of the Commercial Road; 1 dock of 60 ft. wide between Blackfriars Bridge and the Falcon Draw Dock.	110 feet at Westminster Bridge; 1 pier of Hungerford Bridge; 3 arches of Waterloo Bridge; 1½ arches of Blackfriars Bridge; abutment of Southwark Bridge.	From Westminster to Blackfriars Bridge, £400,000.	
94	6 HY. TURNER	Embankment commencing at Lambeth New Bridge, terminating at the river frontage at Hungerford.						
83	7 W. A. BROOKS	Four quays or line of embankment; 1st, from Fore Street, Lambeth, to Westminster Bridge; 2d, between Westminster Bridge and Bankside, Southwark; 3d, Off St. Saviour's Dock, Bermondsey; 4th, from Thames Tunnel to King and Queen Stairs, Rotherhithe.				100 ft. at Lambeth Palace; present river frontage at Westminster Bridge; 80 ft. at Hungerford Bridge; 1 arch of Waterloo Bridge; present abutment of Blackfriars, and present river frontage at Emerson Street, Southwark.	£167,492 from Lambeth Church to Bankside. £44,880 for the Bermondsey Quay. £48,620 for the Rotherhithe Quay, exclusive of all purchase of property and compensation.	
86	8 A. GILES	Embankment from Vauxhall Bridge to Lambeth New Bridge, thence, roadway or embankment 60 feet wide to Bankside; encroaches 40 feet on present river frontage at Fore Street.	New road from Nine Elms Station to Lambeth Church, between the Railway and Princes Street.	-	Between his roadway and the premises at Stangate, and from Westminster Bridge to Bankside between his roadway and the present river frontage, 8 encroachments 25 ft. wide.	1½ arches of Vauxhall Bridge; 150 ft. at Westminster Bridge; 2 arches of Waterloo Bridge; 2 arches of Blackfriars Bridge, present shore at Bankside.	£400,000.	

85	9	T. E. WELLER	Solid embankment from abutment of Westminster Bridge to present line of river frontage above Blackfriars Bridge.	-	-	-	-	-	Half way to first pier of Hungerford Bridge; 1 arch of Waterloo Bridge.		
95	10	JNO. FAIRFAX	Solid Embankment from London Gasworks to Bankside.	-	-	-	-	-	-	£450,000.	
96	11	JNO. LIGHTFOOT	Embankment at Vauxhall Bridge, parallel with present river frontage to Lambeth Church, with roadway in front of all the premises to Rotherhithe, having docks between the roadway, and said premises to London Bridge. Proposes a new bridge opposite the Horse Guards, and new street to join York Road and the present site of College Street.	-	-	-	-	-	$\frac{1}{4}$ of first arch of Vauxhall Bridge; 50 ft. outside of river frontage at Fore Street; 200 ft. at Westminster Bridge; 1 pier at Hungerford Bridge; 2 arches of Waterloo Bridge; $1\frac{1}{4}$ of Blackfriars Bridge; 150 ft. from Bankside; $\frac{3}{4}$ of 1 arch of Southwark Bridge; 1 arch of London Bridge; generally 60 ft. in front of all water-side premises of South Bank in the Pool.	£5,200,000.	To be built by the Government, who would receive the amount of the rentals and the sums arising from the sale of sewage.
97	12	WM. PAICE	Embankment from Westminster Bridge to London Bridge, about 70 ft. wide, with dock under roadway part of the distance.	-	-	-	-	-	Docks would extend nearly the whole length of Embankment.		
			Raised roadway on wrought iron girders, from midway between Waterloo and Hungerford, terminating at Southwark.	-	-	-	-	-	Midway between Waterloo and Hungerford, terminating at Southwark, with 8 openings 40 ft. wide.		

Evidence at Page		No.	Name.	General Description.	Roadway.	Railway.	Docks.	Extent of Encroachment on River.	Estimated Expense.	Mode of defraying Expense.
98		13	J. F. SMITH (Belvedere).	Solid embankment from Westminster Bridge to Blackfriars; new road of 80 ft. wide from Waterloo to Blackfriars following the line of the northern embankment.	80 ft. throughout, and quay of 30 ft. wide outside the roadway.	-	-	100 ft. at Westminster Bridge, 240 ft. at Hungerford; 1½ arch of Waterloo Bridge.	£227,815, not including the filling in of wharves.	
67		14	F. W. SHEILDS	Embankment from Vauxhall to Westminster Bridges, the portion next Vauxhall Bridge to midway between the Bridge and Lambeth Pier not being constructed at present. Takes off 50 ft. from projecting wharf-line at Upper Fore Street, extends out 40 ft. at Lambeth Pier, goes from thence straight to New Westminster Bridge abutment. No embankment from Westminster to Southwark, but a fixed river boundary corresponding with the abutments of the existing bridges and with the general line of wharf frontage.	Continuing and widening Vauxhall Row, at the E. end of the London Gasworks, by removing the small buildings on the S. side of Princes Street; and turning it on to the Embankment below the Flour Mill: forming road 80 ft. wide by river side, from thence to Westminster Bridge, removing that portion of Upper Fore Street that stands westward of Broad Street, and the portion of Lower Fore Street, between Broad Street and Lambeth Church, continuing the road in front of Stangate to Westminster Bridge, leaving a large portion of reclaimed ground between the road and the present wharves.	-	-	Abutment of Vauxhall Bridge, 70 ft. from the Bishop's Walk; abutment of Westminster Bridge; abutment of Hungerford Bridge; abutment of Waterloo Bridge; abutment of Blackfriars Bridge; abutment of Southwark Bridge.	£120,000 for works of construction, not including compensation for property disturbed.	

57	15	WM. CARPMAEL - No. 1.	Solid embankment from Vauxhall Bridge to London Bridge on the lines suggested by Mr. Walker, but for the embankment to pass under the bridges in place of having access at the bridges as proposed by Mr. Walker, with travelling cranes over the roadway to water-side premises. Plan for regulating existing wharves and River wall to one uniform line.	50 feet wide	-	-	-	-	Abutment of Vauxhall Bridge; abutment of Westminster Bridge; 1 arch of Waterloo Bridge; 1 arch of Blackfriars Bridge; abutment of Southwark Bridge; abutment of London Bridge.	£75,000 per mile.
64	16	JAMES CARTER - No. 2	Embankment on both sides of the River from Bishop's Walk to Westminster Bridge, thence 100 ft. wide parallel with the River frontage, terminating at Deptford.	Roadway upon arches from 50 ft. upwards. A front wharf 30 ft. wide where no inlet exists, and a space for light and air, 20 ft. between existing buildings.	Tramroad to all bridges.	-	-	-	General encroachment of 100 ft. on present line of river frontage.	£400,000.
95	17	H. W. SICH	Embankment from Lambeth Church to Blackfriars Bridge, with roadway on suspension principle outside the embankment, and barge bed under roadway. From Westminster Bridge to Blackfriars Bridge an extent of reclaimed land by embankment of 45 ft. wide on the average for the use of wharfers.	Roadway 40 ft. wide, raised on columns with barge bed underneath it.	-	-	-	-	At Bishop's Walk, 80 ft.; Westminster Bridge, 60 ft.; Hungerford Bridge, 130 ft.; Waterloo Bridge, 1 arch; Blackfriars Bridge, 1 arch.	
105	18	JOS. GIBBS	Embankment from Battersea Bridge to below Southwark Bridge, cutting off the projecting point at Fore Street, Lambeth, but only recommends the present construction from Westminster to Battersea Bridge.	Roadway on outer part of embankment as far as Westminster Bridge.	-	-	-	-	Two arches of Vauxhall Bridge; 150 ft. at Westminster; 2½ ft. at Waterloo; Half an arch of Blackfriars Bridge; Abutment of Southwark Bridge, and widening the River at certain parts of Lambeth.	

No.	Name.	General Description.	Roadway.	Railway.	Docks.	Extent of Encroachment on River.	Estimated Expense.	Mode of defraying Expense.
108	Messrs. ALLEN	Embankment on both sides, making a channel of 700 ft. wide and 6 ft. depth at low water. Space reclaimed available for building purposes.	Roadway 75 ft. wide on each embankment.					
106	C. HENMAN	Suggests a solid embankment, the exception being shallow docks, for timber floats only; the general level of the embankment and road to be 4 ft. above Trinity high-water mark.	A high level road for main through traffic 60 ft. wide, connecting the Borough side of London Bridge, Southwark, Blackfriars, Waterloo, and Westminster, at the level of these Bridges. A low level road 80 ft. wide, in connection with the principal thoroughfares in the rear; and also in connection with warehouses to be built on line of frontage.	A street tramway on the low level road.	Shallow docks for floats of timber under roadway of embankment in front of present timber yards only.	To be furnished hereafter. Westminster, half of first arch; Waterloo, 2 arches; Blackfriars, 2 arches; Southwark, 60 ft. northwards of S. abutment.	To compensate owners: form the embankment and upper roadway, and erect warehouses, shops, and houses according to design: 2,750,000<i>l.</i> Estimates that the rental to be derived, if my plan is carried out, will be 80,000<i>l.</i> per annum, and that the capital could be raised, and this great national improvement effected on the Tontine principle, without any ultimate actual expense to the Government or Metropolitan. Provided a minimum dividend of say 3 per cent. is guaranteed to the nominees of the Shareholders for their lives. The Tontine should be divided into 80 classes to suit all ages, and in 100<i>l.</i> shares, so that the surviving nominee in each class would obtain a property in perpetuity of 100<i>l.</i> to 1,000<i>l.</i> per an., whilst every other nominee would obtain a gradually increasing annuity during his life, varying from the guaranteed minimum up to 500<i>l.</i> per an. The same principle could also be applied to a similar construction on the North side of the Thames: and in that case the Coal Duties, intended to be appropriated to its construction, might form the guarantee fund, and relieve the Government from any responsibility.	

THAMES EMBANKMENT COMMISSION, SURREY SIDE;
1861 & 1862.

APPENDIX B.

MINUTES OF EVIDENCE.

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MINUTES OF EVIDENCE

TAKEN BEFORE

The COMMISSIONERS appointed to EXAMINE into PLANS for EMBANKING the SURREY SIDE of the RIVER THAMES within the METROPOLIS.

Tuesday, 17th December 1861.

PRESENT :

The Right Hon. THE LORD MAYOR.
Major-Gen. Sir JOSHUA JEBB, K.C.B.
JOHN THWAITES, Esq.

Captain D. GALTON, R.E.
Captain BURSTAL, R.N.
HENRY ARTHUR HUNT, Esq.

The Right Hon. The LORD MAYOR in the Chair.

ROBERT TAYLOR, Esq. examined.

R. Taylor, Esq.

17 Dec. 1861.

1. (*Chairman.*) You are aware that the Commissioners have been re-appointed, with a view to consider the necessities for embanking the south side of the Thames?—Yes.

2. You have been invited to come here to-day because we believe that you have a great knowledge of the district, and of its requirements in that respect, and perhaps you will be kind enough to tell us what in your opinion is necessary, with a view to prevent the inconveniences which now exist there. Probably you will tell it to us in your own way and in your own language; and after you shall have got through what may occur to your mind, I may ask you one or two questions, rather to elucidate anything which may appear to require explanation?—I am afraid that with regard to what it would be necessary to do, I shall be able to give the Commissioners very little information. I can tell them what we have been enduring for many years past at every high tide. During the long term of office in which I was churchwarden of Lambeth I lived close to the church and to the palace, and I was frequently sent for by the persons connected with the church and the locality to consider as to what could be done under the circumstances, the poor people all round that locality being continually flooded by the overflow of the Thames at a certain high tide, and the parish engine which we had there was used almost every month for the purpose of pumping out the water from the basement floors of the houses round about that locality. I am now speaking of the locality within a radius of half mile of Lambeth church or of Lambeth palace, and at the palace itself the water flows into the gateway, of which Mr. Hunt would know something. At certain high tides they are obliged to stop out the water by putting boards, or clay, or sand, or anything which can be obtained, for the purpose of resisting the water from running into the gateway. But the dire affliction which has been brought about among my poor neighbours by the overflowing of the Thames at certain spring tides, and when the wind has been in a certain direction, almost beggars description. At the present time there is in the savings bank the balance of a large fund raised for the purpose of assisting poor people who cannot help themselves. It is what we call the flooding fund. The money stands in the names of the late rector, Mr. Dalton, and myself, and is applicable for the purpose of assisting poor people under the mishaps caused by the overflowing of the Thames. With respect to the wharfingers lower down, I myself have frequently seen boats, in what we call

Fore Street, Lambeth, at an unusually high tide. My impression is, though perhaps it is only a common sense impression, that in case the northern side of the river is to be embanked something should be done on the southern side to protect it, because my idea is, that if you embank the northern side it may cause a greater pressure on the southern side, and I have no hesitation in saying that I dread the taking away of the copper dams and places which have been erected at Westminster Bridge. I am fearful that the effect will be sad and disastrous to that portion of the parish of Lambeth lying between Lambeth church and half way up to Vauxhall Bridge.

3. How does the water get into Fore Street?—I suspect that it comes up the sewer, but that is at an ordinary tide. At an extraordinary tide it comes over the whole landing place.

4. The public road?—The public way; the public steps down to the boats.

5. Would it not be very easy to raise a ridge across that landing place, with an easy ascent?—I do not know whether your Lordship has been in the habit of going along what we call Bishop's Walk in Lambeth; at the side of the palace there is an iron rail, but the water flows over that.

6. Right over that stone pitching?—Yes, completely over it.

7. By taking up that stone pitching, and resetting it on a few courses of brick-work, would it not keep out the water?—That has been lately done by Mr. Stiff, who is a potter, and who has lately built some large warehouses and a manufactory in Fore Street, Lambeth. He tells me that he has raised his wharf as much as 6 inches, but that still at high tide the water comes over it.

8. He has not got it quite high enough?—He has not got it quite high enough.

9. But I suppose you would say that it is obvious that if each individual raises his wharf to some level or other he will keep the tide from flowing into his premises?—No doubt.

10. If every proprietor was to do that, and if the public authorities who have charge of the roads were to raise the landing places there as far as that rise of the tide goes, the district would be safe?—Yes; but it is right that you should know that there are certain ancient dock ways in Lambeth. In olden times, no doubt, persons used to come up and down by the river; that was the highway to Lambeth; and here and there, as you go through the locality of which I speak, there are open docks, where persons may land their goods free, and we have had contentions with

the parochial authorities as to the right of stopping up some of the small ones. In point of fact that seems to be the only way in which the public used to go down to get water from the Thames. Those are all ancient rights of way to the River Thames, and how you are to alter that I do not know.

11. Probably these docks run up between private properties, having their entrance at their mouths?—Not all of them.

12. The public then would have access not merely to what I call the mouth but also to the sides of the dock?—Some of them are extremely narrow, so much so that a cart can just get up it, and scarcely so.

13. Are they walled on either side, generally?—Sometimes there are walls, and there are wooden erections which have become in many instances decayed, and then there would become a question as to who should keep them in repair.

14. Supposing the question settled as to who should keep them in repair, I presume that if it was a wall it might be raised high enough to keep out the tide at the sides, and that if it was wood that also might be raised high enough to keep out the water at the sides and that at what I call the mouth of the dock, which is where the carts enter; if the ground was raised it might be raised to a height which would keep the tide from flowing over?—I am afraid that there must be some system of dock making to resist the water. It is a slant from low-water mark up to the street. I will give you one instance, namely, High Street; that is the only place, I believe, where we land all the material for mending our roads in our vast parish, and there is a right to land from barges there; the carts go down alongside the barge, and the material is thrown into the carts, and is then drawn up this incline; but how that is to be stopped I cannot possibly say.

15. But if there is a wall on either side of that incline, the raising of the wall would prevent the water from overflowing the sides of the incline; and at the top of the incline when you come to the road, if it was also raised high enough, I presume that the water would not overflow it?—Supposing this to be the two corners of a dock, I can understand that the raising here (*describing the same*) would resist the high spring tides, but how the water is to be kept out from this waterway I cannot say.

16. It is an inclined plane, down which the carts go and up which they draw the load?—Yes.

17. If you made the top of the inclined plane higher than any spring tide ever rises, would not that meet the difficulty?—Perhaps it might; but you must have some more practical mind than mine to suggest the mode of doing it. You must raise the level of the street.

18. You must raise the public way where it immediately adjoins the dock, but not beyond that. If the public way is a foot or two feet below the level of the highest spring tide, you would have to raise that part of the public way which is in immediate proximity with your draw dock, and with the incline up and down into it?—Yes. It is a matter which perhaps I need not mention here, but my idea for many years has been, and in point of fact I produced to the Metropolitan Board of Works a plan for it, that a new street should be made continuing Palace Road through Lambeth; and it has only been laid aside, perhaps, because the more important work from London Bridge terminus to Stamford Street is being carried out; otherwise I think that if all that wretched property which is there now could be pulled down, and a street made, and wharves of a superior character made there, it might have the effect of resisting the flooding in that particular part which I am now mentioning.

19. (*Sir Joshua Jebb.*) Have you observed any effect from the construction of the embankment by Mr. Cubitt above the Houses of Parliament up at Pimlico?—Yes.

20. Has it raised the water much in those wharves?—I am not able to say that that has caused a greater mischief to our locality; but I well remember, when the Penitentiary was built, that wall being built, and I can imagine that such a wall as that, if built, would have the effect of keeping away the high tide.

21. (*Mr. Hunt.*) But would it increase the inundation on the Lambeth side?—I am not able to say. Our parish runs from very near Blackfriars Bridge, taking the river frontage, up to the Nine Elms goods station; that is the river frontage of Lambeth parish; it then diverges across Battersea and Clapham, and away nearly to Croydon; but that of which you are speaking I fancy might have been an inconvenience to the Battersea parish, of which I should not know much.

22. (*Sir Joshua Jebb.*) You have alluded to the water running up the sewers, and flooding some parts of the parish?—Yes.

23. That would be remedied, I suppose, by the new drainage?—I am not quite sure whether the new drainage will effect that. The first symptom of the effect of the rising tide is the bubbling up at the sewer grating; but that is a mere ordinary flooding; a flooding sufficient to prevent foot passengers going round Lambeth Church and to the steam boats; but the great evil of which I complain is when the banks are completely overflowed.

24. (*Captain Galton.*) Do these ordinary floodings take place at every tide?—No; not at every tide.

25. At every spring tide?—At nearly every spring tide. There are certain spring tides when the wind is in a certain direction which keeps the tide up, and blows it up; on those occasions it is that we have to complain.

26. It is not in consequence of any defect in the flaps of the sewers?—No; even if those flaps were made so as to resist the water coming up, still it would overflow the top.

27. It would come in above the flap?—Yes.

28. There is no opening above the flap. In the sewer at Bishop's Walk the flap is a very good one. Does the water flow in through that?—Through the one near Lambeth Palace it does. There is a channel made there, and I suppose it is some inches lower, and the consequence is that the water finds its level there. If that was stopped out altogether it would then come over the side, I have no doubt, as it does now with every high tide.

29. How often is it that this overflowing of the bank takes place, on the average?—I should think that you may say once in two months, supposing that one spring tide shall not be a very high one, and that the wind does not affect it; but I think it is very likely that those who live exactly at the spot may be enabled to tell better than I can. As I did not go that way to town, I knew of the overflowing only when the poor people were inconvenienced by it. The sexton and the people connected with the church would be sure to find their way to me if the poor people were inconvenienced, because many of them lived in the basement rooms, and the water ran into their rooms. I have been called up at the hour of four o'clock in the morning, and have gone down, and it has been a scene which is not easily described; I have seen poor women fetching their children out of those places, and getting them into some neighbours' passages how they could, and then the parish engine has been set to work directly the tide has begun to ebb, to pump the water out of those places which have been flooded.

30. I understand you to say that there are two sorts of flooding; one from the sewers and the other over the land?—The flooding through the sewers, I fancy, has seldom or never caused much inconvenience to the dwellings of the poor people; but it is that which overflows the bank which sends the tide into Fore Street, so much so that the people get from house to house by boats.

31. And this does a great deal of damage?—If it was more valuable property the damage would be

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very considerable, but the damage is vast to these poor people who are obliged to live there.

32. What is about the extent of the flooding fund of which you speak?—I think that the balance of the fund is now about 75*l*.

33. How is that fund raised?—By those who contribute.

34. Those who contribute are the persons entitled to come upon it?—No. As an instance I will give you this case. His Grace the Archbishop of Canterbury had read in the papers of a flooding in Lambeth, and I received a note from him enclosing a cheque, in consequence of the account which he had read in the paper, as having been produced by the overflowing of the Thames in that locality. Many other people send contributions, and we made a collection at the church.

35. When was that case which you have just mentioned?—I should say that that case of which I am now speaking would be about five years ago. You will frequently see an extraordinary high tide, and whenever that is the case you may be quite sure that Lambeth has its share of it, although you cannot in the same way that it is patent to those living in the locality what is the suffering which the poor people have to endure.

36. Have you any idea of what is the area subject to these floods?—The area of which I am now speaking I should think would be half a mile in length.

37. Does it run far back?—Yes; it takes in two streets; it takes in Fore Street and a portion of High Street. I have seen the water up to what we call the burial ground wall, which is a wall in a portion of High Street, and of course to get there it has to pass over Fore Street into High Street.

38. (*Chairman.*) Fore Street is that very narrow street lying close to the river?—Yes; it is like a beehive.

39. (*Mr. Hunt.*) It is parallel to the river?—Yes.

40. (*Captain Galton.*) Those docks of which you have spoken are merely roads running down to the shore, are they not?—Yes.

41. There are no regular docks?—There appear to have been docks from time immemorial; a public right of way.

42. What are called draw docks, where carts can go down?—Yes. I have no doubt that they were originally meant for the purpose of the cattle taking water, and for the inhabitants fetching their water from the Thames prior to there being any accommodation for water.

43. And those were public landing places?—Yes.

44. (*Mr. Thwaites.*) I suppose that your attention has been more directed to the evil than to any remedy?—Yes, it has.

45. You have spoken of an area of half a mile. Do you mean that a river frontage of half a mile is subject to being flooded at high tides?—Yes; the portion of which I speak is near the river.

46. How far back in those high tides does the water flow in the streets; for what distance from the river does it find its way?—I of course speak subject to correction, but I should think that it would be at least 100 yards.

47. Then is that part of Lambeth which is 100 yards from the river higher generally than the other portion?—Yes; beyond the 100 yards of which I speak it is so; it is rising from the river.

48. Does that apply to the whole of the frontage of the parish of Lambeth?—Yes, I think it does; because we do not hear of the water running back further than that distance of which I am now speaking. I do not know that it goes much further than the distance which I mention, and I account for that by the height of the streets, there being a gradual incline from the river up to those streets.

49. Is the whole of the parish of Lambeth subject to flooding from the river to 100 yards in the rear?—In that part of the parish.

50. You have spoken of the sewers showing the first symptoms of flooding, as evidenced by the water rising up the gullies. Has your attention been at all directed to the overflow of the banks, and that water finding its way into the gullies, thus flooding the sewers themselves?—I do not think that there is a very great deal of inconvenience arising from a tide which causes the water rising through the sewer only; and I am not quite sure that I am using the term rightly in saying "the sewer;" I do not know whether or not it is the channel which takes away the surface water from the streets. There is a grating just by the landing place.

51. Supposing that the sewer was trapped in front sufficiently to resist the rising tide, is there any part of the bank over which the water could flow, and find its way into open gullies, and thus flood the sewers?—Yes; all the part of which I have been speaking.

52. Do you remember any case in which you can account for the flooding of the sewer from the water overflowing the banks, and not coming through the mouth of the sewer?—I do not know that I can; but there is one gentleman, whom the Commissioners have summoned to be here, who is our surveyor of sewers, Mr. Macintosh, who will be able to give you all the information upon that head, because it is his particular business to know that fact. My knowledge of the fact has only been derived when I have found the ground over-flooded.

53. In addition to the wharfage property, are there contiguous to the river, or within the area of 100 yards which you have described, a great many cottages in which the poor generally reside?—Yes; houses inhabited by poor persons.

54. What has been the general effect of the flooding upon that population; has it driven them to the guardians for relief?—Very often it has done so; and in some instances we have been obliged to take whole families into the workhouse, because they have had no other place to go to; families who but for that circumstance would perhaps have continued to live without receiving parish relief.

55. Have you observed, or has it been reported, to your knowledge, by your medical officer, that the effect upon the health of that class of people has been detrimental?—Yes; that has been testified by our medical officers. We have different district medical officers. Our medical officer for the parish, Dr. Odling, has nothing to do with attending to the poor in districts. There are district medical officers under the guardians, and they have frequently drawn my attention to the dreadfully damp state of the walls of the houses in which those poor people are obliged to live. Supposing that we have a very high tide this spring tide, and that the water has to be pumped out of those dwellings, you may see the walls as high as the water has gone quite damp; in point of fact they never get dry. We have given away a great portion of our fund for coals, to enable the people to keep fires in the rooms, to try and dry the rooms; but we find that the walls get so saturated with wet that they are very seldom dry, even in the summer time.

56. In addition to the damp which you describe, do the poor suffer very much from the nature of the fluid which has filled their rooms, the washing of the streets and a part of it from the sewers, which must leave that which is very prejudicial to health; have you observed that?—Yes; and I have known that persons have gone away from the locality to live elsewhere in consequence of the effect produced upon their residences.

57. Have you ever, as a parish, taken any steps to call upon the wharfingers and other parties to raise their banks?—No; we have never taken steps to do so, because I believe that we have no power; but I have always looked with a great deal of pleasure and satisfaction when I have seen any of the wharfingers rebuilding or reinstating their wharves, when they were raising them a few courses of bricks higher, such as the Lord Mayor, in the early portion of my statement, was pleased to allude to. I have been

very pleased to see that done, because it resists the water; but I am not quite sure that it does not make it worse in other parts where that is not done.

58. Then are you of opinion that unless there is something like a uniform system of raising the bank, the fact of A., B., and C. raising the height of their wharves six, eight, or ten inches will be of no benefit, if you have a gap lower down, through which the water can flow, and flood the inner district which is lower than high water?—No doubt that is so, and unless there is a universal raising of the wall all along I do not think that the evil of which I am now speaking will be at all remedied.

59. (*Mr. Hunt.*) Is it not the case that the wharves at Stangate are never inundated?—No. I have known them to be inundated. You perhaps remember Messrs. Haward and Nixon's premises; I have been in their yard when the sawpit has been half full of water.

60. Then it must have percolated through the walls?—Yes; but that raising of the wharfage which was done by the late Mr. Copeland, which used to be market gardens, I believe has been successful in keeping out the water. I never heard of its coming in.

61. The same kind of inundation prevails on the opposite shore, at the Horseferry, does it not?—I do not know at all.

62. You are not acquainted with that?—I am not acquainted with it at all.

63. (*Captain Burstal*) Are you at all acquainted with the locality at Nine Elms?—Not very much.

64. I think that the public ways to which you have referred, the draw docks, the five-foot ways, and so on, are entirely within the control of the parish itself; that is to say, no private individual has a right to touch them?—There is a great question about that. Mr. Stiff has stopped up a way in the rebuilding of his wharf, a way which I can well remember, where the public road used to go right down; but there is a broader dock close to it.

65. Those five-foot ways are not much used?—No.

66. I think that Lac's dock is perhaps almost the only draw dock which is used as a draw dock?—I believe it is.

67. Ferry Street is a street which is frequently flooded?—Yes.

68. Supposing even that the wharves were sufficiently high to be above the level of the water at the highest tide, it is clear that Ferry Street would be fed by Gunhouse Alley and the various five-foot ways which there are now, over which no private individual has any control?—Yes, I think that that is very likely.

69. The raising of the five-foot ways three feet, they being now two feet above Trinity datum, and the stopping up of those feeding alleys, would not have been a very expensive thing on the part of the parish at any time to have done?—I do not know that the parish would have been permitted to do so, it being a public right of way.

70. I do not mean to stop it up, but to raise it to prevent inundation. Ferry Street is that very

narrow street running from Bishop's Walk westward, and it is the Street nearest the river?—Yes. There are two streets running from the palace; one is called Fore Street, which is a narrow street, and the other is High Street, and Ferry Street runs from High Street into Fore Street.

71. When the water comes over Bishop's Walk, which is two feet above Trinity, you say, I think, that the water runs 100 yards up inland?—Yes; from the side of the river.

72. Then it is arrested by the fact of the street standing higher?—Yes.

73. Under those circumstances, does the water from the river go over the coping of the wall, and then down into a sewer?—No; it comes near the palace, and rushes into the two streets that I have been speaking of.

74. Ferry Street is flooded directly from the river?—Yes.

75. Turning our attention to Kennington Oval, Princes Street, and that locality, which is only about equal with Trinity high water, and consequently at high tides three feet below it, what floods Kennington Oval?—I should think that the flooding of Kennington Oval would be from the sewer, and supposing there is a great storm.

76. Supposing it is fine weather, with the wind from the north-west, when the high tides come into the river, and Kennington Oval is flooded, which I have seen, does that flooding come from the sewer in the face of the wall, or from the grating over the top of the wall at Lambeth?—I should think that it comes over the sides of the wall. I should think that the flooding of the Oval arises from the overflowing of the Effra.

77. Does that overflow its banks?—Yes. In some portions, where it is covered with wood and stone, I have known it force that up. The Effra has to receive the water from Norwood and Sydenham, and all that way.

78. Therefore that could be cured by raising the banks of the Effra all along?—Yes; but I think that that will be cured by our main drainage.

79. The main drainage scheme will take that in?—Yes; at least the people living about the Brixton Road and Kennington Oval are hoping and trusting that that will be the result.

80. That that will be one cure for that district, so far inland as that?—Yes.

81. The only cure for Ferry Street and Fore Street, Lambeth, you think, is to make the bank of the river sufficiently high to prevent the water from tumbling over?—Yes; that is my opinion; but of course I am not by profession at all connected with this subject, and I can give no idea of it. My object in coming here was especially to let you know what our neighbours have to suffer and endure. Others, I have no doubt, will be able to give you more information on the subject than I can give.

82. (*Chairman.*) Your evidence in that respect is most important and very interesting. You have told us of the great degree of suffering which is inflicted upon the poor inhabitants of those low-lying localities?—Yes.

The witness withdrew.

FELIX KNYVETT, Esq. examined.

83. (*Chairman.*) Will you be kind enough to tell us what is the nature of the evil, and to what extent you suffer, with reference to the flooding of the property in and about the Lambeth Palace Gardens?—Generally, I may say, about 20 times in the year, on an average, the porter tells me, that he is up twenty nights, more or less, to watch for the water coming at the palace gates, and that he is obliged to put boarding, with sand and other remedies which he has, to keep the water out of the basement of the palace, and also out of his own lodge where he lives. Of course that generally happens at spring tides, or

when the wind is in that quarter which blows the water up the Thames, and a very serious nuisance it is. The first notice which there is of it is generally from a grating in front of Lambeth Church, which was made, I apprehend, to carry off the rain water. The tide generally shows itself in that spot first, then it gradually rises, till it runs over the parapet of Bishop's Walk, which it does sometimes so much that the people would have to approach the palace in a boat. There is an exceedingly good illustration of it in the Illustrated London News, not at all exaggerated.

R. Taylor, Esq.

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F. Knyvett,
Esq.

*F. Knyvett,
Esq.*

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84. (*Mr. Thwaites.*) When was that?—It may be two years ago. That tells you exactly what was the state of things, and it is not at all exaggerated; the people rowing about in boats.

85. You are not able to put in a copy, I suppose?—I have no copy of it.

86. (*Chairman.*) Does the water, which the porter has to watch, come in at more than one spot?—Only at the gate. It can only come in at the gate.

87. Do you know what height of sand or barricade he has to put?—I rather think I am correct in saying sometimes 18 inches. As a casual observer, I have also noticed that by Pedlar's Acre, in the neighbourhood of the Hungerford Suspension Bridge, all the low houses have a waterproof board up for their areas, nearly up to the York Road; that locality sometimes impassable, at high tides.

88. (*Captain Galton.*) At the back of the York Road?—Between the York Road and the river. I find all those small streets with water-tight boards in front of the area of the houses, to keep out the water. I suppose that you particularly wish to know respecting the water; but of course we have a much greater evil in the mud. The mud which is in front of the palace I think I am justified in saying is at times perfectly pestilential.

89. (*Mr. Thwaites.*) The mud bank?—The mud bank.

90. (*Chairman.*) Do you mean the mud bank in the river?—In the river.

91. And that is a continual evil?—It is a continual evil. The Conservators of the Thames, about a year ago, improved it by throwing in an immense quantity of material; but the mud has accumulated again, and is accumulating very fast, varying in colour, I believe, according to the state of the heat, and the decomposition of the animal substances which it contains. The worst state, I believe, is an approach to a sort of pink colour, at which time it contains worms. One cannot speak too strongly of that mud. Two members of the family at Lambeth Palace have died from fever. Of course it cannot be directly traced to the mud; but when you consider the malaria you naturally attribute it to that cause.

92. (*Captain Galton.*) For what distance of the river does the mud extend?—Along the whole of the palace wall.

93. Do you mean the whole length of Bishop's Walk?—That part which is open; there is a part of Bishop's Walk which is closed by houses, but for the whole of that part which is open the mud extends, and of course, looking to the embankment, we should hope that it would clear away a few of those nuisances which lie between the palace and Vauxhall Bridge.

94. You mean the bone boilers and manure manufacturers?—Yes, about which I believe that the medical men of the Penitentiary on the opposite side of the river would give very interesting evidence; I am informed so.

95. Are those premises offensive?—Excessively.

96. (*Captain Burstal.*) An embankment would not clear away that?—I hope it would. The premises would be required for the new road and the embankment.

97. (*Captain Galton.*) Do the floods at the end of Bishop's Walk ever occur in consequence of the rain?—No.

98. Never?—Never, I should say.

99. It is entirely from the river?—Yes.

100. It is not from the upland water at all?—No. There was a question asked of Mr. Taylor, whether the water had been increasing lately. It certainly has in the last two years; I cannot tell you why.

101. Do you mean the flooding?—Yes; the flooding has increased in depth in the last two years.

102. And has the area increased?—I can only speak for the depth at Lambeth Palace. I conclude that the area must as a matter of necessity have increased; but the depth certainly has increased in the last two years.

103. (*Mr. Thwaites.*) You heard the evidence

given by Mr. Taylor as to the effect of this flooding upon the poor; do you concur with it?—Yes; the poor suffer very severely from it.

104. In that locality surrounding the Bishop's Palace they suffer greatly?—They are of course subject to every flood; and I have no doubt that their sufferings are very great, from the damp and rheumatic complaints. The children suffer perhaps most.

105. And low fevers?—Yes.

106. In your judgment, while the flooding is a great evil respecting the district and the health of the inhabitants in a sanitary point of view, do you regard with more alarm the condition of the mud banks under the wall of the Bishop's gardens than you do the flooding?—They are both very injurious.

107. Of course, if any system of embankment could be adopted by which those mud banks could be dredged or kept covered with water, so that the deposit, if any, and the decomposition to which you have referred, could be prevented, it would be a very great relief?—It would be a very great relief, but I apprehend that any stagnant water covering that mud bank would become impure itself, and very foul and offensive.

108. Supposing any system of embankment to be adopted by which you would get rid of the banks by dredging, those banks being constantly covered with water, and washed, and not being subject to that decomposition, would it not be beneficial?—It would be a very great improvement.

109. It would be that which you would feel would be a great benefit to the district?—Yes, in all respects.

110. Has your attention been directed to the effects of flooding in the neighbourhood of the Bishop's palace?—I cannot say that it has, excepting the very great number of complaints which of course are constantly being made of sickness and the dampness of the houses.

111. In visiting the poor, after one of those floods have you not found, in addition to the damp, that the smell is very offensive?—That does not fall to my duty, not being in the church. I am the secretary to the Archbishop, and in the law, and therefore the visiting of the poor is not a part of my duties, but I have seen enough of them to answer the question. I can certainly say that that would be so.

112. Have you ever visited those localities after, one of those floods to which you refer, of which you say there are about twenty in the year, when the poor have been in great suffering?—I have frequently seen them.

113. And have you not only observed suffering from the effects of damp, but has the smell been observed, and the filth of the sewers and of the streets, which finds its way in?—Yes, very fully.

114. How long after such a flooding do they re-inhabit those houses?—Immediately; they have no other place to go to.

115. You heard Mr. Taylor's statement in answer to a question put to him as to the extent of the flow of this water into the district; what have you observed in that respect?—I really can hardly answer that question; but I think, of my own personal knowledge, that the street leading over Hungerford Bridge up the York Road is as far as I can state the water to have risen. You there see boards, about a foot or eighteen inches high, put all along the railings to keep the water out, and at a certain distance these boards of course cease.

116. The porter of the palace would be the best judge of the distance, probably?—He would only know as far as the palace was concerned.

117. Mr. Taylor stated that in his judgment the water flowed back about 100 yards from the river?—I should think so.

118. Have you observed that?—I should think so, as far as I can say.

119. (*Mr. Hunt.*) Your business takes you into the palace every day?—Yes.

120. Therefore you have the very best opportunity

of judging with reference as well to the flooding as to the smell from the mud?—Yes. I have been once or twice seriously unwell from that smell.

121. You think it is injurious to the inhabitants as well as to those in the palace?—Yes; I think it is dangerous to life.

122. (*Captain Burstal.*) That mud must be caused from the Bishop's Walk recess being in the rear of the other premises, and an eddy being formed?—I do not think it is much in the rear of the premises higher up the river; it is so a little below, but above I think it is nearly on the line.

122. The smell cannot be so bad there now as it was 20 years ago?—No, it is not.

124. Because the object of the Conservators of the Thames was to make the shore on a gentle incline, and put clean material on it, and also to prevent the drainage from Lambeth Palace expending itself over on the foreshore. Now the drainage of Lambeth Palace is carried out below low water mark?—Yes, it is so, but yet the mud accumulates.

125. Close in by the walk?—I do not think that the mud was caused by the drainage from the palace.

126. But the drainage from the palace diffused itself over that surface?—More or less. There was

The witness withdrew.

WILLIAM SNOOKE, Esq., examined.

133. (*Chairman.*) You are an architect and engineer?—Yes.

134. Living close to the river?—Yes; at Duke Street, London Bridge.

135. And having had a good deal of experience as an architect and as an engineer on its banks?—Yes.

136. Probably, without my asking you any questions in detail, you will favour us with your notions generally as to any evils which may exist, and as to their extent, with regard to the flooding of the districts immediately adjoining the river?—I received your summons only on Friday, and therefore, of course, I have not given much time to the matter; and not having volunteered to come forward, but having been requested to attend here, I should rather have preferred your putting any specific questions to me, if you had any to put. I should then have been able to answer them. Of course I have seen upon the south side of the river the necessity of something being done. I am acquainted with the south side of the river, extending from London Bridge more particularly down to Bermondsey and Rotherhithe, of which I am the district surveyor, and nearly to the Victualling Office in Deptford. Of course I know for a fact that the banks have been very often flooded, and that the water has been in the streets there. I have been concerned, in conjunction with my partner, Mr. Stock, in the erection of various wharves and warehouses on the river side, the Hibernia Chambers and Hibernia Wharf on the west side of London Bridge, Cotton's and Depot Wharfs on the east side, part of Symon's Wharf, Freeman's Wharf, and Mark Brown's Wharf in Shad Thames. Of course, at all times, one material object in view has been to raise the river's banks, so as to prevent the recurrence of the evils which have before taken place. I would mention the unfortunate fire at Cotton's Wharf. We are now going to rebuild there, having been previously architects for many of the buildings there, and we have found that though the wharf was raised some two or three years since, and on the granite kerb an iron sill was put to keep off the water, still, once or twice, at one part of the wharf which had sunk, the water overflowed, and we are now, in the re-erection of the wharf, intending to raise, not only the wharf wall but all the inland warehouses twelve inches higher than the present sill of the river wall, and the plans which I had the honour of submitting last week to the Corporation for the

a deep channel which carried it away from the palace.

127. I suppose that the flooding 20 times a year must come into the Bishop's garden directly from the grating which you speak of?—It comes over the wall as well.

128. It can come over the wall only when it is a very high tide indeed, two feet above Trinity?—Yes.

129. But it might come into the garden when it is only a moderate tide?—When it is a moderate tide.

130. If you were to embank ever so high it would not cure that, would it?—No, certainly not, and it would not cure it, I am afraid, for the neighbourhood, unless the wall was made watertight.

131. The water comes from a grating, and then through the gate?—It first comes through the grating, and then rushes over the wall through the palace gates.

132. But still if the water came one inch below the coping of Bishop's Walk, it would go in?—I do not know that it would; I think that it must come over the wall before it would rush into the palace.

re-erection show our intention of raising the whole of the wharf the one foot higher, so as to prevent the access of the floods inland.

137. You are now alluding to Cotton's Wharf?—Yes; Cotton's and the Depot Warehouses at Scovell's Wharf; it is next to Humphrey's Wharf. We are going to rebuild the whole of the warehouses, and we have arranged to raise them a foot higher than they are now from the river. From what cause I can hardly say but certainly, prior to the last four or five years, in our experience, we had imagined that the height of the tides in the Thames had been greater; that there had been a gradual and imperceptible rise in them. The old Commissioners of Sewers had the power, and I believe that the same power was conferred in the Sewers' Act of 1848, (and I think that in the present Local Management Act it is also transferred to the vestries and district boards,) to take wharf walls, embankments, and all the river side obstructions to the water under their peculiar control. I remember perfectly well being engaged for the East Country Dock, (at that time, about 16 or 17 years ago,) when there had been a commission appointed, and several of the wharves and docks upon the south side of the Thames received notice from the then Commissioners of Sewers to raise the river banks, and they were raised accordingly, because I was engaged on behalf of the East Country Dock, and they were raised there. That power, I believe, is now vested in the vestries and district boards; but certainly, as far as my own experience goes, I think that that is one of the mistakes, if I may be allowed to observe upon the matter, of the Metropolis Local Management Act, in giving such a power as that, which has never been exerted within my own knowledge, to a local board, a district board, or a vestry board. I know of no case in which it has been worked upon by them; and it is a thing which certainly the present Metropolitan Sewers Board and the Thames Conservancy Board should have under their jurisdiction.

138. District boards and vestries are empowered to compel proprietors to raise their banks, wharves, and docks, abutting upon any river, but they are not required to compel them to do so?—Yes; they have power themselves to cause them to be done, but they have not exercised that power; it is not compulsory upon the proprietors.

139. You have spoken of those parts very near to London Bridge and a little way down the river on

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that side. Does your knowledge of the state of the wharves extend any considerable distance down towards Rotherhithe and Bermondsey?—There is a very perceptible difference between the circumstances as to an embankment extending from London Bridge down St. Olave's and St. John's parishes and a great part of Bermondsey and Rotherhithe, because most of the warehouses there are built upon the edge of the wall, and the wharf walls are of course substantially built of bricks or stone; but lower down, along Rotherhithe, many of the embankments are merely formed of timber piling and timber planking, and I know that in many instances some of them are only backed up by the earth; they are consequently very insecure. Most of the property down there is of a very inferior character, and much of it is used merely as depots for timber and stone. I refer especially to the premises in Rotherhithe which were for so many years mortgaged to the Atlas Company; that property is now taken by a company who occupy it for creosoting, and they have a great quantity of timber, and that is only a timber wharf. Lately, in Rotherhithe, great improvements have been made in that respect; many of the proprietors have thought it worth their while to put and are now engaged in putting timber jetties in front, planked and piled, but not more.

140. Such a structure as that, if properly done, and carried high enough, would, as far as it goes, prevent any overflowing of the river into the lands behind?—I think that it ought to be backed to some extent. Some years ago I had a timber embankment in Deptford Creek, where I did that. If you make it of concrete, formed with hydraulic lime, it becomes a good and solid embankment, and I think is sufficient for the purpose.

141. Are you of opinion that if the proprietors were called upon and compelled to make substantial embankments, either by walls or by woodwork, substantial and solid, and of a sufficient height, that would prevent the recurrence of the evil which now exists from the water running behind?—Yes. Our sewers there, which are the reservoirs at the present time for the sewage matter for three or four hours before and after high water, are sometimes three parts full, but still they are well trapped at the river, and very little damage arises from that source. We have had one or two instances of it in Saint Olave's Parish where the water has come into the district; but otherwise, from the general care of the sluice keepers, extending, as far as I know, from London Bridge down to Rotherhithe, we certainly have very little, if any, accident from that cause.

142. And probably when the new system of sewage is completed there will be no inconvenience from sewage matter?—I have no reason to imagine any. I do not know of any at the present moment, from that cause.

143. Are you of opinion that it would be very desirable that the local boards should not only have authority to compel proprietors to make proper embankments, but that they should be required to compel them to do so?—With regard to local boards, I rather doubt the propriety of the authority being given to them, because I do not think that local boards would work with the unanimity with which they ought to work.

144. A local board has jurisdiction, we will say, along half a mile of the shore. What uniformity of action is necessary between that local board and another local board which takes another half mile. If each is compelled to do its own portion, is any joint action necessary?—No; but in local boards, I think, there is not sufficient liberality or generosity of action to give that power to them, because I was myself a member of a local board for two or three years, and I think that for a board to deal with a case of that sort it requires a liberal, a generous, and a comprehensive feeling with regard to those things, and my experience is this, I would rather go to the Thames Conservancy Board, or I would rather go to the Metro-

politan Board of Works, because I believe that those boards are generally composed of men of good sound sense, men of enlarged views and liberal education. With regard to district boards generally, that is not so, and my own experience is, that there is a confined and cramped action mixed with much personal feeling; there is too often times a dealing with men and not with measures. I was myself for two or three years a member of a board, until I left it, sorry to find that men could meet and talk against each other and against time, instead of dealing with what was for the benefit of the public. And with regard to combined action, and things of that sort, I do not think that the officers generally of those boards are competent to deal with the question of embankments, &c., because they have not been so brought up. Many of them are the mere surveyors; they are neither architects nor engineers, and I think that one of the great errors of the working of those things is this, that the right man is not put in the right place. Engineering is a profession which requires a great deal of attention and practical experience.

145. (*Captain Galton.*) In altering wharves have you to submit the plans to a district board or authority?—No; only to the Thames Conservancy Board.

146. Supposing it is merely that you are rebuilding an existing wharf have you to submit that to the Thames Conservancy Board?—I do not know that there is any power compelling us to do so. I certainly should do so as a matter of courtesy and security.

147. Then the Thames Conservancy Board could suggest the raising of the wharves, I suppose?—I do not think that they have the power to do it. In making our sections for them we always have to give them the height with regard to Trinity high-water mark, and the various sections are made in relation thereto.

148. Their power is as to encroachments upon the tide of the river?—As to projections into the river.

149. The district to which you have particularly attended is below London Bridge, I think?—Yes; and just on the upper side of London Bridge.

150. You are a district surveyor of buildings, are you not?—Yes.

151. What district is that?—Rotherhithe, Deptford in Surrey, and also part of Camberwell.

152. Does the building of warehouses come under you?—Yes. I think that the district surveyors are generally men who are presumed to be men of some knowledge, and some position and status in the profession, and some experience. Wharf walls, jetties, embankments, and so on, by the Building Act, are excluded from their supervision. Now, I have myself seen along Rotherhithe works going on which I should certainly not wish to have under my care. Persons unfortunately take ground for a short term, and of course their object is to occupy a certain space of ground at as low a rent as they possibly can; the outlay, of course, which they first make, forms a part of the ultimate rent, and too often have I thus seen, not only the exceedingly careless manner in which the workmanship has been done, but also the inferior character of the materials as well. That is beyond the supervision of the district surveyor, and I think that there is really no supervision given to it, and I think that it is exceedingly essential that the power should be exercised by some board, not only with regard to the *modus operandi*, but also with regard to the materials used in forming the embankment.

153. Does the district of Rotherhithe suffer much from flooding in the basements of the houses?—It does. I think that my district has about 2½ miles fronting to the River Thames.

154. And what breadth?—The breadth inland is considerable; my district extends more than a mile south of New Cross.

155. And the greater part of that is below the

level of high water, I suppose?—Yes; six or eight feet in a large portion of Rotherhithe.

156. And there is no power of compelling the inhabitants in building new houses to take care and keep them above the level of the ground?—None at all.

157. (*Mr. Theaites.*) The difficulty in your mind with reference to embankment is that the power now vested in the district boards is a dead letter?—It has proved itself so. I know of no case where the power has been exercised by the district board. Mr. Taylor, a member of the Lambeth board, has said that he did not know that the vestries had the power, but I believe that one of the sections (69) of the Act gives them the power, the same power which was given to the Sewers Commissioners in 1848, and which the old commission possessed, has been transferred to the vestries and district boards.

158. Then, in your opinion, whatever body might in future be entrusted with that jurisdiction should be a body to have general jurisdiction over the frontage of the river, and you think that it should not be left to the action of the individual parishes?—I think so.

159. You have spoken of local bodies not putting the Act in force; does any difficulty at all arise from the fact of those wharfingers being large ratepayers who exercise any influence over the boards?—I am not aware that that is the case; there is a great deal of independence, I admit, amongst those boards.

160. In your judgment the power to compel the wharfingers to raise their wharves, and to deal generally and continuously with the bank of the river, should be vested in some independent body having jurisdiction over the whole?—That is my feeling about it.

161. What has been the effect of the flooding in your district; the effect upon the poor, for instance?—Of course the houses have been very damp. In Rotherhithe at times they are obliged to go about in boats; and so high up as Mill Lane in St. Olave's, and St. John's Horsleydown and Shad Thames, the houses and warehouses have also been much flooded. If you walk from Pickle Herring Wharf along the waterside by the footpath which takes you through Symon's wharf, and down the riverside, you will find the loopholes to the warehouses closed, and every precaution taken; there are grooved sills to put boards in three or four feet up; and in spring tides, when they expect flooding, you will find the boards put in, and banked up also with stiff clay.

162. Of course the raising of the walls in front of the wharves, within the Bermondsey district, for example, unless it was extended to Rotherhithe, would be of very little advantage, because the water would find its way, and flood the district, notwithstanding that?—Certainly it should be done as far down as Deptford Creek. I think that it would be to the interest of the parties along the shore to do it; and especially following out Walker and Burgess's plan, which is laid down on the south side of the shore, on account of the very narrow depths of many of the properties there, I think that it would answer the purpose of the parties to do so, and if it were under a commission I think that if some little compulsory power were exercised in this matter it would be advisable.

163. (*Captain Burstal.*) Do you know of any instances where the water comes over the river banks, and thence into the streets, in the localities to which you have referred; take Bermondsey, for example?—In many instances the overflow has been from that source.

164. And not from the sewer?—Not from the sewer, decidedly.

165. Do you know of any flooding from rains?—No; but the water has of course been assisted by the rains and the strong winds.

166. But do you know of the rain having been alone the cause?—I do not know that personally. My general information with regard to all the flooding

which has taken place there is that the flooding has come over the river banks.

167. Have you any idea of the general height of the wharves from Deptford Dockyard up to the Tunnel?—No.

168. You have never seen a section of it?—I have not.

169. Are you under the impression that they are low, and that the water would flow over them?—Some of them at Rotherhithe I know are low, and the water does flow over them. At London Bridge I think that Cotton's Wharf and Humphery's Wharf are about three feet eight to four feet above Trinity high-water mark.

170. That is high?—Yes.

171. Do you imagine that the supervision of these wharves generally from time to time would come more directly from the officers employed on the river, or do you think that it would come more directly from the vestries?—I think more directly from the officers employed on the river. There is one thing which might be remarked; namely, there may be a slight difficulty about it, because it is a supervision to prevent an evil which will affect the vestries and district boards. I admit that there may be a conflicting power there; but my own impression is this, that as the Metropolitan Board have in all cases power over the grand trunk sewers it might be a power delegated to them.

172. So as to protect the inland property?—So as to protect the inland property, because with them of course is the grand power of protecting and maintaining those things. We should have, in my opinion, a much more effective system of doing it.

173. You think that at places where the land recedes, and where eddies form now, such as at St. Saviour's Dock, the river may fairly be embanked out to a certain line?—Do you mean that the line might be continued?

174. Yes.—That of course would interfere with vested interests up the dock.

175. I mean leaving open a space for the dock. From Fore-and-Aft Dock down to Springall's you think that that part of the river opposite St. Saviour's Dock may be embanked with benefit to the river itself and to the locality?—Unquestionably, and I should say with benefit to the individuals as well.

176. Giving them so much additional territory where it is now narrower?—Yes; the warehouse property is at present so narrow that it would be a benefit.

177. Is the construction of embankments too expensive for the people themselves there to do it?—That depends of course upon the interest which they have in them. For myself if I had a long lease I should only be too glad to do it.

178. With reference to the wharves which you have been making in the last two or three years, do you bear in mind the height above Trinity to which you make the coping?—We are always compelled to do it by the Thames Conservancy Board; we always keep that point in view, more especially, because in the sections which we are compelled to send to the Thames Conservancy Board we are especially compelled to refer to Trinity high-water mark, as I have before observed.

179. (*Chairman.*) I suppose that if there were a public body to whom this matter was committed the right thing to do in your opinion would be this,—to give the public body the right to embank such parts as you speak of, but allowing each individual proprietor to contribute to the cost of what might lie in front of his premises, and if you did not suffer him to contribute by laying down capital, still that he should do it in the shape of a rentcharge which should compensate for the outlay?—Yes; to be paid off in a given time. That would be a great benefit, and I think that many persons would be too glad, under those circumstances to accept of the boon offered.

180. Do you think that you can give us any further information?—I am not aware of it, unless you have

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any specific question to put to me. I have not come as a voluntary witness here. I am pleased, of course, to obey your summons. The great question would be the section for the embankment. I need not say that many parts of the river are much more favourable than others, with regard to the depth of it. Some of our embankment walls where we have had to put warehouses upon them have cost us 20*l.* a foot run, and in timber it has been under 5*l.*; it varies from that to 20*l.*

181. What should you say as to the possibility of making a thoroughfare along the river in front of the wharves? Take Cotton's Wharf and the other wharves, can you conceive the possibility of a roadway being made between the front of those wharves and the river?—Upon the first blush of the thing, I can hardly see that it would be a matter to be appreciated. I do not think that the benefit to be gained would sufficiently compensate for the outlay. I do not see the practical necessity for it. All that district is a large circle to the river, and as the great business of that district is access from Bermondsey down to the Grand Surrey Docks and the Commercial Docks, they would prefer a shorter route, and with the indents there a roadway would be an inconvenience, and as far as wharf business goes impracticable.

182. You think that a roadway between the business and the river would be injurious there? I am speaking of a thoroughfare along the river?—I do not think that in that part of the river the thing is at all practicable. I am alluding to the east side of London Bridge.

183. You think that it would inflict too great an injury on the business?—Unquestionably the most valuable wharf property which we have in London is on the east side of the new bridge for some way down, and I think that the little benefit which would be derivable from such a roadway would ill compensate for the interference with the rights of the wharfingers there.

184. That is to say, that if you were to impose such an inconvenience on the business you would have to pay compensation?—Very largely, decidedly.

185. And you think that no kind of roadway or

thoroughfare could be constructed which would not necessitate a large amount of compensation?—Certainly.

186. You are speaking now in reference to the front of Cotton's Wharf?—I am speaking now of the wharves east of London Bridge some way down. The wharf property, as you get lower down to St. John's, diminishes very perceptibly in its value. There is an immense difference in value (because I have lately been called in to advise upon that), as wharf property, between that property of which I have last spoken and Cotton's Wharf and Humphery's Wharf; the value of wharf property lower down is nearly 50 per cent. less than in the other portions.

187. To bring you a little higher up, you no doubt are well acquainted with the condition of the river between Blackfriars Bridge and Westminster Bridge?—Yes.

188. Should you think that a roadway along the front of those wharves could be tolerated?—That I think is more probable, because there is not so much traffic or business done there, and it does not necessarily bring a large tonnage of vessels up there, because beyond London Bridge they cannot go, and I think that a roadway and embankment of that sort would be perhaps almost as much a pleasure as a business road.

189. Between Blackfriars Bridge and Westminster Bridge is it not a fact that every linear yard is occupied by business?—Yes, I believe so.

190. Beginning with the British Plate Glass Company, and then you go on with various timber yards, lime wharves, and coal wharves?—Yes, mostly occupied for inland goods.

191. To whatever business is carried on there must not inconvenience result from any roadway between the front of the wharves and the river?—No doubt. I have very little knowledge with regard to the amount of access to those wharves, by barges and so on; of course it must be entirely dependent upon that. I know full well of course that the same proportion of business at the wharves above bridge cannot exist which does below.

The witness withdrew.

Adjourned to Saturday next at 12 o'clock.

Saturday, 21st December 1861.

PRESENT :

Major-Gen. Sir JOSHUA JEBB, K.C.B.
JOHN THWAITES, Esq.
Captain D. GALTON, R.E.

Captain BURSTAL, R.N.
HENRY ARTHUR HUNT, Esq.

Captain D. GALTON in the Chair.

FREDERICK DOULTON, Esq., examined.

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192. (*Chairman.*) You are one of the members of the Metropolitan Board of Works?—I am.

193. You live on the south side of the Thames?—Yes.

194. You have had some experience of the evils which are felt in consequence of the present state of the river side?—Yes.

195. Can you give us an account of some of those evils?—Yes. Am I to understand that the Commission have yet come to any determination as to the necessity of a southern embankment?

196. The Commissioners are desirous of receiving evidence upon the necessity of a southern embankment.—Then perhaps I had better hand in at once a resolution which was passed last evening at a meeting of the representatives of the southern parishes, asking the Commission kindly to afford the southern parishes an opportunity of giving evidence upon that question. (*The witness delivered in the same.*)

The arguments in favour of a southern embankment appear to me to be based upon three very simple facts, and they are these:—first, that we are periodically subjected to floods of a very disastrous character; secondly, that we also suffer from pestilential mud banks on the southern shore; and, thirdly, that we require an embankment on the southern side to afford us increased facilities for traffic. Those are the three points which appear to me to be the basis of any argument in favour of a southern embankment. The floods of which we complain affect two classes of inhabitants, and in a different manner; they affect the poorer class of our inhabitants, and they affect also, though not to the same extent or in the same manner, the manufacturers and wharfingers. They affect the poor most disastrously; between Westminster Bridge and Nine Elms there are some hundreds of habitations in which are located the very poorest class of the inhabitants of Lambeth; they are

for the most part persons who do not occupy an entire house, but who reside in apartments.

197. Does your evidence relate chiefly to the portion between Nine Elms and Westminster?—It relates chiefly to the portion from Westminster to Nine Elms or Battersea; the remarks which I make affect in some degree also the other parts, but still that is the portion of the southern shore to which I particularly direct my remarks. The inhabitants of those houses have sometimes one, sometimes two rooms, and the consequence is, that when these floods occur, and not only then but in ordinary high tides, the inhabitants of those rooms are either compelled to seek shelter in the upper part of the house, where there are other lodgers, or, as is very often the case, are driven into the streets until those floods have subsided. These poor creatures return, the moment the floods are over, into their soddened houses, and I need scarcely point out the amount of disease which is inevitably generated by such a state of things. That is how it affects our poorer inhabitants. But these floods also affect to a considerable extent the manufacturers and wharfingers. The case of the firm with which I am connected is perhaps the case of many other manufacturers in Lambeth and in Vauxhall, and also lower down the river between Westminster and Blackfriars. We have wharf property immediately abutting on the river; on the other side of the street we have our manufactory; and not only upon the occasions to which I have referred, when we have these heavy floods, but when we have very high spring tides, which occur, perhaps, thirteen or fourteen times in a year, our manufactory is completely and entirely shut off from our wharf. On one side of the road we have our wharf; on the other our manufactory. Our business requires a communication to be made almost every minute in the day from one portion of our works to another; yet the occasions arise, not only when we have these floods, but when we have high tides, in which our manufactory is completely and entirely separated from our wharf, and that is how the high tides to which I have referred affect wharfingers,—manufacturers along the southern shore.

198. Will you explain what are the different causes of the floods and of the high tides? You distinguish the floods from the high tides. Are the floods from the rainfall?—If we have a strong westerly wind, for instance, blowing down the river, sometimes its direction is suddenly reversed to due east, and we have it blowing up the river; if that occurs at the time of high spring tides then we have an overflow over the banks, and all our low localities are flooded; but we very often have in Lambeth ordinary high tides, and even then one portion of our works is shut off from communication with another. We have also on the southern shore a large extent of mud banks. The acreage of these is far greater than on the northern shore; and with regard to those districts immediately adjoining these mud banks, medical evidence will be given to-day to the Commission showing that these localities are never free from many and very serious cases of fever. That is a point which will come more within the province of the medical officer of Lambeth, who, I believe, is summoned to give evidence to-day. It has appeared to us that the only remedy, for the mud banks at any rate, would be an embankment on the southern shore. Then again we need improved communications. Of course upon this question I am simply giving my individual opinion. That opinion undoubtedly is, that, taking that portion of the southern shore from Westminster to London Bridge, we do not require increased facilities for traffic. A new street is at present being constructed, which is known by the name of the Southwark Improvement; that is brought, I believe, quite to Westminster Bridge. A railway is also being constructed from Charing Cross to London Bridge; and my own opinion is that that portion of the southern side will then be well provided with the means for traffic, with certain small improvements which would necessarily be carried out. But when we come higher up than Westminster Bridge

the case presents altogether a different aspect. I will divide the portion from Westminster to Vauxhall into two sections. I will take first from Westminster Bridge to Lambeth Palace, there we have a roadway about half the distance; running parallel with the river; the other half is only a footway. The consequence is that all the traffic coming from Westminster and from the western districts to Lambeth has to traverse the whole extent of the Westminster Road to Maudslay's manufactory, round Hercules Buildings, and then down the whole extent of Church Street to get to High Street, Lambeth, and the wharf property there. That distance is a little more than half a mile. If the new street is opened from Lambeth Palace to Westminster that distance would be shortened one-half. If that is an inconvenience at the present time, it will be greatly aggravated next year. A new bridge is at present being constructed at Lambeth; it will be opened, we are given to understand, next year. All the traffic from Belgravia and Pimlico which is directed to Southwark and to the South-eastern Railway would, if that street were opened, come over Lambeth Bridge, and then there would be a direct line of communication from Lambeth Bridge to the South-eastern Railway, through the new street which is being constructed. Then if I take the other section from Lambeth Palace to Vauxhall Bridge, the case is quite as bad if not worse. There is an enormous amount of traffic going to the Nine Elms railway station. All that traffic from Westminster and even from Waterloo Bridge, and from all the manufactories in that district, has to take one or two courses in order to get to the Nine Elms station; either through Lambeth Walk and Vauxhall Walk, or through High Street and Princes Street. Those are the two directions in which the traffic is taken. Now the average width of the one route, through High Street and Princes Street, is something like, taking the whole extent, pathways and roadway, 22 or 23 feet. The other route is Vauxhall Walk and Lambeth Walk, and the average width of Vauxhall Walk, including pathways, is about 28 or 30 feet. The traffic which goes through those streets is something enormous; it is not traffic by which we are benefited, but it is through traffic from other parts of the metropolis to the Nine Elms station. Just now the goods stations at Nine Elms are being enlarged, and the traffic is of course greatly increasing, so that the difficulties which we have in communications will be aggravated every year. It is not an uncommon thing for a stoppage to occur in Princes Street and again in Vauxhall Walk for ten minutes or a quarter of an hour at a time, with traffic brought, not from our manufactories, but from distant parts going to the Nine Elms railway station. Of course that would be remedied by an embankment from Vauxhall Bridge or Nine Elms straight up to Lambeth church, and from Lambeth church the traffic would go down the new street which is proposed to be constructed. So that the Commissioners will gather from what I have said that my opinion is, that from Westminster Bridge to London Bridge we want simply a solid embankment, something which will prevent the floodings, and affect but to a very slight degree the wharf property [the only effect generally would be, that it would give to the wharf property a considerable piece of land in front of the wharves]; but that from Westminster Bridge upwards to Battersea and Nine Elms we want an embankment, and also a new street. Whether that new street should be constructed on the embankment, or whether it should be constructed by widening an existing thoroughfare which runs parallel with the river, is of course a question upon which I can hardly offer an opinion; it is an engineering question. It can be made either by a road on the top of an embankment, or by widening the existing narrow thoroughfares which run at the back of the wharf property. Of course the Commission will see that I have assumed at once that any embankment to meet the evils of which we complain must be of greater extent than the embankment on the northern side,

*F. Doulton,
Esq.*

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which it is proposed should commence at Westminster Bridge; but the Commission will bear in mind this fact, that, with the exception of a very small portion indeed on the northern side, between the Houses of Parliament and the Penitentiary, the whole of the northern side is really embanked up to Chelsea; so that though the proposed embankment is to commence at Westminster, it is embanked up to Chelsea, with the exception of a very small portion of the northern shore exactly opposite Lambeth Palace. But if a plan were carried out such as I have suggested, which would interfere very little indeed with the wharf property, the expense would be very small in comparison with that of the northern embankment. I have seen some short reports of the evidence which was given before the Commission on the previous occasion, and I notice that a query was suggested as to whether or not the evil of which we complain on the southern shore would be remedied by heightening existing wharf walls. Now it appears to me that all the money so expended would be completely thrown away. Difficulties at once present themselves. The first is this:—you have the difficulty of dealing with those open docks and ways, which are 10 or 12 in number, taking only the distance from Westminster Bridge to Battersea. To alter those ways in the manner proposed would be interfering to a great extent with the existing thoroughfares, which could not possibly be done unless in connexion with a new street. Then you have another difficulty, namely, that it would really involve an entire re-construction. During the last day or two I have gone up the river from Westminster to Battersea, and I have observed what no one can fail to observe who goes up it, that it would involve an entire reconstruction of the whole of the present wharf walls. In many cases they are simply wooden walls, and where they are brick walls they are so old and of such bad construction that the tide now forces its way through them; and even in many cases the wharfingers have raised the flooring of their wharves, and allowed the tide to force its way underneath into the street at the back. And if that is so now, and if it would involve a reconstruction of those wharf walls even under the circumstances which exist at the present time, it would be certain that that reconstruction will be still more necessary when you have what indeed is part and parcel of the northern scheme, namely, the dredging. Inevitably, then, even supposing that the wharf walls were stronger than they are now, it would materially affect them. But looking at it as it is now, any attempt to patch the thing up by putting a few courses of brickwork over the existing wharf walls would appear to me to utterly entirely fail to meet the great evils of which we complain. It certainly would not meet the evils of flooding; but even if it would, are we to be left to the evils consequent upon the mud banks? The medical evidence which will be given will show that they are of a most pestilential character; and certainly if you raised the existing walls even two or three feet, you would still leave us with all the evils consequent on the mud banks. Then again we should be still left as we were with relation to the question of improved communications. I cannot lay before this Commission at the present time any particulars as to the amount of traffic going through those narrow streets, but it is very great; at any rate there is no inhabitant of that district but will say that it is a large and increasing traffic, and that some provision must speedily be made for it. I do not think there can be any doubt that an embankment will remove the evils of which we complain. I think that no other course will remove them; and if there are some doubts upon that question, we really think that we have a right to ask that we shall have an embankment, with the general advantages which, doubtless, will result from it. We pay a very large proportion to the fund from which the northern embankment is to be defrayed. I believe that on the southern side, consequent upon the extensive manufactories which there are there, we actually pay half the sum derived

from the coal tax. It would be poor satisfaction to us, who are manufacturers on the southern side, to see a large work being carried out on the northern side to which we were contributing, and from which we were claiming no benefit. Our firm pay in coal tax between 500*l.* and 600*l.* a year, which we shall be paying, of course, for the next 10 or the next 15 years, and we shall continue to be impeded in our business and manufactory through these floodings, unless these improvements are carried out. Those are the chief points which occur to me. I shall be happy to answer any question which the Commissioners may desire to put to me.

199. Would not that argument which you have mentioned apply generally, namely, that every part of the metropolis should receive some benefit from the proceeds of the coal tax?—I think that if the northern side is embanked all the northern inhabitants will be benefited; and I think that if the southern side is embanked, all the southern inhabitants will be benefited to a greater or less extent.

200. I suppose that one cause of the traffic being so very large through those streets which you have mentioned is because Vauxhall Bridge is a toll bridge. The traffic from Westminster would go by Vauxhall Bridge to Nine Elms if it was a not toll bridge?—On the northern side, but not on the southern side.

201. Do the floods occur by the water flowing up through the sewers, or by its flowing over the banks?—The floods to which I have referred have no connexion at all with the water flowing through the sewers. If you go inland to Brixton Road and the Oval at Kennington, and some parts of South Lambeth, there are there occasional floods through the water coming up the sewers; but the floods to which I have referred have nothing whatever to do with that, and oftentimes you will find that the sewers are comparatively empty while we have floods in the lower parts of Lambeth.

202. The water flows over the banks, and then fills the sewers?—Over the banks and over the wharves, and through the wharves,—through the wharf walls.

203. The floods partly occur in consequence of the bad condition of the present wharf walls; the water goes through the wharf walls, in fact?—Yes; but in all the part to which I have referred it flows over the wharf wall in the whole extent.

204. Would it be injurious to the public to abolish the existing free landing places which you have mentioned?—Very injurious indeed. I do not know the tonnage, but it is something enormous, which is landed at those free landing places.

205. Therefore any embankment which was made should have landing places alongside it, I presume?—That must necessarily be so. I should think that at one of the free docks to which I have referred, from what I have seen, probably 2,000 tons are carted up that one free dock every week.

206. Then any road which was made along the side of the river between Westminster and Nine Elms would be subject to a very considerable amount of traffic being landed upon it?—It would have to be carried out, I imagine, in connexion with an arrangement for these landing-places.

207. With reference to the mud banks, do not you anticipate that a very considerable diminution of the evil complained of with respect to them will take place when the main drainage is completed?—There is no doubt that that will affect it to some extent, but I believe that the existing mud banks will remain, unless some means are taken to remove them. I do not think that the simple transference of the sewage will remove them for many years.

208. The objectionable nature of those banks, I presume, is partly due to the deposit of the sewage?—Yes, there is no doubt of it.

209. (*Sir Joshua Jebb.*) You said that the communication between your manufactory and the wharf was cut off at certain times?—Yes.

210. Do you mean that the road is flooded, or that the wharf only is flooded?—The road is flooded.

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211. Then any improvement in that respect would involve some alteration in the level of the roads; any alteration with a view to the raising of the wharf would involve also the raising of the communications of the roads?—If an embankment were carried out I imagine that it would at once remedy the evil.

212. There is one point on which I should like to ask you a question, respecting the proceedings to be adopted above Westminster Bridge and below it. If I understood you rightly, I gleaned that you would recommend a solid embankment above Westminster Bridge?—Below Westminster Bridge; from Westminster Bridge to London Bridge.

213. In that case should you have any convenience for carrying on the trade inside the embankment?—No.

214. Nothing but the wharf?—I would immediately extend property where new land was reclaimed; it would, generally speaking, increase the size of those different wharves.

215. If a solid embankment were made, taking in the general line of this mud bank, there would still be required a very large waterway for carrying on the trade, for the barges to lie, and for the timber which now lies there?—Of course they would lie alongside the embankment, I imagine.

216. How much space, do you suppose, that that would take up in the river?—I have not considered that question; it is rather an engineering question.

217. That has an important bearing upon the question, because of course there must be retained a certain width of water way in the river, say, 1,000 feet, or whatever it may be?—Yes.

218. If that is to be taken up in a great measure by timber lying there and by barges, it will make a very great difference?—Of course. That would be considered in determining any line of embankment.

219. Probably you saw some of the plans which were submitted for the northern shore?—Yes, I did.

220. Most of which contained openings for docks within the embankment, for the purposes of commerce?—Yes.

221. You would not approve of that kind of thing on the south side?—I think that that would be an interference with the wharf property which is not needed. Of course when the northern embankment is carried out it will be more than ever necessary that the opportunities for business carried on by wharves should be kept intact on the southern side.

222. Perhaps you would merely contemplate a general embankment, not very far in advance of the present wharves?—That is my own impression, that it is not required very far in advance.

223. Have you formed any notion of the positive distance?—No, I have not all.

224. Then you contemplate no difference in the mode of carrying out the works above Westminster Bridge and below it; you would have a solid embankment both above and below Westminster Bridge?—Above Westminster Bridge we want an embankment with an improved communication; below Westminster Bridge we want simply an embankment.

225. (*Mr. Thwaites.*) You have referred to the effects of flooding on the wharf property, and to the interruption which is caused to the general traffic and to the trade on the banks of the river. Can you inform the Commission as to the extent of that flooding inland?—When we have what are known by the name of floods [we had, I think, six or seven last year,] as far as I can recollect the water flows about 220 to 250 yards inland.

226. Upon the average?—Yes.

227. Are you aware of the Ordnance levels, taking for instance, your own wharf, from that point inland? You probably have not the particular figures with you?—No, I have not.

228. You have stated that the mere repair of the present wharf-walls would not meet the evils of which you have complained; first, because those wharf-walls, as a general rule, are in such an imperfect condition that

they would not bear that addition, and that they would be likely to be acted upon by the tide, especially if any amount of dredging were carried on in the centre of the river; that is your opinion?—Yes.

229. And you are therefore of opinion that we ought to have a distinct river-wall of solid embankment from London Bridge, as the case may be, to Westminster, and from Westminster upwards, with a roadway on the embankment, if it could be carried out, having regard to the convenience of the wharfers upon the river?—Yes.

230. You have spoken of the area of the mud banks on the south side as being much greater than that on the north. Have you any figures on that subject?—I have not.

231. But you judge, I suppose, from the plans which are familiar to the public?—Yes; and I have also gone about the river for the express purpose of looking myself.

232. Supposing that a distinct river-wall were built on the south side, and these mud banks dredged, so that you would have a constant depth of water up to the wall, would not that be a much more convenient state of things than the present mud banks, with the barges stranded upon them?—No doubt.

233. Is it your experience that for all purposes of trade it would be better that a barge should float than that it should lie on a bank?—Yes.

234. The way in front of Lambeth Palace is narrow; it is not a roadway?—It is a mere footpath.

235. That could be extended without difficulty, into a sufficient roadway?—Yes, and at a very moderate cost, I should think. There is no property of any value which would interfere with it.

236. When you speak of the contributions of the residents on the south side to the general expense of an embankment on the north as being unjust to them, do you refer to the fact that they are suffering from evils much greater than those experienced by the persons on the north, and that they would be left to endure those evils without any remedy, supposing that no embankment were made on the south side?—Yes.

237. And you therefore conclude that it is an injustice to those who are contributing on the south towards a northern embankment, by having one side embanked and the other left without a remedy being applied?—Yes.

238. Of course the right on the north side or on the south would be to have a general metropolitan improvement in which all parties would participate?—Yes.

239. At what point does the new bridge cross the river above the Houses of Parliament?—It is from the Horseferry to the landing-place at Lambeth Stairs; it will be in a line with Church Street.

240. As soon as that bridge is completed, it will, in your judgment, increase the traffic on the south side, and therefore increase the evil?—There is no doubt of it; the traffic will be increased not only from that side, but also by reason of the fact that the displacement of the wharf property on the north side will bring over more trade on the south.

241. With respect to the new bridge relieving Westminster Bridge, as is contemplated, if the present inconvenient communication on the south side remained unimproved, parties would probably still use Westminster Bridge, rather than make use of the new bridge, and take a shorter cut to the south?—Certainly; no one would think of coming over Lambeth Bridge to get to the new street at Southwark. He would go over Westminster Bridge, unless we had the improved communication to which I have referred.

242. Am I to understand that your idea of a street is confined to the point at Westminster Bridge and that of the new bridge?—From Westminster Bridge up to Nine Elms.

243. From what you know of the requirements of trade on the south side, and especially having regard to a probable embankment on the north, which would

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displace a large number of wharfingers, is it your opinion that it would be inconvenient and injurious to displace any number of wharves on the south side?—I think it would; and inasmuch as the principal wharf property on the south side is between Westminster and London Bridge, it does not seem necessary to interfere with it at all.

244. From your knowledge of the trade now carried on upon the northern bank, which must necessarily be removed by an embankment there of a solid nature, those traders would, in all probability, seek wharves on the southern side to carry on their business there?—Yes.

245. And you would not propose between Westminster Bridge and London Bridge that there should be, for street purposes, any interference with existing wharves?—Certainly not.

246. But where there is a roadway in front of an inconvenient width, that might be advantageously extended?—Yes.

247. And where there is no roadway you would not propose to go to the great expense of the destruction of those wharves, which should be continued through-out?—Just so.

248. (*Captain Burstal.*) The district to which you refer more particularly as being flooded by the water from the river is, I apprehend, between Bishop's Walk and Vauxhall Bridge?—No; between Westminster Bridge and Vauxhall Bridge.

249. Did you ever know it flooded at Stangate, or is that a matter of very rare occurrence?—Not so frequently as the lower parts of Lambeth. I have known the upper part of Stangate to be quite impassable.

250. Ferry Street and Fore Street, Lambeth, are the principal places which suffer?—Yes; the whole extent of Fore Street.

251. The water comes over Bishop's Walk, no doubt; but does it generally come over the wharves, between Lambeth church and Vauxhall Bridge, or more particularly up the parish ways?—It comes over the wharves. We have a wharf immediately on the banks, and the water is sometimes eighteen inches high.

252. The streets, of course, being lower, there would be deeper water in the streets than there is over the coping of the walls?—Yes.

253. When the main sewer is finished do you think that the water from which you now suffer from land floods will run into the land sewer, and that therefore the evil will not be considerable, or will be diminished?—Certainly. I think that the occasional floodings which take place in the Brixton Road and some parts of South Lambeth and Kennington Oval will be remedied to a great extent by the main drainage, but that the lower parts of Lambeth will be entirely unaffected by it.

254. In what locality between Westminster Bridge and Vauxhall do you consider that the mud banks are so pestilential?—Immediately adjoining Lambeth Palace.

255. Your premises are in Fore Street, Lambeth, I believe?—Yes.

256. The bank there is tolerably clean, is it not; it is gravel?—The bank is generally covered with boats and barges, and it is tolerably clean there. The steamboats at that point come close in upon the shore.

257. Do you think that the mud resting on the bank at the lower part of Bishop's Walk is caused by the want of the wash of the steamers; the steamers cross over to the Houses of Parliament?—They do.

258. And the consequence is that there is not much wave from the steamers?—Very little.

259. It is expended before it comes to the shore?—Yes.

260. And therefore that would probably be a reason for the deposit, which would otherwise be washed off?—There is no doubt that the steamers affect it to a considerable extent.

261. You think that any embankment, if carried out as far as the mud extends in the river, would correct the evil complained of?—Yes, I do.

262. On the Surrey side of the river, more particularly below Waterloo Bridge, the inshore part of the foreshore of the river is all mud, or there is a great quantity of mud?—Yes.

263. After you come out, probably half way to low water-mark, there is a clear and defined line of gravel?—Yes.

264. Looking at the matter in a sanitary point of view, do you think that if that part which is now encumbered with mud was embanked that would do all that was necessary?—Yes.

265. With reference to a nuisance which used to exist, and I do not know whether it exists now, namely, the bone works; there is some very objectionable business carried on in that locality,—Hunt's Bone Works; do you know them at all?—Yes.

266. You have, I dare say, often smelt them?—In times past; very seldom now.

267. The description of property in that locality is not of the very highest character, is it?—No; which is partly owing to the miserable state in which we are; owing to the floodings people will not put up valuable property. Manufactories which are put up there now would be put up in a very different style were they always free from floods.

268. I think you have stated that one of your reasons for being apprehensive of any danger to the present wharves is, that any dredging which might take place in the river would cause them to slip and tumble down?—It would increase the liability to it, I suppose.

269. That, I suppose, would depend upon whether it was dredged near the wharves or not?—There is no doubt that that would have some effect. I believe that, apart from that, it would be necessary to reconstruct them entirely; but I believe that that would add to the necessity.

270. You know that the river between Fore Street, Lambeth, and the Penitentiary is the deepest part of the river on either side?—Yes.

271. Therefore it is questionable whether the bed of the river would be dredged there at all or not?—Higher up than Lambeth, you mean?

272. Yes?—Yes.

273. (*Chairman.*) What is the position of the worst of the mud banks to which you have alluded?—From Lambeth stairs to Westminster Bridge, and below Westminster Bridge again; indeed the whole of the portion below Westminster Bridge, I should imagine, though I am not so certain as to that neighbourhood, is almost as pestilential as the other.

274. (*Mr. Thwaites.*) The worst banks are in front of the Bishop's palace, are they not?—Yes.

275. (*Chairman.*) Have you any idea of the value of the wharf property above Lambeth Palace, as compared with that below the bridge. I mean per wharf. Take as far as the Vinegar Works?—There is none of any considerable value. On that line it would, of course, be of very large value if it were not for the circumstances in which we are placed in relation to the floods. Between Lambeth Palace and Nine Elms the property bears no comparison at all to the value of the wharf property below Westminster Bridge. We have none there of any extent. They are houses.

276. But there are some bone works there?—There are some, but they are mostly on the other side of the street.

277. The narrow row of buildings between the street and the river is of no value as wharves?—Of very little value.

278. Do you know whether any calculation has ever been made as to the cost in the way of damage to property which a flood causes in that district?—I do not; it is very considerable, but it is most felt by our poorer inhabitants.

279. There is a fund raised, is there not, for that purpose?—There has been from time to time, and immediately after any flooding by any high tide a general subscription is made through the neighbourhood to meet the evils under which these poor creatures have suffered.

280. (*Capt. Burstal.*) I understood you to say that a communication was most desirable from Nine Elms eastward?—Yes.

281. At present you have to go up Kennington Lane, and make a detour to the south?—Yes.

282. That is a long route, is it not?—A very long route.

283. And the route which suggests itself to you

would be from Nine Elms, going across into Fore Street, and down by the river up to the York Road?—Yes; into the new street. There would then be a direct line of communication from the South-eastern Railway to the Nine Elms station.

284. And then from the south end of Westminster Bridge you have good and ample communication to London Bridge?—Yes; that is my opinion.

The witness withdrew.

HUGH M'INTOSH, Esq., examined.

285. (*Chairman.*) You are the surveyor, I believe, to the Lambeth Vestry?—I am.

286. You have heard Mr. Doulton's evidence; can you give us any facts relating to the question of flooding which will be of interest to the Commission?—Yes; I can speak strongly and practically in support of all that Mr. Doulton has stated to you. With regard to the facts of the inconvenience and the mischief done, the records of the old Commissioners of Sewers are from time to time loaded with them, and the applications and complaints made to our vestry are now very numerous and distressing; the suffering in that respect is very well known.

287. For how long have you been surveyor to the Lambeth Vestry?—I have been connected with the parish between eleven and twelve years, and surveyor to the vestry since its establishment.

288. Have any efforts been made during that time to relieve the district from flooding in any way?—There has not been any means of relieving it; the cause has been beyond the power of the authorities.

289. Did not the Commissioners of Sewers possess some powers of causing the wharves to be raised?—No powers which they could practically put into operation. Upon various occasions they made an endeavour to exercise those powers, but they always found them inoperative.

290. There was a report by Mr. Creasy, I think, some time ago, in which he recommended certain steps to be taken?—Yes; that was to alleviate flooding in the lower part of the district.

291. Would not that have affected the district in Lambeth?—No; that would more affect floods arising from land waters than those from tidal causes.

292. The report to which I allude is one in which he recommended that steps should be taken to cause the wharfingers to raise the levels of their wharves?—Yes; that was a report upon which steps were endeavoured to be taken, but they were found impracticable.

293. Was not that with respect to the tidal waters?—Yes.

294. And no steps were taken upon it?—Steps were taken in serving notices, but the wharfingers declined to obey the notice, and the Commissioners were unable to enforce them.

295. Had the Commissioners of Sewers no power to enforce their notice?—I believe not.

296. Do you know how the banks on the lower part of the river are protected? Are they not kept up by commissioners of the same nature as the Commissioners of Sewers who existed before the Metropolitan Board of Works was formed?—The original purpose of the Commissioners of Sewers, no doubt, was to maintain those banks, but from a variety of changes and circumstances their duties have become very different from what they were originally intended to be.

297. The old Commissioners of Sewers who had the regulation of the Lambeth district must have had power similar to those which existed lower down the river, I presume?—They never had a power which they could enforce, of late years, to compel the banks to be raised.

298. Can you state the area which is flooded in Lambeth in a high tide?—The area upon the surface varies according to the height of the tide and its duration.

299. What is the greatest extent which you have known; how far back from the river?—From the river to Broad Street, nearly to Lambeth Walk.

300. How far would that be?—I should suppose 250 yards.

301. Is not the flooding further back than that?—The flooding would not be further back than that on the surface, because the water gets relief into the sewers. If it happens that a tidal flood comes at a time when there is much water in the sewers, the sewers get surcharged, and then the basements in the lower part of the district, are flooded and a great deal of injury is done.

302. Are the basements of the houses below the top of high water in the sewers in many cases?—Yes.

303. The Effra, I suppose, has some effect?—The Effra is only influenced by land water.

304. But the tide flows up the Effra to some extent, does it not?—Yes; but it is seldom that the banks are overflowed.

305. Which are the sewers in which you experience the worst flooding?—The Duffield is the worst line, but all the lines of sewers are so connected that upon an occasion of that kind one line can scarcely be distinguished from another.

306. No flooding ever occurs, I presume, from the water flowing into the mouth of the sewer?—No.

307. The sewers are too well trapped for that to take place?—During my experience, only one such occasion has occurred, and that was from the carelessness of the sluice-keeper; but that is quite a different occurrence from what we are now discussing.

308. Have you ever floodings from the rain-water coming down?—Yes.

309. At high tide?—At high tide. That may occur without an overflow. It affects the lower parts of the district; not the river side premises; they lie too high.

310. What portions of the district are chiefly affected by the rain-water flooding?—The part nearest the outlet; the neighbourhood of Broadwall, Stamford Street, and as near as we get to Blackfriars Road.

311. Do you anticipate that the new main sewer will entirely relieve the district from that inconvenience?—Yes, from the rain-water flooding, but not from the tidal floods. Beyond the special floods which occur in the district from the overflow of the river over the walls, there is a daily inconvenience suffered by all the river-side premises in Lambeth, because the subsoil is gravel, and the walls are very bad and rotten, and do not resist the water; it gets through the walls, through the subsoil, and travels with the rise and fall of the tide for a great distance inland; as far as Kennington Oval there are wells which are influenced by the rising and the falling of the tide.

312. Can those wells be used for any purposes?—They are used principally for supplying engines; not for domestic purposes; it would not be very good water. Of course to remedy that would require a new embankment.

313. At what depth is the clay in Lambeth below the surface?—I do not know precisely.

314. (*Captain Burstal.*) 29 feet?—We have no sewer so deep as that.

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315. (*Mr. Thwaites.*) Can you describe to the Commission the general character of the surface of this area which is affected by the floods in Lambeth, and the Ordnance levels as compared with the height of the sills of the wharves?—The surface closely contiguous to the river is higher than the roads inland. Of course that forms an embankment which protects the land from greater flooding than it has. The sewers in that neighbourhood are generally about seven or eight feet below the surface of the roads, and when the water comes over the front walls it flows back into the streets, which are at a lower level, and would continue to flow and increase the surface flooding but for the discharge which it gets into the gully-holes and the sewers. Premises surrounded by walls may be protected from flooding; whereas those which are open get it more severely. The basements are of course flooded, and the amount of flooding depends upon the duration of the tide.

316. While the practical effect of the flooding extends 250 yards, but for the outlet into the sewers it would extend a very much greater distance from the river wall than it does now?—Most certainly; and moreover, from the surface flooding being relieved it very frequently happens that the basements in the lower portions of the district are flooded.

317. From your practical knowledge as the surveyor of the district, is it not one of the effects of this flooding that the sewers become filled with water, and especially during a fall of rain, and that the sewage finds its way into the basements of the houses at a very considerable distance beyond the 250 yards to which you have referred?—Most undoubtedly, for a very great distance; that one would rather estimate by miles than yards.

318. Will you describe any instance which occurs to your own mind?—The difficulty is to select from so many any particular instances. I remember one particular case, perhaps the worst, when an enormous amount of damage was done. I think that was in 1850.

319. Was that by a flood?—A tidal flood during wet weather; it was very bad upon that occasion. On account of the floodings having been less than usual, the various traders and shopkeepers had used their lower premises for storing goods; they thought that the flooding was abated, and this flood came, and injured a great quantity of cheese, bacon, flour, and destroyed a great deal of property. The claims upon the Commission at that time were very heavy. After that a caution was given to all parties having low basements, of which we had information, and they discontinued the use of the lower floor, which of course was a serious detriment and injury to them.

320. Can you inform the Commission as to the distance from the river wall over which the tide flows at which these evils occur?—The places I refer to were at Tooley Street, Horselydown, and in that neighbourhood, near the outlets of those sewers the inlet to which is at Church Street, Lambeth.

321. Then in point of fact, while the external evidence of a flood is confined to an area say of 200 yards from the river, that flood finds its way into the sewers, surcharges those sewers, and especially is aggravated in the event of a heavy fall of rain during the same period, and its influence is felt from Lambeth down to the outlet in St. John's, and the lower part of Bermondsey?—Precisely so.

322. And in its course it so surcharges the sewers that the water, by having a head, finds its way up into the basements of the houses along its course?—Yes.

323. And not only has property been destroyed, but the health of the inhabitants has been affected?—Very severely so.

324. To your own knowledge?—To my own knowledge. Of course, upon an occasion of that sort, the basement floor is saturated with wet, and the people living in such situations are not able to avail themselves of the means of more wealthy persons, to have fires and get their rooms dry. They only hope to get a dry living room when the weather gets warmer.

It takes a season to get rid of the effects of a flooding of that sort.

325. I suppose that the medical officer would more accurately inform us upon the effects of these floodings as to the nature of the flood; but you having had a good deal to do with the district, and seeing the houses after a flooding, is it not a very great evil, not simply from the damp which might arise from clean water, but from filthy water, partly sewage and washing from the streets, and other matter being absorbed in the brickwork in the basement of the houses, and which continues for a long time, giving out an unpleasant smell?—Undoubtedly; it is most unwholesome, and I should suppose that the consequences must be in very many cases positively fatal; the cold and illness which arise from these occurrences must be very serious.

326. Having regard to the nature of the present wharf walls or camp shedding, which would probably more correctly describe some of them, their rotten and imperfect condition, and having regard to the draw docks and other places of public landing, is it your opinion that nothing but a distinct embankment would be a perfect remedy for the evils of which you complain?—Most certainly, because if the flooding were stopped upon these extraordinary occasions we should still be suffering from the daily rise and fall of the tide through the soil which is a very important matter.

327. You say through the soil; do you mean through the imperfect walls at present?—Through the walls and through the earth.

328. Is there sufficient filtration through those imperfect walls to affect not only the soil of the wharves but the soil a greater distance from the river?—That is perceptible by the water in the wells rising and falling with the tide.

329. For any considerable distance?—As far back as Kennington Oval; the same thing was apparent in Kennington Park (Kennington Common which was); when that was enclosed holes were dug, and they were influenced by the tide.

330. Then it would appear perfectly clear that nothing but a wall carried down, with a sufficient depth of concrete, and made impervious, would remedy that evil?—Certainly.

331. Any repairing or heightening of the present wharf walls would utterly fail, in your judgment, in accomplishing that object?—Certainly.

332. (*Capt. Burstal.*) Do you recollect at what time of the year it was in 1850 when the flood took place to which you have referred?—I think that it was in the fall of the year.

333. There was a remarkable high tide in 1850, in February; 3 feet 7 in. above Trinity; that was one of the highest tides ever known in the river. Was the flood to which you allude referable more to rain than to river water?—I believe that it was attributable to both.

334. Do you say that you are at the mercy, to some extent, of the penstockmen, the men who have charge of the sluices, supposing they neglect their duty?—Then we should have the River Thames flowing through its banks.

335. Would that be corrected by an embankment being carried sufficiently high?—No; that would be quite a different matter.

336. If they neglect their duty the water would still flow into the district?—Yes; but the district on the south side of the Thames will always, of necessity, unless you raise it bodily, be subject to danger from tidal water.

337. What did you say of the penstockmen; you said that a penstockman once neglected his duty?—The question was asked me whether this flooding arose from the water rising from the river through the sewers. I said, on no occasion, but with one exception, within my knowledge, where a penstockman omitted to put down his penstock, and the water as the tide rose in the river of course it rose in the sewer. But

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timely warning was obtained, from its coming up very quickly, and the mischief was stopped.

338. It was no fault of the high tide on that occasion?—It was simply the fault of the carelessness of the sluice-keeper.

339. You say that the soil is of such a character above the clay that the water percolates through?—Yes.

340. Do you think that, supposing the present wharves were all water-tight, there would be sufficient time for the water to percolate through the soil, and inundate the basements of the houses, as they are now?—Not to the extent of inundating.

341. But it would make them damp, you think?—It would make them damp, certainly.

342. Therefore it would be necessary to carry any wharf-wall right down to the clay to prevent the water percolating?—Not of necessity.

343. Has it ever occurred to you that it is desirable that district board of works should exercise the power which they have of requiring the owners of premises to raise their wharves?—It would certainly be desirable that something should be done to remedy the present state of things; but I do not think that the vestries or local boards having the power to require the wharves to be raised would be a remedy; it would very generally necessitate the reconstruction of the external wall, whether wooden or otherwise, so that as far as a remedy goes it would really have little influence.

344. There is no doubt that the neighbourhood of Lambeth, between Westminster and Vauxhall Bridge, is all very low, and it does not require much evidence to prove that water frequently goes over the tops of those wharves. I think that you know something of the district below London Bridge as well; you have referred to it?—I do not know that district very particularly; I know it generally.

345. You do not know any particular place where the water is in the habit of getting over into the streets?—The character of that part of the river frontage is very different from Lambeth; the property is more valuable, and well-considered plans have been carried out to protect them from flooding.

346. Have you ever heard that the vestries of Rotherhithe and Bermondsey have, for the last ten years, taken particular care, and called the attention of wharfingers to their wharves?—They have had some very large reconstruction of wharves, and I believe that the wharfingers themselves, independently of any board, have taken precautions. I am not aware that the boards have ever exercised any coercion over them.

347. I believe they pay great attention with reference to the five feet ways?—Yes.

348. And there are none of those ten feet ways in the district of Rotherhithe and Bermondsey which are so low that the water comes over?—No. With regard to the necessity of some improved means of communication in Lambeth, that is a matter which is of very great importance, second, of course, to the flooding; and if the opportunity which occurs now were lost it would of course involve very much greater expense and difficulty in effecting any improvement in that part hereafter.

349. (*Chairman.*) The streets are under you, are they not?—They are. If this embankment were carried out so as to give a further space upon the river side of the existing streets, they might be widened and an improvement effected at comparatively very small expense.

350. Do you mean by removing the wharves?—The existing property is of so little value, and the advantage of improving the river frontage of the property would be so great, that the expense of widening the road would be in a great degree provided for; whereas of course if this opportunity is lost the river frontage year by year gets improved, and buildings and trades are established, for which when it is wished to effect an improvement it will be necessary to compensate the parties.

351. How often do these heavy floods occur on an average?—They vary very much.

352. Is the ground floor of the houses in any case subject to flooding?—Not in many cases.

353. Do you know of any cases?—Yes; in the neighbourhood of Ferry Street and Fore Street; but those are old buildings. In all new buildings we require them to be kept at such a height as to be safe from flooding.

354. Have you the power to compel the builders of houses to raise their basement floors, that is to say, not to sink their basement below a certain point?—In all new buildings.

354. What height do you assume for the basement?—We permit no basement below the level at which proper drainage can be obtained.

356. Each neighbourhood, therefore, has its own level, dependent upon the drainage into the sewer nearest to it?—Yes; and the importance of this regulation is shown in a very great degree by the case of a district built upon within the last few years at the back of Kennington Park. The builders would have wished to construct basement floors on a very large piece of ground, but they were debarred from doing that, and of course the advantage which would have accrued they were deprived of entirely, on account of the water rising in the subsoil.

357. In fact you are now compelling the whole district to raise itself?—Not in the old district; we have not the same power in rebuilding.

358. But is it not very desirable that you should have that power?—It would be desirable, certainly.

359. Will not the new main drain depend for relief, to some extent, in times of rain, upon storm overflows?—Yes.

360. When the new main drainage is completed do you anticipate that it will prevent any flooding in the case of a rainfall occurring at high water?—I think so.

361. You think that it is of sufficient size to act as a reservoir for the whole of the water which can fall in the district during the period for which the high water would prevail?—I think so, taking into account the storm overflows as well; but it will leave the question of flooding from tidal causes as it was.

362. Unless something is done to the banks of the Thames?—Yes.

363. Has there been a very high tide during the last two or three days?—I have not observed it.

364. (*Mr. Thwaites.*) In addition to the weakness of the present law in respect to the power of the vestries to call upon wharfingers to raise their walls, are there other practical difficulties, such as sluices, the right to which is doubtful, whether those open sluices vest in parishes or individuals; and if one single opening were left the heightening of the walls would be of no use, because the water would find its way?—Yes.

365. And in order that that power might be useful somebody must not only have general jurisdiction over all the wharfs within all the parishes abutting on the Thames, but must have sufficient power to deal with those open doubtful places?—Yes.

366. I say doubtful, because questions have arisen as to the body in which they are vested, whether the parish have the right, or whether the adjoining owner has the right. Many questions are still unsettled on that matter?—Yes.

367. Unless a body had the power to deal with those openings, draw docks and other places of that kind, any general heightening of the wall would be imperfect?—Quite.

368. Therefore the powers, although nominally existing, are practically defeated by cases of that description?—Certainly.

369. And you therefore draw the conclusion that in order to meet the evil in all its branches you must have a distinct embankment?—Certainly; and further, if any other arrangement were adopted the expense would ruin the wharfingers, and of course, as they

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would pay, they would consider their own convenience rather than any uniform plan; and very great disadvantage might reasonably be looked for in that, one particular disadvantage would be that our mud banks would remain just as they were.

370. You have spoken of the banks of the river below London Bridge differing from those above. I suppose you refer to the character of the wharf wall; that where the wharf property is of so much greater value, much more care has been bestowed upon the construction of the walls and the carrying it a sufficient depth and on a concrete foundation, and that so far it differs from the walls which are built on the south side higher up the river?—Quite so.

371. Many of which are mere piles, with mud behind them?—Just so.

372. We may call them in point of fact coffer dams?—Yes.

The witness withdrew.

F.W. Goddard,
Esq.

FREDERICK WILLIAM GODDARD, Esq., examined.

374. (Chairman.) You are, I believe, a member of the Lambeth Vestry?—I am.

375. You have given considerable attention to this question of the inconvenience which the district suffers from flooding?—I have.

376. Have you heard what Mr. Doulton has stated?—I heard the greater portion of his evidence. I did not come in at the commencement of it.

377. Will you state your views upon the question of a southern embankment?—I can bear testimony personally to the fact of the percolation of the water in consequence of the ineffective state of the present river wall. I happen to live within about 300 yards of the bank of the river at Nine Elms, and I can say that the lower part of my garden is almost always under water; that in digging in any part of the garden for 18 inches, that is to say, three spades deep, we get immediately to water.

378. How far back from the river is that?—About 300 yards.

379. Do you know what the level of the garden is?—The level of my garden is below the level of the river.

380. Below the level of high water?—Yes.

381. You can always find water at high water, I presume?—You can always find water at any time, even in the driest summer; with about 6 or 12 inches deeper digging you get water at once.

382. Does the rise and fall of the tide act upon that to any extent?—I apprehend that the ground upon which that house, and the houses in the streets adjacent, are built is one perfect quagmire, and the best evidence of that is that there has been a settlement of every building which has been placed upon that ground. The back of my house has a crack sufficient to put your fist through; it has been plugged up with what is called Mason's putty.

383. Has it increased?—It has increased; and the back doors of my house have been pieced several times during my occupancy of six or seven years; in order to enable them to shut they have been eased at one place and pieced at another in consequence of the sinking.

384. Have you a basement to your house?—I have.

385. Is it below the level of the garden?—No; it stands about on a level with the garden, the house being raised in front and the garden being at the back. I may add that the district to which I belong is a district which suffers exceedingly from the wet state of the ground. The poor inhabitants of the small streets round about are scarcely ever without those epidemic diseases which result from damp atmosphere, small typhoid fever, scarlatina, and those visitations.

386. Does your house ever suffer from the floodings of the sewers?—As we are not connected with any

373. (Sir Joshua Jebb.) You have mentioned one very important point, which is the extensive operation of the rise and fall of the tide in districts far remote from the banks of the river, and you have stated that you should not consider it necessary in all cases to prevent that going down to the clay. Are you sufficiently aware of the different strata which lie along the bank of the river to have formed any practical opinion as to how that could be prevented without going down to the clay?—I am not; but I draw my opinion from the fact that the water now takes a long while reaching, and reaches but in small quantities, to the distance which I have mentioned, and therefore I think that if you went somewhat below (I know that the present foundations go very little below the ground), I think that if you went some reasonable distance further down you would find the soil sufficiently tenacious to prevent any injurious percolation.

sewer at all but drain into cesspool drainage, we experience no inconvenience from that.

387. Do the poorer houses about you in any cases suffer from it?—Very much indeed, for some of them drain into the notorious Heath Hall sewer, and that sewer at certain states of the tide is prevented discharging itself and flows back into the houses. I may add also that I have practically experienced the difficulty of the low wall at certain tides. My memory is fixed upon paying 6d. to a man some years back to enable me to land from a steam-boat.

388. At what pier was that?—Lambeth Pier. The whole of the front surrounding the Archbishop's Palace and High Street were then under water some two feet, and men were following a profitable occupation by taking people on their backs at 6d. a head.

389. And that still occurs?—Yes. Having travelled up by the boats and living in this house, and having been an inhabitant of Lambeth for the last 15 years, my attention has been more particularly called to it, my family having been resident in Lambeth for some three or four generations; it is a matter of patent observation. I may allude to another matter which came more particularly within my own province, being an auctioneer and valuer. My attention was called some years back to the fact of the advantage which would result to a speculative company if powers could be obtained to take the whole of the property from Westminster Bridge to Vauxhall, to take in the foreshores to a certain extent, to construct buildings upon it, or to let portions for the purpose of erecting substantial warehouses, and paying out of the funds of the company all compensation for the vested interest then lying therein, and it was at that time considered that if powers could be obtained for the purpose of carrying into effect that company, a large profit would result, because at present the majority of the property on that part of the river between Lambeth Palace and Vauxhall Bridge especially, is what may be termed, perhaps without offence to the owners thereof, ramshackle. There is there an amount of foreshore which could be taken in and profitably employed for wharves, for which more especially now there will be a greater demand than ever, inasmuch as some considerable portion must necessarily be taken away from the northern side. The only difficulty which supervened in this matter was that possibly powers could not be obtained by a company for that which should form a matter which the public generally should take up.

390. Such an arrangement would not in any way provide a roadway along the river?—We should have given at the back a fresh communication to Fore Street and that district in order to increase the value of the wharfage, which would then have been placed upon the ground taken in from the river, and in any public undertaking that must be provided for, for

that part of Lambeth is an incongruous number of streets without any real thoroughfare through it.

391. Then you consider that at the present time the value of property there is very low?—I look at it both as a private individual and a vestryman.

392. And as a valuer?—Yes; and I think that anything like the improvement which must necessarily take place if an embankment is made, will relieve our rates most materially, because property of an increased value will be put upon the ground now occupied by property of an inferior nature, and we shall get a large accession to our ordinary revenue.

393. Then you consider that an embankment would improve the value of the whole of the property in the parish of Lambeth now subject to flooding?—I think that it would add most materially to its value.

394. What is the present amount of the rates in Lambeth per annum?—It is about 2s. 6d. in the pound; our rates are necessarily larger now than they have been (I am alluding to the poor rate and all), because we have to undertake certain works which the formation of the district vestries and so on imposed upon our body, and upon the metropolitan parishes generally.

395. Do the periodical floodings of the poorer districts throw any expenses on the rates?—They throw expenses on the rates in this respect, that the poorer inhabitants, suffering in health, are thrown out of employment, and come upon the poor-rate in the shape of out-door parochial relief; and as we distribute about half the amount collected (I think the collection is something like 100,000*l.* a year for the whole of the rates) in the form of out-door parochial relief; and as our charities are for the most part for that purpose, we should be considerably relieved by the better health of the inhabitants taking place, from anything like the sanitary result which would ensue from embanking the river side.

396. (*Mr. Thwaites.*) I do not know in what capacity I can ask you the question, but probably in your capacity as a vestryman, seeing that you contemplate such an enormous relief to your rates and to the private charities, do you think that the vestry would be disposed to contribute towards the formation of an embankment which would have such an extraordinary effect upon the district?—I think I can answer thus: that the south side of London feel so strongly in this matter that they have every claim of justice, and that they will never cease the agitation until their purpose is effected, that in the event of any demand coming before them for a voluntary contribution towards any expense, it would be cheerfully met by everyone.

397. You have spoken of the rating of Lambeth; surely the rates of Lambeth, including the poor-rate, are very much beyond 2s. 6d. in the pound?—I am speaking in that of the rates imposed by our vestry alone, not of the poor-rate.

398. I suppose that the whole amount would be 5s. or 6s.?—Yes; the poor-rate itself would be 2s. 6d. in the pound; but I thought that the question alluded to the rates for purposes of this kind, and other matters with which our vestry have to do; of course we do not interfere with the poor-rate.

399. (*Chairman.*) I meant those rates of which you would be relieved to some extent by the improvement of the property?—The poor-rate itself would be 2s. 6d. in the pound, and we should be relieved to some extent, of course not to a very large extent, by reason of the increased health of the inhabitants.

400. (*Mr. Thwaites.*) I suppose that while you have referred to the financial advantage of this embankment, your main object would be the improvement of the health of the district, improved communication, and generally to carry out a metropolitan improvement, because all improvements must peculiarly benefit localities, and therefore we do not take that into account?—Not in the slightest degree; we look upon Lambeth as forming only one portion of the south side of the Thames, and one portion of the metropolis, and we look upon this as a great public, or rather a great national, improvement.

401. Then you would concur in the views expressed by Mr. McIntosh, that such is the nature of the present river wall, that unless a proper and efficient wall were built, no relief would be obtained by you, as a resident for instance, with the water rising within 18 inches of the surface of your garden?—I think that no relief would arise unless we had a substantial and a proper wall built. If my memory serves me rightly, we are only deriving very partial benefit from what was done about 1,800 years ago. I think that the Romans originally embanked the River Thames.

402. You have a great deal to do with property in an extensive practice; have you surveyed any of this wharf property in front of the river, and examined the walls?—I have surveyed some of the wharves on the Lambeth side of the Thames, and have observed how very insecure, and how very ineffective, the walls are upon that side.

403. In point of fact, they are not walls?—They are not walls; they have been patched from time to time. If they had absolutely a substantial building upon them, a party, in order to erect that building, must go down to the foundation of the river bank and dig much below it, and put in a concrete surface and so on, for the purpose of getting a sufficient foundation upon which to put his superstructure, otherwise it would all topple in.

404. In point of fact, no system of dredging, which would remove those mud banks of which you complain, could be carried out with safety to the existing wharves?—I think that they would silt up to them. I think that the taking away of the mud banks would gradually undermine the wharves, and that they would fall in if the dredging was got out anywhere near.

405. Those mud banks are near?—Yes.

406. The question is whether their removal would affect the foundation of the existing wall, and would render it necessary for the wharfinger to build a wall of a greater depth and with a foundation of concrete?—I should say that it would.

407. You have, no doubt, witnessed the effect of those mud banks?—I may say that the pungency of those mud banks has been a matter of daily complaint. In the year 1859, I think, when the summer was rather hot, in going by the steamboats I observed that persons were taken with such nausea that occasionally a visit to the side of the vessel became necessary.

408. (*Captain Burstal.*) You reside near Nine Elms?—I reside in the Wandsworth Road, close to Nine Elms.

409. Have you ever referred to the levels of the public roads at Nine Elms and in the Wandsworth Road?—No; I only know by report, and by parties living on the spot; the circumstance that we are upon the same level as the Thames, in fact, is apparent, I think, by seeing the state of the tide sometimes, and examining my own garden.

410. The roads at Nine Elms and the Wandsworth Road are nearly on a level with Trinity datum; consequently if they are inundated the water must come either over the wharves or through the draw docks; are you aware which way the water does come?—My garden is four feet lower than the road; the Wandsworth Road is in front. I have a basement which corresponds with the ground going in, and then there is a flight of steps leading down to the garden, so that we are about four feet lower on the garden side than in the fore-court.

411. Then every day at high water, even in neap tides, your garden is level with the water in the Thames?—I expect that it is.

412. Then if the water percolates through that soil there is no wonder that you dig into water?—I expect that we are on a quagmire; in fact, the stuff which we dig up is such as would be the deposit of a river at some time or other.

413. Have you ever felt any necessity for a more direct communication from your neighbourhood to the eastward?—We have no communication at present,

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except by a very circuitous route and very small streets; but as I do not drive my own trap, I have not so particularly felt the necessity of that.

414. Then you are not in a position to speak as to the necessity of an improved communication?—I can only say that I wish I was.

415. Which are the defective wharves to which you referred in your evidence just now?—From the corner of Mr. Stiff's Factory up towards the Gas Works.

416. Near Lee's Dock?—I do not know the exact name of it.

417. There are a great many of those premises which do not come up to the denomination of wharves at all?—No; they are boat-builders' premises, and barge places, and so on.

418. There are private dwellings?—Yes; such private dwellings as I think few people would like to occupy.

419. These private dwellings are where the wharf walls are so defective?—Yes.

The witness withdrew.

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WILLIAM ODLING, Esq., M.B., F.R.S., examined.

423. (Chairman.) You are connected, I believe, with the southern district of London?—I am Officer of Health for the district of Lambeth.

424. You have paid considerable attention, I presume, to the effect which the flooding of the district has upon the health of the inhabitants?—Yes; the flooding of the district at intervals, and more particularly the saturated state of the soil with water at all times.

425. Will you state to us your views upon that subject?—We find that the greater part of the most populous district of Lambeth is within one or two feet of high water-mark, and that very many streets are one, two, three, or even in some places four feet below high-water mark; that the houses there are for the most part damp; and that in some streets more particularly there is always a low form of typhoid fever prevailing, which is marked by a remittent character, and by a want of power, in which respects it corresponds with the fevers that are caused or aggravated by deficient drainage. I should say that the water existing in the soil is, in my opinion, not water which has come from the river, but water that is going to the river. During low water it gradually drains away, and during high water it is backed up, so that, as Mr. McIntosh observed, the wells oscillate with the tide. I fear that the low-level sewer would have very little effect in draining this district dry, if there were the same communication between the soil and the Thames which now exists. The low-level sewer would drain away the drainage water which now saturates the soil, and then the current would be from the river into the land, instead of from the land into the river, as is now the case, although indeed the current is very slow. I think that the want of an embankment would interfere materially with the good which the low-level sewer would otherwise effect in draining the land.

426. Then would your view be, that the embankment should be such as entirely to prevent any percolation of water from the river; that it should go down to the clay?—It should be sufficient at any rate to prevent any material percolation.

427. I think you say that the water at present, in your opinion, does not percolate from the river, but comes down from the higher level of the land behind?—I think so.

428. In what way then would the embankment act upon the drainage?—The embankment would allow the low-level sewer to drain this land; whereas if it continued to be in free communication with the river, what it yielded up to the sewer it would regain from the river.

429. Nothing, I apprehend, would pass into the sewer except from the surface of the land? The sewer would be too water-tight for anything else to pass

420. And the water percolates under them?—Yes.

421. (Chairman.) You said that you considered that it would pay a private company to construct warehouses and to form a road between Westminster and Vauxhall?—Yes.

422. Do you also consider that it would pay a private company to construct warehouses between Westminster and Blackfriars, assuming that they took in a certain amount of the river bed?—I think that all the expenses resulting from that would be met by the improved value of the property itself, and by the letting afterwards; but the project which I have spoken of had many additional and favourable features in it, which I do not think the other absolutely possesses; at the same time the amount to be taken in, and the amount of compensation, would, in the other case, I think, be about a balance. In the project which I have spoken of some little calculation was gone into, and it seemed to show that a large benefit would accrue; I am not prepared to speak as to the other.

into it?—I believe that the most water-tight sewers drain the land; they at any rate lower the water level wherever they are placed, no matter how perfect their construction. Another evil is the flooding, and I do not know that I can say any more about that than has been already said. The water gets into these houses, and when it goes out there is left a stratum of wet mud; the houses remain damp for a long while.

430. The whole district, in fact, ought to be raised?—The whole district ought either to be raised or efficiently drained and dried in some way. With regard to the mud banks, the most offensive one, no doubt, is that opposite Bishop's Walk. There is always a very large mud bank there.

431. That is chiefly caused, I presume, by the deposit from the sewer; there is a sewer at Bishop's Walk?—There is a sewer; but I should rather think that the mud is left by the retiring tide. During the hot weather the temperature of the mud gets as high as 120°, while that of the river water is not above 70°, and it is always at such times that the smells are most unpleasant.

432. You have made a great many observations upon the river mud, and upon the water of the river itself, I believe?—Yes. I may say that the medical attendant of the Archbishop spoke to me at the time about the mud banks, and asked whether anything could be done with them, and he complained of the great nuisance which they caused.

433. You are quite of opinion that the greatest portion of the evil from the smell of the river arises from the mud banks?—I have no doubt that they have a great deal to do with it.

434. You perceive that the water smells worst near high water, when the mud banks are covered?—Yes; and I believe it is from the fact that when the mud banks have been exposed to the action of the sun their temperature becomes very greatly increased, whereby they undergo a sort of fermentation, and then when the tide comes and disturbs them we get the greatest smell.

435. Do these floodings of the district occasion much ill health among the inhabitants?—It is such a matter of common occurrence that you cannot trace specific effects to any particular flood. At the same time, in the whole of that neighbourhood disease is more or less prevalent, and a low form of typhoid fever is very seldom absent.

436. Can you give us any returns of the state of health of that district as compared with the health of higher parts of London? Have you ever made any observations of that nature?—I have, but I have not got the results with me. The rate of mortality in those districts is, of course, very much greater than it is in the higher districts of Lambeth; but then there are many other points to be considered as well. I

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mean to say that in the Brixton, Norwood, and Kennington districts the rate of mortality is nothing like so high; speaking from memory, I should say only half as high.

437. And you attribute the greater portion of that increased rate of mortality to the damp state of the district?—To a large extent, but there are other causes. First of all it is a poorer and more densely populated neighbourhood.

438. Are the trades which are carried on there of a nature to increase the mortality in the district?—There are some trades there which are extremely nasty, but they form a very small portion of the whole; they are in a circumscribed locality.

439. They would not have any important influence upon the health of the district generally?—I think not.

440. (*Mr. Thwaites.*) When you speak of some of the trades being exceedingly nasty, I suppose you draw a distinction between a smell which may be very offensive to the senses and that which may be very injurious to the health?—I think there is a difference to be drawn.

441. You have been asked whether you could put in any figures showing the increased rate of mortality in the area affected by the floodings of those districts, within the parish of Lambeth, under your charge. You have not the figures with you?—No.

442. I suppose that you can supply them, if necessary?—Yes.

443. I suppose that your observation of the effects of this flooding leaves no doubt upon your own mind that it has a depressing influence upon the health?—I have no doubt of it whatever.

444. And the result is, that fever of a typhoid character is more prevalent in that locality than in any other under your charge?—Yes.

445. You have spoken of the flood waters fighting with the percolation of the water from the Thames; that the one comes in and the other goes out; and that it depends upon the amount of rainfall which meets the percolation from the Thames?—Yes.

446. Independently of the rainfall, does your observation enable you to say with confidence that the percolation from the river is injurious to the district, as producing the dampness to which you have referred?—No doubt. If the river's height were never above its present low-water mark, the whole of this district would become dry very soon, and would remain dry.

447. That is to say, that supposing you had such a river wall built as would prevent any percolation from the river into the adjacent soil, the soil would soon become dry?—Yes; and it would not run the risk of coming into its present condition again.

448. And the effect of the rainfalls would not be injurious?—Of course for a time, during a very severe rainfall, the ground would become soddened, but it would quickly become drained.

449. The rainfall would find its way into the sewers, and be carried off?—Yes.

450. The other is a constant source of evil?—Yes.

451. Is it your opinion, from the very careful observations which you have made, and for a long period, that it is essential to the public health that those mud banks should be removed?—That is my opinion.

452. Notwithstanding the probability of a future deposit being prevented by reason of the main drainage, still the existing state of things would require them to be removed?—I think so. I am not competent to speak positively on this subject; but I question whether those places where mud banks now exist would ever be free from them, notwithstanding the main drainage. The mud bank is a sort of permanent thing which the feeble ebb tide causes in the slacks.

453. You mean that whatever care might be taken in the construction of the main intercepting sewers there still would be a large quantity of filth which would find its way into the river, and especially in

those parts of the river on the banks of which there are large manufactories and trading bodies carrying on that which is offensive?—Yes.

454. And that, supposing there were an exposed bank, there would be a deposit, if not of sewage, of something else, which would decompose, and give out gases prejudicial to the public health?—Quite so.

455. Therefore the removal of those mud banks is, in your judgment, a matter which is required?—I think so.

456. (*Captain Burstal.*) Are you speaking of the mud bank off Bishop's Walk as it is at present, or as it was a year or two ago?—I have not been there within the last week or two, but there were mud banks there within the last two or three months.

457. You have not observed whether there is any improvement in the state of that mud bank caused by the large quantity of gravel which has been placed upon it, and which was placed on a certain inclination?—The mud bank is much narrower than it was.

458. Do you mean nearer the shore?—When the tide is low the mud does not reach down to the water.

459. You mean that about half way between high and low water mark the shore is comparatively clean?—Yes.

460. Have you ever thought what has been the cause of that mud bank; is it the formation of the bank?—I have no doubt that the flatness of the bank has a good deal to do with it, and also its position.

461. Did it ever strike you that the barges belonging to Nash and Miller which lie there have anything to do with it?—I have no doubt they tend to increase the slack at that part, and so interfere with the flow of the stream.

462. Before the mud bank which was there was formed into a gravel bank the sewage of the Palace expended itself on the foreshore?—It did.

463. It is now carried to low-water mark?—Yes.

464. Then one source of the evil is removed?—It is.

465. In the year 1859 I think it has been stated that the smell of the river was very great, when the summer was the hottest?—Yes.

466. Do you observe that the river water increases in its offensive character with the temperature?—Yes.

467. To what do you attribute that?—The organic matter in the river undergoes a more rapid putrefaction during hot weather than during cold, and moreover during hot weather the river is not so well aerated as it is during cold.

468. Have you observed any marked difference between the smell of the river at high water and at low water, or at what time of the tide the river gives out the most offensive smell?—It happened during that particular year that there was a body of offensive water which oscillated between Greenwich and Chelsea, and that at Chelsea the water had the greatest smell at high water, whereas at Greenwich it had the greatest smell at low water.

469. Is that from observation?—Yes; I think I may say that that is from observation.

470. Do you attribute that to the water being charged with saline particles?—I have no doubt that the admixture of sea water causes an increased smell from the river. The fact is that sea water by itself will soon putrify in closed vessels.

471. In 1859 did you ever smell the actual mud itself, irrespective of the water?—No; but I have done something similar; I have found that on holding test papers over the water I could not get them affected, whereas by holding them over the mud I could.

472. Was that from the fermentation?—It was from the liberation of sulphuretted hydrogen.

473. You have stated that there are some very disagreeable trades carried on in the locality of Lambeth; do you find that those trades, offensive as they are to the smell, are also injurious to the health?—I have a strong conviction that they must be injurious to

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health, but there is great difficulty in tracing any injurious effect to them, and the immediate neighbours, who should suffer most, never will complain.

474. Because they are pecuniarily interested, I suppose?—It may be so.

475. There was a bone boilers?—Ye's.

476. Are there any pottery works in that neighbourhood?—Yes.

477. Are those works at all objectionable?—I do not think that the pottery works are at all objectionable to health; they give off a large quantity of black smoke, and at other times a large quantity of white vapour from the salt glazing. I do not think they are injurious to health, but they are unpleasant.

478. The bone boiling is much more unpleasant?—Yes.

479. Do you think that that is injurious to health?—My conviction is that it is, but I cannot give positive evidence of it.

480. In the locality of Lambeth there are the Phoenix Gas Works just above Vauxhall Bridge and

The witness withdrew.

G. Legg, Esq.

GEORGE LEGG, Esq., examined.

487. (Chairman.) You are connected with the district of Bermondsey, I believe?—Rotherhithe. I know the district of Bermondsey well.

488. What is your position with respect to the district of Rotherhithe?—I have charge of the district sewers there.

489. Can you tell us whether that district suffers from flooding from the tidal water in the same manner that the Lambeth district is said to suffer?—It does suffer from the effects of the tidal water materially.

490. Is that in consequence of the wharves being too low?—The difference in the level; it being on the average in some parts of it six or seven feet below Trinity high-water standard, and it being a gravelly and sandy soil, in many places it stands charged with water so that underneath the houses, in some cases, when they open the ground by putting in a spade, you see the water.

491. Does the water flow in through the bank?—It is affected by the rise of the tide.

492. Is that in consequence of the buildings being constructed upon the gravel?—No. Very many of the wharves are camp-shedded, and it naturally follows that the water finds its way through the joints where the boards abut, and many of them are of very old construction.

493. In fact the district has been built over without any proper bank having been made to the river?—There is not any sufficient bank to retain the river in its position without affecting the soil.

494. It is very much in the position of the marshes lower down, I presume?—Yes; it would be like a river wall, except that from its being camp-shedding it in many parts admits the water through, and it percolates through the gravel strata and sand. For instance, when the Commercial Dock new entrance was being formed, it affected wells perhaps 500 or 600 yards off; and although the wall was put in at eight or ten feet thick, so soon as the water came into the gravel surface it raised the water again in those wells.

495. Passing under the foundations?—Passing under the foundations. Works have been formed there lately by the Surrey Dock Company, a timber pond and so on, and the weight of water upon 22 acres readily flows up to the surface of some of the ground seven or eight feet below that level in the yards of the houses.

496. What were the sides of that timber pond formed of?—Only earth.

497. In the Commercial Docks what are the sides?—Walls.

498. To what depth do those walls go?—The recent ones, I think, about eight or ten feet below the level of the sill of the dock, which would be about 18 feet below low water-mark. The sills are fixed at

the London Gas Works just below Vauxhall Bridge?—Yes.

481. They give out a very offensive smell sometimes?—Occasionally.

482. Do you think that they are objectionable in the neighbourhood?—I think that the only inconvenient smells which are given out from the gas works (of course accidents happen sometimes) result from the charging and discharging of the retorts, when there is a large quantity of smoke and tarry vapour given out into the air. I have no evidence whatever to show that that is injurious to health.

483. Any refuse from gas works, for instance, going into the river, would be objectionable?—It would be very objectionable.

484. It will not kill fish?—Yes.

485. And prevent people from drinking the water?—Yes.

486. Do the people in that neighbourhood drink water from the river?—I think not, but it is used in some manufactories of drinkable products.

ten feet below low water, and the walls go down below that level.

499. Do you think that an embankment wall would in any way relieve the district from that saturation of water of which you have spoken?—Properly constructed, an embankment wall must necessarily relieve the upper portion of it materially.

500. Would not the percolation still take place under this embankment?—I think not to the same extent, and not rise to the same height.

501. But you have said that it does take place under the dock walls?—Under the dock embankment; that is with reference to the timber ponds, which are not down to the same level.

502. But not in the case of the Commercial Dock walls?—I do not think that it occurs to the same extent at all.

503. Do you consider that an embankment wall would be advisable below London Bridge?—If the various wharves were constructed with proper walls, I think that it would be very desirable; it would be beneficial to the health of the neighbourhood, in my opinion.

504. Does the neighbourhood suffer at all beyond this percolation of water? Does it suffer from flooding?—I have known the turnpike road to be flooded, and the water has come into the Victualling Yard at Deptford.

505. What was the occasion of the turnpike road being flooded? Was it rain?—No; it was the high tide which took place. In 1847 or 1848, at the time of the extraordinary high tides, when the river was said to have risen four feet six inches above the Trinity high-water standard, the water came into the Victualling Yard, and for a long length the turnpike road was covered with sand five or six inches deep after the water had subsided, and the gulleys were all filled up with it. That applies to the parts adjoining the Victualling Yard, the South Coast Dock, and some of those other places adjoining St. George's Stairs. At most of those places there is some opening communicating with the river, and at high tides the water finds its way up.

506. Have the vestry any power as to fixing the level of the wharves?—They adopt that power, under the Metropolis Local Management Act; and there was an instance recently where a wharf was considered to be out of condition; where there is a runs ning sand; it had rather subsided towards the river, and it got down below the level. The owners had made an embankment on the head of the old wall about three or four feet, and the vestry gave them notice, and required them to do what was necessary within a certain period.

507. Has that been done?—Yes. In all places on the river when any notice is given of rebuilding, and

so on, the vestry adopt the course of fixing that it shall be from four feet to four feet six above the Trinity standard.

508. Can the Metropolitan Board of Works or the vestry in the same way require the wharfingers to rebuild their walls altogether, in order to prevent percolation through them?—No; I do not think they can. I think that the Conservancy Board to a certain extent may do so, when persons bring out their premises, by the way in which they allow them to execute the works.

509. Have the vestry powers with respect to the levels of the basements of the houses?—Yes.

510. And are those exercised?—Yes; we always exercise that power.

511. What is your rule?—We are governed by the sewers in the immediate locality where they are to be drained into.

512. You require the basement to be above the level of the sewer?—Always above the level of the sewer, so that the houses can be thoroughly drained; that they shall be at least one foot six or two feet above it, dependent upon the respective distances that they are from the sewer so as to allow of a proper and efficient fall.

513. Then the whole district is gradually being raised, in fact?—I cannot say so; some parts of it have been raised, and many of the thoroughfares, when you come to open them, you find have been raised three or four feet.

514. You cannot compel existing houses to be raised, even in rebuilding?—Certainly. There is a street which used to be constantly flooded in high tides, containing upwards of a hundred houses, and the poor occupiers have been obliged to bale out the water; the water came up to the sills of the windows of the ground story.

515. What street is that?—Adam Street.

516. Whereabouts is it?—It is parallel with the river, and by Rotherhithe Church. There were a vast number of open ditches in Rotherhithe; they are getting rid of them as much as they possibly can. They have done a great deal towards it. There the tide used to flow up from the sewers, but in many cases it has done so because the lower part of the parish is tide-locked, and owing to the running sand there has been great difficulty in getting down; in many places they have been obliged to put down iron pipes, and to have means of communication in that way.

517. To what point down the river should you consider it desirable that this improvement in the wharf walls should take place?—I think so far as regards the whole of the parish of Rotherhithe, or any part abutting upon it where it is below the level.

518. That would extend down to Deptford, in fact?—It would. The difference in cost very often has prevented the parties from doing so. There have been certain embankments brought out recently at some parts of Rotherhithe quite 100 feet, covering the mud banks.

519. In the case of new warehouses which are built, if any are built abutting upon the river, they have good foundations, I presume?—Yes.

520. And they are carried down to a proper depth?—Yes; they must do so. It depends a great deal upon the shore. I remember, some 18 months ago, underpinning a warehouse five or six stories high; it was one of the granaries at Bermondsey, where the foundations did not go down; it was merely a sort of face wall put upon it, and timbers were laid into the ground 30 or 40 feet in length, and cross timbers, just so as to sustain it; it was nothing more than a face. We had to underpin it four or five feet.

521. Is a gradual improvement taking place in the river property?—The river property at Rotherhithe, so far as regards the occupancy, is improving, but it is not improving so far as regards its annual value, in my opinion. There is a length of, I think, about a mile and half or two miles, where you go right round or come back, inasmuch as these docks have shut off

all means of communication; and there is a difficulty on account of the bridges opening which prevents the property improving in value. The Surrey Canal is the upper one, and has two bridges, and the Commercial Dock is the lower one. I think the two places are about a mile and a half apart. The Surrey Canal has a double entrance. The parish went to great expense in opposing their respective bills, so that these bridges should only be opened for a certain period, and that they should be closed for a further period if any person was waiting to pass.

522. All the property between those two points has not improved?—It has not improved in value in proportion to the other parts, on account of the difficulty of access. Anything in the nature of a large extension, or any improved means of communication to the city or to the west end, would be a great improvement, because the streets and roads there, in many cases, have been very tortuous, and the trustees of the roads have laid out large sums of money in improving the ways, wherever they could get an opportunity of doing so; because vehicles with long lengths of timber, with four horses, being about 130 to 150 feet, it requires a long curve. Over the Surrey Canal, coming out from the Commercial Docks, there is a bridge 20 feet in width; the rise is 1 in 19. The parish, the trustees of the roads, and anybody connected with Rotherhithe property, would do all they possibly could in order to get the level altered, because the improvement in the docks has rendered it necessary that the means of communication should be improved in every way in which it can be; that bridge is in a bad state.

523. You have said that you are also acquainted with Bermondsey?—Yes.

524. Does that suffer in the same way as Rotherhithe?—Not quite to the same extent; there is a difference of two feet in level, upon the average. Bermondsey is better off in that respect. They have been tide locked by their sewers, and the water has found its way into their basements; the basements were made lower in most cases.

525. Do they suffer from any flooding over the wall in cases of high tides?—They must have done so where their wharves were only the same height. I remember that five or six years ago the two parishes had juries out to view, just prior to the dissolution of the old Commission of Sewers, and they gave notices to owners to raise the walls, in order to bring them up to the proper level. In many cases those notices were effective, but they did not compel the parties to do so in all cases, I believe.

526. It would not be effective if not done in all cases, would it?—It would tend to improve the state of things. With the wash of the steamers, they want perhaps 15 inches difference. In the case of business premises, the wall being raised a foot or so might impede their delivery into craft. In the docks at Rotherhithe the vestry take cognizance, and require them to build their wall in a certain way, so as to exclude as much water as they possibly can, because in many cases the street is six or seven feet below the level of the docks immediately adjoining.

527. Are you speaking of the Commercial Docks?—I am speaking of the various docks which are used for the docking of vessels for repairs; many of them have only camp shedding at the sides.

528. St. Saviour's Dock, for instance?—St. Saviour's Dock is an open dock to the river; it is a different thing altogether; it is almost like a creek; it goes up to Dockhead.

529. (Mr. Hunt.) You would recommend a solid brick wall, I suppose?—I think so.

530. As an effectual remedy?—I do not say as an effectual remedy; it would tend to remedy the evil, it would be a move in the right direction, I conceive.

531. It would be an improvement in a sanitary point of view?—I think so.

532. Would it enhance the value of property at all?—I think it would tend to enhance the value of property, inasmuch as if it were properly constructed the barges alongside would not do the same amount of

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damage that they do to the wooden walls, and there would not be the same constant repair going on.

533. But except that it would not increase the value of wharf property?—I think it would tend to increase the value of wharf property, because it would necessarily follow that the outlay of the persons occupying it would be less in proportion, but not to the extent of the outlay incurred.

534. (*Mr. Thwaites.*) You have spoken of the power of the district boards to call upon the parties to raise their wharf walls; and you have said that certain action has been taken, but that the parties have failed to carry out the orders of the vestries, and that thus the thing has fallen to the ground?—No. I say that where there is any alteration (whether the board have the right or not I am not prepared to say) the board exercise the right, and they require the persons to raise the walls up to a level so as to prevent the water coming over them.

535. Taking the district of which you have the management, would it at all affect the question if out of 2,000 wharves 500 were raised?—It would necessarily follow that if those 500 were together we should not get the same water through the camp shedding if a wall was substituted for it for that length.

536. It would follow that you would not get the water through the same place; but does it equally follow that you would not get the water?—We should not get it to the same extent, I conceive.

537. Is it not your opinion that unless there was a continuous wall of an equal height, that is to say, of a sufficient height above high water and the washing of the steamers, the flooding would be continued?—The flooding would be continued, but not to the same extent. I conceive that any works which were going on which would tend to make that wall ultimately continuous must be an improvement.

538. Supposing, for example, that on either side the wharves were raised a given height, and yet a space was left the width of this room, would not that admit the tide and the flood right and left?—It would necessarily follow that it would find its way in there, but there would not be the same space exposed to the action of the tide; and therefore I do not conceive that it would find its way to the same extent.

539. Having regard to the period required for the tide to rise to a given height, would not a sufficient quantity of water flow through a space equal to the width of this room to flood the district right and left?—Yes, I think so, if it were an open space through which it could flow.

540. Then in point of fact unless you had a continuous wall the object would be defeated?—Yes.

541. You have spoken of the wharves which have been erected of a superior class, where the parties have gone down a considerable depth, and have carried a wall up of a character sufficient to resist the action of the tide; and you have stated that notwithstanding that the water finds its way underneath the foundation of that wall so constructed?—I was speaking with reference to a well which was dried by the improvement to the Commercial Dock when the company were making their entrance. I said that after the water was admitted the water rose again, showing that it is upon the same principle as the filter bed of a reservoir belonging to a water company, where the water comes up through the bed.

542. Does not it occur to you that supposing the length of the wall to which you have referred to be 1,000 feet, the filtration at each end of that wall might have been sufficient to affect the district, and that in point of fact the water might not have gone under the foundation?—Yes; it might be in that way.

543. That would be the case?—It might be in that way.

544. You have no evidence to satisfy your own mind that of necessity this water must have gone under the foundation?—I am satisfied of it in my own mind, inasmuch as it was after the admission of the

water into the new dock that the water rose in the well. To give you a recent case of pumping, at the time when the new piece of sewer was being put down near the gas works at Deptford, it affected a pump, I should think 600 or 800 yards off, so that they were obliged to sink a well there in consequence of it; then the water returned to something like the same level when that pumping had ceased.

545. Does not that rather confirm the view which I have suggested, that while a thousand feet of river-wall might be constructed upon the best principles to resist the action of the tide the water might filter in at either end, and affect the ground at the rear?—It would filter in at either end, but I conceive not to the same extent.

546. I wish to know your opinion of a partial improvement in the river walls, as compared with a continuous wall taken down to a proper depth, in order to resist the water coming in?—A continuous wall would be the best thing, but I think that it could not be obtained at once, and that therefore it would be desirable to get what you could, with the ultimate view of its being continuous.

547. Supposing that the vestry of Rotherhithe, with which you are connected, were to exercise all the zeal and to put in force all the powers which they possess under the Metropolis Local Management Act, of calling upon the parties to raise their walls, and that the parties obeyed, and did not question the power of the vestry under the Act to enforce carrying out their instructions, and supposing that the vestry of Bermondsey were to neglect to put in force their powers, would not the district in front of which the improved wall had been built be injured by the system of filtration in consequence of the imperfect river-walls to which you have referred, namely, the camp shedding, without reference to the overflow over the sills of the walls?—I think that it would affect the district behind the improved wall, but still I think that any portion of the wall would be an improvement, because it must tend to resist some portion of the pressure from the water.

548. No doubt if you have one wharf properly done out of a hundred, it is a hundredth part of a great work carried out?—Quite so. It ought to be continuous and ought to be done.

549. But unless there were concurrent action on the part of the vestries the practical result would not be accomplished?—The practical result would not be effectual.

550. You have considerable experience in the nature of the wharf walls at present existing, which you have described as mere camp shedding?—Yes.

551. Are you of opinion that a mere heightening of those walls, or any addition which might be placed upon them, would accomplish the object?—No, I think that it would be quite inefficient. I think that they must be properly constructed from their foundation, and that they must go down sufficiently low so as to get a proper bed, in order to shut off the pressure of the water.

552. From your experience in Rotherhithe and the adjoining parishes, are you able to speak as to the willingness of the parishes to put in force the power which they are assumed to have under the Metropolis Local Management Act?—I have always presumed that they have a willingness to do so; they look at the matter most thoroughly, and give their attention to the case of any wall from which they are afraid of being flooded.

553. Do they look at it broadly? Will the parish of Bermondsey say, the parish of Rotherhithe are about to serve notices upon all their wharfingers, and we must follow the same rule, in order to have a perfect resistance to the water?—I do not think that the one parish would at all control the other, or that they would act in unison at the time, unless there were some compulsory power.

554. (*Captain Burstal.*) You seem to know this locality very well. Have you ever been in one of the

cellars of the warehouses adjoining the river?—Yes; and I have had to asphalt many of them.

555. Do you find that the water gets into the cellar by percolation?—Yes; it comes really through the walls.

556. From the river?—Yes; so much so that it is affected by the tide, and we have put it in concrete at the bottom, and asphalted them as the tide has gone down, and we have carried it up a certain height, round the walls.

557. Do you know of any instance where the water has come up over the top of the wharves between Deptford and the Tunnel?—It has done so in the cases to which I have referred. There were openings, and we have shut them off in the camp shedding by having sliding doors to go down.

558. The parish authorities are very particular about the parish ways?—We look after them as much as possible.

559. There are the Commercial Docks and the Grand Surrey Canal, containing very large quantities of water, which entirely divide this district from about the Tunnel from the Deptford Lower Road. Those docks have always been full of water. Is it not reasonable to suppose that the water would percolate from those docks, the Commercial Docks and the Grand Surrey Canal, and thus saturate the ground in that locality, quite as much as the water from the river?—Not from the docks, because the water there stands at a lower level in itself. If you refer to the timber-ponds, which are formed almost upon the surface, they would rather affect it.

560. Say that the water in the docks is 18 feet?—Then I conceive that if 10 feet of that water was below the level of the surface it would not affect it to the same extent as there being eight feet entirely above the surface.

561. The water in the docks only attains the same height as the water in the river, and consequently it must percolate horizontally?—Not if the walls are carried down to the same extent. I will give you a case in proof. There is a turnpike road immediately adjoining upon the Commercial Dock wall, and there are no ill effects from it there; that is called London Street.

562. Is the bottom of the docks paved?—No; but it is generally made up with gravel, and some of them are formed with concrete.

563. If the bottom of the dock is gravel, surely the water will percolate through that gravel?—No; there is a difference in this respect. If you look at any of the deep excavations in that neighbourhood, you will find that when you get down to a certain point you come to a fine sand, through which the water runs more than when you get down to a more solid base.

564. When the main sewer is constructed, do you think that the water which is at present saturated in the land will drain off into the sewer, and tend to make it drier?—The main sewer would tend to make it drier, because it necessarily follows that the pumping out of the water for the works would make it drier.

565. That would tend to make the district drier?—Slightly drier.

566. Do you know of any place where the water actually comes over the top now? You said the platform, I think?—There is a way down by the side. Some persons said that it did come over the top.

567. That must be at very high tides?—Yes; it was on an extraordinary tide.

568. What do you mean by camp shedding, in contradistinction from general wharf building?—Camp shedding would be constructed of wood. In some cases they put their piles outside, and in other cases they put them inside, and put merely a wood lining over them; old deck or deal planks.

569. Is sheet piling much used?—No; there are scarcely any of the wharves sheet piled; there are

only piles. In some cases they put them as fender piles on the outside, and in other cases they line them on the outside; but they in most cases only put them outside as fender piles.

570. (*Chairman.*) Do not you consider that the cost of improving these wharves is a cost which might properly be levied upon the district which would be affected by the improvement?—I think not, inasmuch as there are vast neighbourhoods in the rear which would receive the benefit of it equally with the parties who are closer to it, or in a less degree, and therefore I think that they ought to bear their proportion of it.

571. You think that all the districts affected by it should bear their proportion?—Decidedly, as it is a great improvement.

572. But not the general metropolis?—Yes, I think it should be the general metropolis, because they will ultimately benefit. I do not think that there should be a separate district rate.

573. Not a separate district rate?—Not a separate district rate, because the trades carried on are for the general benefit of the metropolis, or for the port of London. The storage of the timber, and all that sort of thing, vast quantities of it, go to the north, and any improved means of communication from this locality would be a great improvement.

574. (*Mr. Thwaites.*) You think then, as these large improvements are carried out mainly for the purpose of promoting the convenience of trade, that that trade should be called upon to contribute some portion towards them, and that the whole cost should not be thrown upon the ratepayers?—I think that as it is a deposit for the general benefit of the public within a distance of 15 or 20 miles, it should be considered as one district, and that that particular locality should not suffer in consequence of the benefit to all the others because the works happen to be there.

575. Take for instance your district. The roads are cut up by means of those heavy waggons which carry timber, not for the benefit of Rotherhithe, but for the benefit of the metropolis generally, and for the benefit of trade. You have to widen your thoroughfares and improve the banks of the river. Do you think that it would be unjust to levy a small tonnage due upon the commodities which are brought here for the purpose of paying for these improvements, or do you think that it is more equitable that the cost of these improvements should be defrayed by means of a direct rate from the inhabitants?—I think that it would be as well to put it upon a tonnage due, as then the persons where the vessels come in and discharge their cargoes, a part of which goes off perhaps 50 miles, would bear their share, whereas otherwise they would go free. Not only does the district suffer by these works, but the class of the population is rather worse in consequence of there being docks than it otherwise would be. There are about a hundred houses erected in a certain street, and the Surrey Canal Company have recently formed a timber pond in the rear of it, and they are now putting in drains to take the water into the sewers which arises from its standing upon the level of the surface.

576. (*Chairman.*) I was alluding more to the sanitary improvement which would take place in the district from the prevention of the percolation of water by the construction of a solid wharf wall instead of that camp shedding to which you have alluded. Do you think that the expense of that wall should be borne by the whole metropolis rather than by the district?—The district do pay their sanitary officer at the present time.

577. But I referred to the construction of solid wharf walls?—The district could never bear the expense of it, inasmuch as it is too poor a district to bear the expense, and the property from its locality, and the way in which it is appropriated to the general benefit of the port of London, will never rise in value sufficiently to enable the parties possessing it to do it.

The witness withdrew.

Adjourned.

G. Legg, Esq.

21 Dec. 1861.

Thursday, 2d January 1862.

PRESENT :

The Right Hon. the LORD MAYOR.
JOHN THWAITES, Esq.
Captain D. GALTON, R.E.

Captain BURSTAL, R.N.
JOHN ROBINSON McCLEAN, Esq.

The Right Hon. the LORD MAYOR in the Chair.

E. Cresy, Esq.

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EDWARD CRESY, Esq., examined.

578. (*Chairman.*) You have come to give us some local information at the suggestion of your chairman, Mr. Thwaites, and as Mr. Thwaites knows better than I do what the kind of information is, probably he will be good enough to ask you some questions.

579. (*Mr. Thwaites.*) You are an engineer and surveyor by profession?—Yes.

580. And at present an officer of the Metropolitan Board of Works?—Yes.

581. You were also for some years an officer under the late Commissioners of Sewers?—From 1849 until the dissolution of the Commission.

582. During that time I think you were one of the surveyors under that Commission?—Yes.

583. And you had a district under your charge?—I had half of the Surrey and Kent district, and the whole of the Ravensborne and Greenwich districts.

584. How far up the river did that portion of the Surrey and Kent district which was under your charge extend?—My section extended up to the Duffield sewer, in the parish of Bermondsey, and downwards as far as Greenwich Marshes; the whole of that portion of the river was in my district.

585. During that time can you state, for the information of the Commission, what was the result of your observations as to the flooding, and its effect upon the districts?—I may state generally that that portion of the Surrey and Kent district was by far the lowest portion of the whole of the southern area; that the average of the whole level of that portion of the Surrey and Kent district was below 10 on Ordnance datum; that is to say, $2\frac{1}{2}$ feet under Trinity high water mark. There were some portions of it as low as 4 on Ordnance datum, that is to say, actually $8\frac{1}{2}$ feet below Trinity high water mark. The greater portion of the district was very imperfectly drained, and suffered in consequence all the evils attendant upon such an imperfect system; but in addition to the evils arising from the defective drainage, the riverain portions of the district,—all those portions of Bermondsey, Rotherhithe, Deptford, and Greenwich, which were within my district,—were peculiarly subject to injury from floods. The Commissioners will of course understand that under any conditions, if it is difficult to take away the sewage and the rainfall from a district, that district must proportionately suffer; but if you superadd to that at frequently recurring intervals, a mass of water poured over the surface of an already saturated subsoil, you may imagine that that district will suffer very considerably more than all the other portions of the district which are suffering merely from defective drainage. From being constantly about in the district and reporting on all the complaints which were laid before the Commissioners of Sewers from 1849, down to the period of their being superseded by the Metropolitan Board of Works (and complaints were constantly being laid before them) my attention was directed to every part of the district, which suffered from all the evils which I have related; but every now and then we had an extraordinarily high tide arising from the concurrence of a spring tide with an easterly wind, and then over would come a mass of water in Bermondsey, Rotherhithe, and Greenwich; it would pour into the cellars, even into the ground floors, sometimes standing two or three feet deep in the streets, and during the next month, six weeks, and sometimes two months, the inhabitants would be suffering from the wet state of their dwellings, and from the saturated condition of

the ground under their floors to such a degree that it is impossible for anybody who has not witnessed it to understand how great was the evil under which they labored. I am aware that some misapprehension has arisen on the point and that it has been believed that these evils arose wholly from the defective drainage, but I had an opportunity, during the construction of a variety of local sewers, of seeing that whenever we cut a trench there we got the water rising and falling with the tide. Doubtless it may be said that that water was land water which was penned back by the tide, and that if a complete system of drainage was laid down that land water would be taken away and the district be completely relieved. But I satisfied my own mind on a great many occasions that that water was not land water simply penned back, but was actually tidal water infiltrating through a porous subsoil, from the fact that when I cut a trench on the upper side of the Surrey Canal, for example, I found that although it was affected by the tide and the land water after a rainy season was coming down in great quantities, and could not get away so freely during the time of high water as it would when the tide was falling, I nevertheless found a great deal more water as I got into the lower portion of my district, and that when I cut a trench there the water instead of being only eight inches or a foot would rise up two or three feet. If that had been simply land water coming down it ought to have been standing relatively to Ordnance datum at the same height. Therefore I have satisfied myself from a great many observations that the district has been constantly suffering, first from the water pouring over the banks at the period of high tide, and next from the water actually percolating through the porous soil of the banks in the neighbourhood. Of course when I presented the reports from time to time stating the evils of which the district complained and laid them before the Commission I was requested to propose a remedy.

586. Have you a copy of one of those reports?—Yes; after the remarkably high tide which took place in 1850, I made a very full report on the subject, a copy of which I beg to hand in (*handing in the same*), and I recommended that certain steps should be taken. The Commissioners had been already made aware by previous evidence that there was a certain power vested in them of providing efficient defences, and of raising and maintaining the banks adjoining the streams and watercourses within their jurisdiction, and I was directed to ascertain how far that power was workable. I suggested that in the first instance a careful survey should be made,—that a sectional elevation, so to speak, should be prepared of the whole of the river wall within my jurisdiction,—and that then notices should be served on all those parties whose wharves were below a certain level. I have here that section, which I think will afford interesting information to the Commission. You will see there a plan and section of the whole of that portion of the district which particularly suffered, and which is not specially alluded to in the report which I have just handed in. The Commissioners, after very carefully considering all the points which I had the honour to submit to them, referred the matter to their secretary, Mr. Woolrych, who was a barrister of very eminent standing, for the purpose of reporting to them on the legal view of the question, and Mr. Woolrych directed me to prepare for his information a case for counsel, stating the principal points, referring so far as I was aware to the powers already possessed by the Com-

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mission, suggesting the difficulties which arose in the execution of their powers, and raising the points upon which information was particularly requested. A copy of the case for counsel I beg to hand in to the Commissioners. The Commission then proposed that Mr. Woolrych should draw up a formal case based upon that report, and that the opinion of the Attorney-General or some eminent counsel should be taken as to the best mode of putting their powers in force. But meanwhile a plan was submitted to them by Mr. Gisborne for a general embankment of the river, and they considered that that plan would effectually and completely remedy all the evils which probably might only be partially dealt with by the exercise of the powers which they possessed under the advice of counsel as suggested, and therefore, any further operation on that subject was suspended pending their consideration of Mr. Gisborne's plan. I need hardly tell the Commissioners that the Metropolitan Commission of Sewers was several times renewed, and of course with the disadvantage, that they dropped the thread of their predecessors' proceedings; considerable time was lost, and subsequently the Metropolitan Board of Works was appointed in their stead, so that nothing further was really done in that matter than what I have just had the opportunity of handing in. Those powers were transferred by the Metropolis Local Management Act to the several Vestries and District Boards, and since that time very little has been done by those local authorities. The same difficulties or rather greater difficulties exist in the way of the exercise of the transferred powers than existed in the way of the exercise of the original powers. The General Commission had power over the whole length of the river within their jurisdiction, whereas each District Board has power only over a very limited section of the river. I would wish before I conclude this general statement very strongly to represent to the Commissioners the sanitary evils which were brought under my immediate observation during my tenure of that district. I was there during the visitation of cholera in 1849, and I was there during the subsequent visitation of cholera in 1852, and I was very much struck by observing how the cholera hung about the low lying district, particularly my portion. The Commission will find it a most instructive thing to compare the cholera map which was prepared at that time (*handing in the same*), and which graphically represented the deaths, with this map (*producing another map*), which shows the area of the Surrey and Kent district below high-water mark. The line surrounding that part coloured blue has a level of 12'50, and the whole of the area coloured blue is below 12'50 on Ordnance datum. If you lay those two maps side by side you will be very much struck by seeing how closely the dark blue tint on the cholera map corresponds with the blue tint on the other map; they are not absolutely identical, for this reason, that that prominent part is occupied in a great degree by the Commercial Docks and by market gardens, and is therefore comparatively uninhabited, so that the cholera mortality would not assume the same aggravated appearance there as over the other portion of the map—that is a discrepancy, but I think that you will be struck by the correspondence more than by the slight discrepancies. I do not think that anything could be more convincing than that, and you must remember that some portions of that area are comparatively well drained, and that other portions are comparatively ill drained, but the whole of them are affected by the overflowing of the Thames at a high tide, and by the percolation of the drainage of that district through the porous subsoil.

587. Am I to understand that the attack of cholera in this district was co-extensive with the district saturated by the overflow to which you refer?—Precisely so. The Main Drainage will completely remedy the evils of the defective drainage of that district, but now to supplement that, and to prevent the evils caused by the overflow and percolation, a

further measure is necessary, namely, the complete embankment of the whole of that saturated portion of the district. I think that those are the main points which occur to me. Doubtless the Commissioners may require some further elucidation of them.

588. Has your attention been directed to that portion of the river west of the district under your care—Lambeth for example?—During the whole of the time that I was in charge of that district I was working with my friend Mr. Grant, and we worked in perfect harmony upon the Main Drainage, and therefore each was made acquainted with the condition of his neighbour's district. Mr. Grant's district was, generally speaking, somewhat more favourably situated than mine. I do not think that any portion of his district was below 8 on Ordnance datum. A good deal of my district was as low as 6 on Ordnance datum, and some portions were as low as 4, and therefore all the evils under which his district suffered mine suffered under in a still greater degree.

589. Supposing that the height of those wharf walls was raised sufficiently to be above the highest tide, would it in your judgment effect a perfect cure for the evil?—The raising of the wharf walls would slightly mitigate the evil, but if the Commission will cast their eyes upon that section they will see the very imperfect construction of the fronts of several of those retaining walls of the wharves, and they will see that in those cases merely raising the wharf wall a foot or 18 inches up to 16 on the Ordnance datum would very imperfectly remedy the evils from which that district suffers. Doubtless the actual pouring over of the water on to the saturated subsoil is an enormous evil, which might be mitigated in some degree by raising the wharves, but it would not in any degree mitigate the evil which arises from the percolation.

590. Is that percolation due in your judgment to the imperfect wharf walls which have been built?—It arises partly from the very porous nature of the subsoil, and partly from the very imperfect nature of the camp shedding and construction of the retaining walls of the wharves.

591. Then I understand your answer to be, that most of the wharf walls, so called, are mere camp shedding—they are not bricks?—A great deal of it is timber construction, as you will see shown on those sections.

592. Are you able to speak as to the extent of the flooding inland in the district of Lambeth and towards Bermondsey?—As to the district of Lambeth, I remember particularly going over it on two occasions,—I think, with my friend Mr. Grant,—and we found the flooding as far back as Kennington Oval—that particularly struck us. Under ordinary high tides we had seen the water over in Fore Street and that part of the district; but on some occasions we have seen it as far back as Kennington Oval. Of course, in that answer I am carefully separating the flooding which we knew arose from the land water coming down the Effra and other sewers, which is a separate matter altogether, but the flooding from the Thames we could trace as far back as that.

593. Have you observed during those floodings whether any portion of the water, and if so to what extent, has found its way up the sewers, or whether it has passed over the wharf walls?—That we had an opportunity of observing also on frequent occasions. Of course the Commissioners are aware that the whole of those sewers in the southern district are tide locked, that is to say, they have only tidal outlets. If a land flood is coming down at the time of low water, of course we get an outlet for it, if it is coming down as the tidal water is rising, our sewers are closed up, and rapidly overflow; whether it is a neap tide, or whether it is a spring tide, our outlets are closed, and the district will be flooded occasionally from that land water, but if we have no floods coming down and have had no wet weather previously and have a high tide, and that tide finds its way over the walls; we see by the water running

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down the gully holes into the sewers that the sewers have nothing to do with it, but that the sewers are relieving the district from the water which is poured over the walls, or which finds its way through the walls into the low lying portion of the district, that we have observed over and over again.

594. I believe that you have resided in Paris for some time?—Yes.

595. During that period was your attention directed to the public works, and the means by which those works were carried out?—Yes; I was there studying under a Parisian architect for some time, and I had an opportunity of following the public works there, and of paying attention generally to their municipal organization.

596. From what source are those large public works carried out?—Their revenue is, as the Commissioners are aware, derived from several sources, but they derive a certain portion of their revenue from direct contribution in the same way as that raised under the Metropolis Local Management Act.

597. You mean by direct taxation; by rates?—Yes; but the larger portion is raised by the octroi, —the taxation on articles of consumption.

598. What portion?—For example in the budget of 1857, they raised about 74,000,000 francs, and out of that about 48,000,000 were raised by the octroi, and a little over 2,000,000 were raised by direct contribution.

599. (*Chairman.*) There have been reports more recent; and I think that in the estimate for the year 1860, the whole of the municipal income was estimated at 104,000,000 francs, and the octroi alone must have furnished 67,000,000 francs?—Yes; that is since the extension of the boundary of the octroi.

600. (*Mr. Thwaites.*) You have directed your attention to public works and the means by which those works should be carried out; you have spoken of the works carried out in Paris, and how the funds are generally raised; is it your opinion that these large works in the Metropolis can be carried out by means of direct rates from the inhabitants?—Of course, as one of the engineers in a district which was for so many years under the former Commission of Sewers, I had an opportunity of hearing a great number of opinions as to designing works and carrying them out, and generally of knowing the feeling in the district with reference to the taxation by that body; and I found, universally, that there was a very considerable opposition to the raising of money by means of direct taxation, which contrasted very forcibly in my mind with the comparative ease which I found prevailing on the other side of the water. I saw there very large works going on.

601. You mean in Paris?—Yes. I also came in contact with those who had to pay for those works; and although I know that considerable irritation was occasioned by the mode in which the octroi was collected, nevertheless that mode of taxation was far easier and far less felt by the contributing parties than the direct mode which was prevailing over the Surrey and Kent district. It appeared to fall with peculiarly heavy force in that district, because it is certainly a very poor one; and a comparatively small rate was felt there much more forcibly than it would be felt in a district like St. George's Hanover Square. But I conceive that some tax levied in the nature of an excise or a tax on articles of consumption, would certainly not have been felt in the same way by the inhabitants of the Surrey and Kent district as was the sewers rate, which was paid by the ratepayers directly.

602. Then in order to carry out these large works in the Metropolis, it is in your judgment necessary to combine the direct and the indirect taxation?—Decidedly; and I was particularly struck with that, with reference to this embankment; because it was obvious that as regarded all that poor district lying in the immediate neighbourhood of the river in Bermondsey and Rotherhithe and Deptford (for the poor rates are especially high in Deptford) to charge

the cost of such a work as a complete embankment on the character of property, and the kind of persons who inhabit that property, would be a burthen most enormously felt in that district; whereas, if you could have some tax which could be spread equally over the whole district, the inhabitants of Camberwell and Peckham, and the wealthier portions of the district paying a tax like the coal tax or other tax on articles of consumption, it would be obviously much more equitable than charging a local rate for the performance of such a work as that, which is the only way in which it can be done under the present Local Management Act, by the several Boards carrying out their powers.

603. You have spoken of the powers possessed by the Commissioners of Sewers, enabling them to call upon the wharfingers to raise their wharf walls. You have also stated some of the reasons which prevented those powers being put in force. Those powers are vested in the local boards and vestries?—They are so.

604. Is that divided jurisdiction conducive to the object contemplated by the Act of Parliament?—It is almost impossible under that divided jurisdiction that that work could be carried out, because it is obvious that there would not be harmonious action between the neighbouring bodies to carry out the work. One district board would serve notice on certain wharfingers, and others would necessarily delay it. One board would go fast and another slow, and unless the wharfingers all acted simultaneously, the notices with which they were served would not in any degree effect the object.

605. (*Chairman.*) Would not that course in any degree effect the object?—Not in any degree.

606. Take one particular district, and let us imagine that the authorities go energetically to work and give notices, and compel each individual proprietor in that district to raise his wharf; so far as that part is concerned, it would effect the object would it not? We will say that the water overflows one particular wharf—surely if you raise the whole of that wharf you effect the object as far as that wharf is concerned?—Not if it overflows right and left of that wharf, and comes into the street at the back.

607. But I say as far as that wharf is concerned. Then if you take the wharf right of that and the wharf left of it, you get the object effected as far as the three wharves are concerned, and so if you take all the wharves in one locality, and the local authorities compel the work to be done all along those wharves within that district, surely as far as that locality is concerned you effect your object?—It would do so if the water were prevented from flowing at the back of those wharves, but if you will look at the maps of that particular locality you will see that we have a high bank running all around, and we have the ground falling steadily from that high bank landwards. Supposing that you raise any particular point in that bank or a section of that bank, if the water gets over at this point and that point (*describing the same*) the object is defeated.

608. But I want to lead you step by step along the whole of the shore, and I want you to admit, or else to show me that I am wrong, that if the authorities of Lambeth can compel all the proprietors to raise their wharves, and do compel them so to do, surely so far as Lambeth is concerned the work is done. I understand you to say that all these local authorities are invested with powers to compel the wharves to be raised, but you seem to apprehend that unless they all go to work together and all work with the same rapidity the object cannot be attained; but surely it would ultimately be attained. Where the work went on faster the object would be attained sooner, but if every local authority does its duty must it not necessarily result in the whole line of the river wall being made so as to prevent overflowing?—You mean that in a long series of years by the

gradual action of the local authorities the work might be carried out.

609. I think that my question was a simple one. You put it "in a long series of years;" why should you use those words? If all the local authorities did their duty would it require a long series of years to get the whole thing done?—I am afraid so. Will you allow me to explain that when I was in charge of that district I endeavoured to persuade the several wharf proprietors to raise their wharves voluntarily, and I was met constantly by the argument "What is the use of my raising my wharf? My neighbours A, B, and C will not raise theirs, I know, and the water will come over there just as badly, and you will not be benefited;" but I used to say, "You raise yours, and I may be successful in persuading A, B, and C to raise theirs." I was constantly met with this argument, "You go to them and persuade them, and then when they begin I will begin mine."

610. I think you will agree with me that if you were invested with authority to compel every owner to raise his wharf and to make it sound, and that if you exercised that authority the object would be ultimately effected?—Certainly.

611. Did I rightly understand you that the river water percolates through the bed of the river, and goes along a stratum of sand and rises inland in the southern districts?—That is my opinion.

612. Then probably you are of opinion that no embankment would prevent that?—Yes, it would, clearly.

613. How so?—We found that when the Commercial Dock Company for example had carried out a masonry wall right down, there were basements at the back of it where they got no percolation.

614. Then that is because the foundation of their walls sank so deep as to get below any stratum of that kind?—Precisely so.

615. Then it comes to the same thing after all, namely, that if every wharf wall were made what it ought to be, that would supersede the necessity of any other embankment?—That would be an embankment.

616. And therefore, if there were a law carried into operation compelling every owner to put his wharf wall into a sufficient state, as far as the river is concerned the evil would be remedied?—Certainly, if you throw the obligation upon him of constructing an embankment the work is done.

617. A wharfinger talks of his wharf wall and of his camp shed, or whatever it is, he does not call it an embankment, and although it perhaps means the same thing, I want you to adopt that very expression "wharf wall." Looking at it in the light in which I have endeavoured to put it, do you agree with me, that if every proprietor were compelled to put his wharf wall into a good condition that would eventually effect the object, as far as the river wall is concerned?—I can conceive the possibility of such a thing being done. I see very great difficulties. Of course, as a practical constructor your lordship knows the difficulties which there are in carrying out two continuous works, that one man is carrying his portion out at one time and the other at another, and that there are difficulties in bonding the face of the wharf walls together, and a number of those practical difficulties which of course will suggest themselves to your mind; the operation carried out as a whole would be perfect and complete, whereas a sectional operation would be imperfect and incomplete.

618. Supposing that you entrusted with unlimited power, would you make a new embankment?—Certainly.

619. In the present line?—That is a question which I think would depend upon the conveniences of trade.

620. Then you are of opinion that the conveniences of trade must be considered?—Pre-eminently above all things; but I am speaking as an engineer of carrying out a perfect work.

621. Give us your beau ideal of a perfect work?—Such a work as Mr. Cubitt's embankment at Pimlico. *E. Cresy, Esq.*
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622. Mr. Cubitt at Pimlico had a naked shore and a naked piece of land; he took, as I did at the Isle of Dogs, a great surface of land lying idle; he then considered how he could best utilize the land, and he felt that it was very desirable to have a roadway, and he felt it very desirable to have walls, but you cannot do that where the ground is already covered. How could you for instance make Bankside in the slightest degree to resemble what was done at Pimlico?—There clearly are cases in which the same principle is inapplicable.

623. I now take you back to the question; if you had unlimited power, what would you advise that we, the Commissioners here, should recommend with regard to the southern bank of the Thames from Lambeth to Rotherhithe?—With regard to Lambeth I think that the mode of treatment of the two sections, the upper portion of the Surrey and Kent district, and the lower portion of the Surrey and Kent district should be different. I do not think that the requirements are precisely the same, and I do not think that the Commissioners would see their way to recommending precisely the same kind of work. At Lambeth, the possibility of carrying out an embankment of a kind similar to that which Mr. Cubitt executed at Pimlico is certainly greater opposite the Archbishop's Palace than it is in the district of Rotherhithe. In the district of Rotherhithe I would undoubtedly suggest a simple sufficient wharf wall. In the upper district I think that the combination of a wharf wall with a reclaimed space, an embankment properly so called, is much more practicable.

624. Take Fore Street, what would you do in that part of the shore which runs along at Fore Street?—Do you mean from the Archbishop's Palace up to Vauxhall Bridge?

625. Fore Street is westward of Lambeth Church?—There are two modes which occur to me of dealing with it. The one is to reclaim a large portion of the shore there, to carry out the embankment in fact, and to construct a roadway with landing places in front of it towards the river; the other is to give up the land so reclaimed to the wharves along the river, and to widen Fore Street, taking the portion required to widen the street off the existing property.

626. To pull down the houses?—Yes, in Fore Street, on one side or the other, whichever is most convenient. The estimate of the value of the property and the cost of the work would determine the problem which would be the most advantageous.

627. Probably you are of opinion that the business carried on at the part of which I am speaking is not of such a nature as that there would be much objection to having a roadway in front of it?—Of course the local people in Lambeth will give you better evidence upon that point than I can, but as far as my personal knowledge goes, it is all heavy trade; it is cement, stoneware pipes, clay for the manufacture of pipes, timber, and all those sort of goods which are not damaged by exposure or by lying upon wharves, and which do not require to be warehoused immediately they are unshipped.

628. (*Captain Burstal.*) You remarked in the early part of your evidence that we had extraordinarily high tides, and that they occurred with easterly winds?—Yes.

629. Have you made the phenomena of tides in the Thames at all a study?—Only so far as these particular overflows; my attention has been drawn to the subject when I have had to report upon it from an overflow. I have not made the tides particularly a study at other times.

630. With reference to the highest tides which have taken place in the Thames during the time that you have been connected with it, have you observed that the highest tides do not come with easterly winds?—The general impression of the district was this—"We have had an easterly wind for so long, a

E. Cresy, Esq. "week or ten days, we shall have a high tide next Tuesday, we shall have it over the banks." That is the sort of impression which I have heard in the district.

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631. Perhaps it may be presumption in me to say that that is a mistake, and that the highest tides invariably come with north-westerly winds. However, that is not a matter of very much consequence in this discussion. If flooding over the banks is a matter of serious consideration, in the re-construction of an embankment it would be a matter of importance to know how often within certain periods these very high tides do take place; have you any information on that point?—I think that we used to have the water very badly over about twice in the year, when it would be an exceedingly bad tide, and we had it over sufficiently to flood the cellars of the people in the neighbourhood, perhaps six or seven times in the year.

632. Over the banks?—Yes.

633. I have before me a copy of the highest tides which have been observed at the London Docks from 1844 to 1857, from which I observe that from 1847 to 1852, there were not more than two tides during the whole of that period when the level of high water was higher than 2 feet 6 inches above Trinity or 15 feet on Ordnance datum?—That would come over in a good many places.

634. At what part of the district to which you refer (I will confine myself to the portion from Deptford to the Pool) would you say that the water covers the wharves and pours into the streets?—I should find it difficult to refer to any particular point, but it was generally in Rotherhithe and Deptford, Rotherhithe more particularly.

635. Since the survey was made from which those plans have been drawn, with a sight of which you have favoured us, are you aware that a great many of the wharves in the neighbourhood of Deptford and the Commercial Dock pier and Cuckold's point, and from there to the Tunnel, have been rebuilt?—Yes, a good many.

636. Do you know that in re-building those wharves the tops of them have been brought higher than they were formerly?—A good many of them have; the Commercial Dock Company have raised theirs. There was a good deal of low property there which they have very much improved.

637. And the Surrey Canal Company also. You have probably not had an opportunity of observing levels of the tops of the wharves since that change was made?—I have not had any levels taken since that change was made, but I have seen several places in which they have been considerably raised, and improved wharves constructed.

638. Do you know any wharves at present where the water would pour into them so as really to damage the neighbourhood?—No, I cannot tell you that without revising those documents.

639. Supposing it to be the case that nearly all the wharves between Deptford and the Pool are at a considerable distance, we will say 4 feet, above Trinity, the damage which you apprehend to that district must principally arise from percolation?—Yes.

640. Do you think that that percolation is entirely attributable to water from the river, or do you think that it is not fair to infer that that percolation comes under the bottoms of the Commercial and the Grand Surrey Docks?—In the neighbourhood of the Commercial and the Grand Surrey Docks I admit the possibility of a leakage, but not where you get away from those docks.

641. But the whole of the district between the Lower Pool and Deptford is entirely between the River Thames and the Commercial Docks?—With respect to that strip of land between the Commercial Docks and the river, I grant that it is within possibility that there might be percolation from those docks; but I may say that in cutting trenches we have not become acquainted with that percolation.

642. That is the district more immediately bordering upon the river?—Yes.

643. If, as I believe is the case, the bottoms of those docks are gravel, is it not reasonable to suppose that percolation would take place under the bottoms of those docks, and go inland towards Deptford Lower Road?—Then we should find more water nearer the docks and less water as we got from the docks; but in that lower district we were never sensibly conscious of percolation from the docks, and I may state that in cutting a trench on the east side of the docks I said particularly, "Just see if any water comes through from the docks," and the report to me from the Clerk of the Works was, that the water did not come through from the docks.

644. Were not you rather surprised at that?—The evidence of course was imperfect.

645. I mean simply because the docks are always full of water; it has no chance of going back again?—Yes; but you will remember that that dock is very well constructed.

646. The walls?—Yes.

647. But from the bottom might you not get water?—Yes; then we ought not to find the water rising and falling in the trench. When we found the water rising and falling in the trench we concluded that it came from the river; when we found it stationary in the trench we concluded it to be from percolation. I think that that would answer your question.

648. Supposing it was considered that it really was the fact that great damage was done to the district by percolation from the river, would not the process of puddling be very considerably cheaper than constructing a new embankment?—I cannot precisely see how you would carry out the puddling, where you would carry it out, and what means you would adopt; but I can conceive of a puddled wall sufficiently thick to prevent percolation.

649. Would not an embankment be much more expensive than puddling?—I do not see precisely how you would carry out the puddling. If I saw how you proposed to carry it out, I should then be able to answer more distinctly.

650. You told my Lord Mayor that there was a large portion of the foreshore of Fore Street, Lambeth, which might be enclosed and embanked for the purpose of carrying out improvements in that locality. Have you considered that question with reference to the proper state of the river in that locality?—No; I think you did not quite understand me. I said that two ways suggested themselves of dealing with that portion of the river, either carrying out the wharves riverwards in that direction, reclaiming a portion of the foreshore, and then widening Fore Street by taking down the houses and giving up that portion to the wharves as a sort of compensation, or carrying out an embankment in the true sense of the word, and carrying a roadway along it.

651. One question would evidently be whether the encroachment upon the river by an embankment would be desirable in that locality or not?—Yes, and I also said that it would be a question of estimate.

652. With reference to the flooding of the inland district, which you referred to shortly as Kennington Oval, I glean from you that that must necessarily arise directly from the sewers either from land floods or from the water tumbling in over the top of the walls?—I said that we distinguished in that respect, that in several cases the land in Kennington Oval was affected by the land floods, but that on some occasions we distinctly traced that the flooding was owing to the Thames.

653. Do you think that generally speaking the main drainage when carried out by a large sewer at a low level will remedy those evils?—Immensely. In some of those extraordinary floods which take place when we have had two inches of rain fall, the main drainage probably would not entirely carry that off.

654. Then you would have to go to your storm outfalls?—Yes.

655. Taking the same consideration in the district below by the Commercial Docks, and between that and the Deptford Road, do you think that a large sewer carried along as proposed, and thus draining all that district, would relieve it a great deal from the dampness from which it now suffers?—Enormously, of course.

656. (*Mr. McClean.*) The low level sewer, I suppose, will also prevent the water remaining in the cellars. You said that formerly it lodged there for five or six weeks after an inundation?—It will drain it off.

657. That evil will be completely removed?—Yes.

658. (*Chairman.*) With regard to indirect taxation, you made some suggestion about levying tolls or dues?—What suggested itself to my mind was a tonnage due.

659. On what?—On all goods entered inwards in the port of London. I do not think that it would be possible in London to collect an octroi.

660. Do you mean a due on the tonnage of the ship or the tonnage of the goods?—On the tonnage of the goods entered inwards for example.

661. Would not that involve a new machinery?—I conceive it possible to collect it by means of the existing Custom House machinery.

662. The Custom House machinery does not apply itself to general articles of consumption?—It applies itself so far that all goods entered inwards are registered although not taxed.

663. Do you happen to know of your own knowledge that there is machinery already in existence which would enable dues to be levied upon all articles of consumption coming in or going out?—I know that the Custom House make an annual return to Parliament of the goods entered inwards in the Port of London, and, therefore, I presume that they must have some machinery for collecting that statistical information, and at the time of collecting the statistics

The witness withdrew.

SAMUEL PEGG, Esq., examined.

670. (*Chairman.*) You have come, I presume, to give us some information connected with the locality in which you live?—Yes.

671. Will you favour us with your address?—81, Bankside.

672. You have premises abutting on the river?—Myself and partner have.

673. Probably you are aware of the object of this Commission; that it is appointed to report upon the best plan for embanking that side of the river, for embellishing the river, and for forming a roadway; all this to be done with the least interference with property?—I am.

674. You have been thinking of the matter, and you have been in discussion with other persons interested in it, and no doubt you have formed your own notions; and probably it would be better if you would please to tell us what you think about the whole subject rather than my asking you a great many questions?—In 1845 the Clink Commission raised Bankside from Bank End to the end of Holland Street or Falcon Dock.

675. Where is Bank End?—Bank End is the part nearest to London Bridge—Clink Street. I was one of the committee to carry out that work; we did not raise it so high as we intended in consequence of the great opposition from the various wharfingers. My brother personally opposed me, and severely too; but I was one of the Board of Guardians at that time, and for several years previous, and I had seen the very severe distress which overflowing had caused; it had brought a great many extra paupers into the workhouse from the overflowing of Bankside and the low lying districts of St. Saviour's parish. I was induced, if I could by some means, to prevent it, and I was a very active member of that committee, to prevent it if possible. As I have said we experienced very great opposition

it occurs to my mind that a tonnage due can be levied.

664. (*Captain Galton.*) Then you mean that you would levy a tonnage due upon all articles which come into the port of London, whether for consumption in London or for consumption in the country at large?—Certainly.

665. You would tax the country at large?—Undoubtedly.

666. (*Captain Burstal.*) Would you tax the goods that come by railway also?—I think that that would be very desirable if possible, but the means of collecting the tax are not so obvious as in the case of goods entered inwards, but at the same time in my mind it would be very desirable to tax all those goods which are transported through the metropolis.

667. (*Captain Galton.*) As your system would tax the country at large, would it not answer the same purpose to pay the money out of the Consolidated Fund?—Not precisely, because the work proposed to be carried out would be carried out for the benefit of the trade in the particular locality, and you would spread the taxation not over the whole country, but over the area to be benefited by that particular work.

668. (*Chairman.*) You are aware that Sir Robert Peel got great credit for abolishing duties on a thousand small matters?—Certainly.

669. Do you not think that it would be rather an unpopular measure for any Minister to impose taxes on articles of consumption which are now free?—So far as I understand that question I believe that the objection to the taxes on small articles which Sir Robert Peel removed was an objection arising from the vexatious and frivolous interference with the current of trade, but I conceive that the mode of levying a tonnage due would not be attended with all those inconveniences which attended the collection of the duties on small articles.

from the various wharf proprietors. My own partner also was opposed to it, because we were obliged to raise our own wharf; and I think that our wharf was punished as much as any wharf in the district, individually it cost us about 180*l*. In consequence of the opposition we had to compromise it in various localities.

676. (*Mr. Theobald.*) Am I to understand the punishment to which you refer, to be the cost of construction, or the punishment arising from the effects of flooding?—The cost of construction. Mr. James Shears was also in the district; and if we had raised his premises so high as we intended, we should have shut out the Bear Garden; he could not have got any carts under the Bear Garden to the back part of his premises in that district, and the same would apply to another district. But wherever we could the Clink Commission raised it, but not so high as was originally intended; and it has very much benefited the neighbourhood ever since. We have had but one or two floods which have gone over the present embankment since 1844. The expense of that was met by annuities; it cost the Clink Commission about 3,600*l*.; the wharfingers had to pay their own expenses. Some little assistance was given to some parties; but, generally speaking, each wharfinger had to bear his own expenses.

677. (*Chairman.*) The Commission was enabled to operate there because there is a roadway all along?—Yes; all along the bank. A certain portion fronting that roadway belonged to the houses opposite, and it was so little and so narrow that the Clink Commission raised it for them, they raising the camp shedding.

678. So that each individual wharfinger raised the camp shedding?—Yes; excepting those parts which abutted upon the river.

679. So that the Commission in fact operated upon

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the public way, but each individual proprietor carried it out at his own cost?—Yes. My father-in-law was very much opposed to it. His premises were at 85, Bankside, and if we had raised it so high as we intended he could not have got out of his wharf. He was a barge builder. It was a compromise between all parties all along the bank. We have not raised it so high as we intended. If we had raised it so high as was originally intended no flood which has occurred since would have gone over it.

680. Have there been many floods since?—Not many. We had a high tide in 1851 with a north-west wind. It is always with a north-west wind that we have a high tide, if it occurs with a new or full moon. We had not a very high tide last week in consequence of the long easterly wind. My wharf descends from north to south; it is low in the middle. The river wall is high, and the street which you go through is high, and there is a hollow in the middle of the wharf. About 20 feet inland I had a wharf wall built with tide boards, and those tide boards I did not put down this last week because of the long prevalence of easterly winds. I estimated that the recent high tide would not come over, and it has not done so.

681. Are you of opinion that anything ought to be done along Bankside?—I think that if we could get the wharfingers to raise their premises it would be a benefit, and it would entirely prevent the water coming in that district. There is one wharf between Messrs. Rennie's premises and the Falcon Dock, exactly opposite Pellatt's Glass House, where it is the lowest part of the neighbourhood. It is in Christchurch parish, and the water does come through that wharf. It is a narrow gutway of a sewer, and there is a yard. If that could be prevented I think we should scarcely ever see the water over,—only about once in four or five years.

682. Could the local authorities get that done?—I think they could. The District Board of Works have endeavoured to raise the street to prevent the water coming in, but it would cause a very great annoyance to Messrs. Pellatt's premises, and also to other premises in the immediate neighbourhood. There was formerly a very sharp incline; they have now made it a gradual incline. It would involve a great outlay, but it could be done.

683. You were I believe one of the gentlemen who attended at the numerous meetings, and you have come here deputed by the meeting to represent their views to the Commissioners?—No; I have not attended any meeting if you mean a parish meeting; I have attended a private meeting of wharf holders.

684. The letter which I hold in my hand is signed by Mr. Roffey, and he says "It was resolved at a vestry meeting that a communication be addressed to the Commissioners now sitting upon a southern embankment requesting them to afford an opportunity to representatives from the above parishes;" are we to understand that you are one of their representatives?—No; I think not. I was requested to attend here to give evidence.

685. The letter signed by Mr. Roffey, and dated the 31st of December, says "I beg to inform you that the gentlemen whose names and addresses are set forth on the other side are desirous of giving evidence on the subject of embanking the River Thames on the Surrey side," and there is the name of "Mr. William Pegg, Bankside, Southwark, iron merchant." I thought that perhaps you had something else to say on behalf of the vestry in addition to what you have stated to us about Bankside?—Our district did suffer very severely when the water overflowed, but I think that if Lambeth parish had done as St. Saviour's has done there would not have been this outcry as to the detriment which the flooding has caused to the locality.

686. Then the Commission may understand that as far as Bankside is concerned there is not much to complain of?—I think so.

687. And that what there is to complain of might

be remedied if you could prevail upon each individual proprietor to raise his camp shedding?—I think it might.

688. Can you tell us how many inches, or how many feet, that camp shedding should be raised?—I only know my own wharf in particular, and I think that if I raised it about 14 inches it would be about 6 inches beyond the highest tide. Adjoining my own premises there is a public highway, a passage, a five-feet highway you may term it,—and there I had a coping stone put down to the highest point that the Clink Commission intended to raise it, and the water has never yet been over that stone.

689. Wherever those passages run from the water side inland there would be no difficulty I presume in raising the ground high enough to prevent the water from ever running over?—None whatever.

690. In fact does the water ever go any great distance along that highway which runs by the side of your premises?—That passage comes into the main street.

691. And does the water go all the way along there?—It would go all the way along there, but it is a continuation of the old stone wall, and there is stone on the top, and the water has not gone over it. Previously to that it used to come up that passage first before it came into my premises, before the bank was raised.

692. (*Captain Galton.*) Out of what funds did the money come with which the Clink Commission operated?—We raised it upon annuities.

693. Upon what security were the annuities?—Upon the rates.

694. (*Mr. Thwaites.*) What powers were possessed by the Clink Commissioners to enable them to carry out this work compulsorily?—I think they had powers under a Local Act.

695. Had the Clink Commissioners power to call upon the individual wharfingers to raise their wharves?—We found that we were very deficient in that, and as I have said before it was a compromise. If I had held out I do not think there was any law to compel me.

696. Supposing that you had called upon A to raise his wharf wall, and A had failed to obey, you had no power to enforce it?—I think not; we were very delicate upon that score, and we did not attempt it, or I am sure that I should have tried it with Mr. Shears.

697. There was a doubt as to the strength of your powers to carry out that object?—Yes.

698. You have stated that notwithstanding the evil to which the district was subjected by reason of the flooding yet you had great difficulties in securing the co-operation of the parties for the purpose of raising uniformly the front wall?—We had.

699. You failed after all your exertions?—We did fail to a certain extent.

700. Supposing that one or two wharfingers should refuse while all the others had obeyed your instructions would not a flood find its way over the wharves of those rebellious wharfingers into the rear, and ultimately flood the district?—It would not, because we raised the street in Bankside; it would come over their own wharves. At Hinton's coal wharf they have not raised their camp shedding at all, but they have made an incline from their wharf on to the roadway at Bankside, and the roadway was not made so high. Messrs. Hinton and Son have since raised their camp shedding and repaved their wharf.

701. You have stated to the Lord Mayor, with regard to a particular part of your district, namely, that contiguous to Holland Street, where there is a low part, and the water finds its way over into the street, that that could be remedied by the local authorities. How do you reconcile that with the statement which you have made of the infirmity of those powers?—I understand that now the Local Board of Works have greater powers than the Clink Commission had.

702. Have the Local Board to your knowledge exercised those powers under the Local Metropolis Management Act?—I think they are satisfied that the evil does not warrant their interfering, it being too slight. It is only about once a year, if then, and then the sewers carry away all that overflows into the premises, and it does not overflow the district.

703. I understood you to state that the district of the Clink required very little improvement?—It certainly required improvement, but it was so well looked after that I think there was no district in London which was better paved and better drained.

704. You have referred to the roadway in front of the houses on the foreshore of the river, supposing that that roadway were raised and extended, and that instead of its being 20 feet it were made 30 or 40 feet in width, and made of a sufficient height to resist the highest tide, would not that be an improvement?—I think it would, but that would take away a portion of the foreshore; but at Bankside I think that they could spare some portion of that foreshore.

705. Where there is an existing road, and all the goods landed at the wharves must be landed over that roadway, would it be an injury to the wharfingers, instead of landing over a 20 feet roadway crowded with traffic, to land over a roadway less crowded with traffic 30 or 40 feet in width?—I think that if a roadway was in front of my wharf, it would be very injurious to me to have my goods carried over while carts and waggons were continually passing.

706. Is there not now, to your own knowledge, a frequent stoppage occurring along that narrow roadway in front?—Yes.

707. Waggons and vehicles are frequently stopped to the inconvenience of the wharfingers?—Very frequently indeed.

708. Supposing that roadway to be widened from 20 feet to 40 feet, while it would offer greater facilities to traffic, would not the wharfingers be less inconvenienced by such an arrangement?—I think that the occupants of the premises at the narrow part of Bankside would not be inconvenienced, but a coal wharf, or corn wharf, or brick wharf, or timber wharf, would be very seriously inconvenienced.

709. I think you stated that the District Board of Works of St. Saviour's have not in any case acted upon their powers with reference to calling upon the wharfingers to raise their wharves?—I do not think that they have in any case. They have raised the sharp incline which was at the end of Holland Street, they have now made a gradual incline; if that had been raised in a uniform line with Holland Street and Bankside it would very seriously have inconvenienced Mr. Pellatt's Glasshouse, and the footpath all round there.

710. Can you speak as to the condition of the river wall along that district?—In some places it is very good, and in some places indifferent; at my father-in-law's old premises the river wharf wall is very indifferent, and the two wharves adjoining.

711. Is it of brick construction?—I think it is all brick except by Hinton's coal wharf, and the two wharves east and west.

712. Have you observed the water to find its way through the wall to the basements of the premises there?—I have not noticed it.

713. Have you noticed that the premises have been damp?—Now you speak of it I remember that the premises have lately been rebuilt, and they had great difficulty in damming out the river from percolating under Bankside in the narrow part; it percolated through the wall, and the brick wall in that locality is very indifferent.

714. I must not ask you your opinion as to the coal dues, but I can ask you a general question. Are you of opinion that the large improvements in the Metropolis can be carried out by means of direct rates from the inhabitants independently of any indirect

taxation or other sources?—I would rather see a coal tax.

715. You think that the present coal tax might not only be continued advantageously, but slightly increased to the advantage of the Metropolis?—I think it might.

716. (*Captain Burstal.*) Why was the raising of the wharves opposed by the wharfingers; was it on account of the expense to them?—It was because of the great expense to them; my brother opposed me in consequence of the great expense to him, my partner opposed it in consequence of the great expense to us; but I had seen such great distress as a member of the Board of Guardians that I endeavoured if I could to alleviate it.

717. Would not a high coping stone all along there effect all the purpose required?—It would be very difficult to arrange it.

718. Without raising the road in front of Bankside?—Yes. Most of the wharfingers have a strip of land; at the narrowest part of Bankside there is, I think, a strip of about four feet belonging to the houses opposite.

719. If the coping stone to which I have referred were generally raised to the necessary height by the competent authorities authorized to do it, would there be any difficulty by means of interruption with carts and vessels which were loading and unloading?—There would be the difficulty of their having to raise their goods higher out of the barges.

720. But to no greater extent than that?—No.

721. Do you know what the present general height of Bankside is above Trinity high-water-mark?—No, I do not recollect it.

722. But I think you said that the water has very seldom come to the summit of it in the last few years?—Very seldom; we had a very high flood in 1850, and then it came up to that coping stone, but it did not come over it.

723. Is there much through traffic at Bankside, or is it more local?—It is more local traffic, the street is too narrow for through traffic, there is very often a stoppage in Bankside.

724. Supposing it was made wider, would it become of importance for through traffic?—I think it would, but a new street is now forming from the Borough to Stamford Street, which will take all the through traffic, I think, and Bankside will only have its local traffic.

725. You consider that that new street which is now being constructed between High Street, Borough, and Stamford Street will very much benefit all persons in that locality?—I do, very much indeed.

726. Are you intimately acquainted with the general requirements of street traffic in that locality?—I cannot say that I am, except from living in the neighbourhood all my life.

727. If this street is constructed from Stamford Street to the Borough, does it strike you as being desirable to have an additional roadway or street for locomotion on the banks of the river?—I think that it would not be. While I should very much like to see a wider street on Bankside, I think that the new street will so much relieve the traffic that it will not be required.

728. You have said that Bankside is mainly for local purposes?—For local traffic.

729. Irrespective of the case in point, which you described to the chairman of the Metropolitan Board of Works just now relative to the re-construction of a building, is it a general complaint at Bankside that the premises and cellars become damp by percolation?—It is a general complaint.

730. Leading you to believe that the wharf wall is leaky?—I think that all the brick wharf wall wants remodelling. I wanted my nephew to live in one of the houses on Bankside, lower down than where I now speak of, and his argument was, "that it was so very damp that the family would have a doctor in the house three parts of the year."

The witness withdrew.

J. Howe, Esq.

2 Jan. 1862.

JOHN HOWE, Esq., examined.

731. (*Chairman.*) You are a surveyor living in Southwark?—I am surveyor to St. Saviour's District Board of Works.

732. Then I dare say you can give us very general information; and as you know what the subjects are upon which we want information, perhaps we shall get on faster if you will state to us your opinions and your views with respect to the present state of things, and what is desirable to be done?—Does your lordship mean as to the necessity of an embankment throughout the district which I represent?

733. Yes?—Your lordship is aware that the proposed embankment, according to the plan which I have seen printed, terminates on the western side of Emerson Street.

734. We have no proposed embankment?—But I have seen a plan with a line of demarcation.

735. We know nothing whatever of such a plan. I have not the slightest idea of what plan you are alluding to?—I only wish that I had thought to have brought it, we have one at our office.

736. (*Captain Galton.*) Do you know who drew it up?—No; it is called "Proposed Thames Embankment," and it was left at our office with a section of the heights upon it.

737. (*Chairman.*) When was that?—It has been left there this fortnight.

738. (*Mr. Thwaites.*) The parties have served notices for the purpose of going to Parliament?—I believe they have. I have seen during the length of time that I have resided in that parish almost all the high tides which have affected the neighbourhood as to overflowing, and the raising of the embankment walls was rendered exceedingly necessary from the amount of damage done to the property in the immediate neighbourhood before the raising of these embankment walls; and further than that, from the very great mischief and destruction which the flooding committed upon the dwellings of the poor who resided in the basement stories, whose clothing and bedding, and every thing of that sort got saturated. But there are a vast number of houses between Bankside and New Park Street, which are as much as 3 to 4 feet below the wharf wall of the bank of the river. For the purpose of informing myself of something like the height of the tide, I took advantage of a period two days after the full moon which happened on the 17th December, for the purpose of gauging the height of it. Whether that tide was influenced by the operation of the wind in an adverse way or not, I do not know, but at the back of St. Mary Overy's it did not reach the top of the stone coping by 2 feet. I measured six other places down Bankside at the same time. I stationed men there to mark the extreme top of high water simultaneously, in order that I might judge from the height at each place. I took that on the 19th of December. I have seen tides, I must admit, 3 feet higher than that, probably affected by wind or other causes, which I do not know.

739. (*Chairman.*) You said that previously to the wharves being raised, great distress was occasioned?—Yes.

740. When were these wharves raised?—I am alluding to the operation of raising the wharf walls referred to by Mr. Pegg. I at that time was employed, being in the building trade, by the Commissioners of Pavements, to which body I had previously belonged for some time, to do a part of the work of this embankment on Bankside.

741. Then are we to understand, that in your opinion, there is no great necessity at the present moment for anything being done there?—I must admit that I have not seen any tides overflowing the banks above once ever since they have been raised. We had a large quantity of water, I think somewhat about 1850 or 1851, but which year I do not rightly know, admitted into the neighbourhood; but that was found to be in consequence of the penstock at the

end of Bank End being left open, where the whole force and weight of tide passed up into the sewers and through the gullies, and filled the streets. Park Street at that time was two feet nine inches deep with water above the top of the footway pavement.

742. That arose from negligence?—From negligence on the river side, I believe; not from an overflow of the water.

743. (*Mr. Thwaites.*) Am I to understand you to state that such is the condition of the Clink district, that it is not susceptible of any improvement?—I do not mean that it could not be improved, because I know that there are some places where the wharf wall could be advantageously carried up to a greater height; but the Commissioners of Pavements, to meet the requirements of the persons whose trade would probably be affected by an increased raising of the river wall, raised the street in front and elevated the ground—for instance, between Holland Street and the wharf wall,—so as to prevent the tide getting through the opening into the streets.

744. I understand you that no part of the district of which you are surveyor, has been flooded since the raising of the walls to which you have referred?—I am not aware that the inhabitants have been flooded by overflow; there may have been a little overflow in a low place or two, but nothing to inundate the neighbourhood.

745. You having been employed to increase the height of those walls at the time referred to, will you state what was the condition generally of those walls?—Some of the walls had not been a great while rebuilt, but a great many of them have been substantially rebuilt; the whole length of Messrs. Barclays', for instance, Messrs. Shears', and many others. Most of the brick walls which are in existence between Bank End and Holland Street are in a decidedly sound condition; but there is some camp shedding in front of the new building to which Mr. Pegg referred in that immediate neighbourhood, which is in a very bad and dilapidated state.

746. As the surveyor of the district, will you state in what condition you have found the premises in that neighbourhood; have you observed any damp?—Do you refer to the houses on Bankside?

747. Has the water percolated through the wharves so as to render the houses, in the basements especially, damp?—I am sure that they are damp, if there is not water in them; but I think that a great deal of that damp arises from the bottom.

748. Is that the general condition?—I believe it is.

749. Where does that water come from?—I am of opinion, from all that I have seen, that a great deal of that water percolates through the gravel from the bottom and not from the wall.

750. Then these walls are not after all in the condition which you described; they are not taken deep enough, for example?—That would be my opinion; not deep enough to prevent the water getting under the foundations and saturating the cellars of the houses.

751. And while a temporary heightening of those walls may to a certain degree prevent the overflowing, still such is the nature of the wall and its want of depth of foundation that the water finds its way?—I think that that dampness would continue in the cellars of those houses just the same. Previously to the raising of these walls, when the water flowed over the river bank, those cellars were filled up to the top.

752. The St. Saviour's District Board, in common with all the other district boards, have power to call upon the wharfingers to raise their wharves. There are some few of the walls now of an insufficient height to resist the high tides. Have the St. Saviour's Board taken any action to enforce their powers?—They have not.

753. Has the matter been under discussion at all ?
—I am not aware that that point has ever been mooted at the Board ; in fact, I suppose that the

reason of the subject not having been mooted or noticed at the Board has been the total absence of any necessity.

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The witness withdrew.

EDWARD WYLD, Esq., examined.

E. Wyld, Esq.

754. (*Chairman.*) You live in Fore Street, Lambeth ?—Yes.

755. Have you any water side premises ?—Yes.

756. Your premises abut on the Thames ?—They do.

757. What business do you carry on there ?—A boat builder.

758. Are you of opinion that an embankment is required in that part ?—I think that if the embankment was taken out towards the bed of the river it would keep out the water.

759. Does the water rise over your wharf ?—Yes.

760. And does it run right over into the street ?—Frequently.

761. If you were to raise your wharf would not that prevent the water from running over as far as your wharf is concerned ?—No, there is a dock next to my premises, and the water runs up the dock and through the street.

762. If the walls of that dock were raised and if the mouth of the dock were also raised above the level of the highest tide, and if your wharf were raised too, I suppose the water would then cease to flow over it, would it not ?—Of course. The whole of the street also must be raised ; the whole of the street is sometimes 18 inches under water.

763. But would not the raising of the premises between the street and the river prevent the water from getting into the street ?—No doubt it would ; but it must be carried on the whole distance, because it comes over the Archbishop of Canterbury's wall and it would run in in that way.

764. Does the water often come over that wall ?—Not very often over that, perhaps seven or eight times in a year.

765. Would it not be very easy to raise the parapet of that wall ?—Yes ; but I must also speak of the percolation, in the house in which I lived the cellar was frequently full, although I kept the water out.

766. To whom did that house belong ?—It was built by Mr. Howard the coal merchant ; I lived in it for 14 years, and when I first went there I let the basement of the house at five shillings a week to a merchant to stow away oil and lead, but since then it has become so much worse that it is quite useless.

767. From the wall being defective ?—I have had it cemented outside, but the water comes in from the bottom ; I have watched it, the water comes in under the bottom through the bricks ; there is a brick floor, so that I could not prevent it by any means : I should have done so if I could for the sake of getting the five shillings a week which I have lost in consequence of the water coming in now so much more frequently than it used to do.

768. Did you say that it would be desirable to carry out an embankment further into the river than the front of your premises ?—I think that it would be very desirable so as to make a good road, for the road at present is very bad.

769. A road next the river ?—Yes.

770. Between the existing properties and the river ?—Yes.

771. Would that promote your business ?—No ; my my particular business would be injured by it, but other businesses I do not think would.

772. What are the businesses adjoining you right and left ?—The premises of Mr. Doulton the potter are the next that are occupied. The premises next adjoining me have been unoccupied for these five years.

773. Would it suit Mr. Doulton to have a roadway

between his premises and the river ?—I should think so. I do not think that it would be objectionable.

774. Do you think that the same answer would apply to most of the property along there ?—I think so.

775. You think that a roadway between the existing properties and the river would not be objected to by the owners of the property ?—I should think not generally. It would be a hindrance to my own particular business.

776. What is the nature of the business which is generally carried on along there ?—The parties are chiefly potters.

777. And you think that the landing of their clay over a roadway and the carrying of their goods from their warehouses over the roadway would not be objected to by them ?—They do it now.

778. Is there a roadway there now ?—There is a roadway inside. They have their premises on the landward side of the street, and all the clay is carried across the road upon planks.

779. They have now to carry their goods across Fore Street ?—Across Fore Street upon planks.

780. In the case which you mention they would have to carry their goods across Fore Street and across the proposed new road on the other side of Fore Street between that and the river ?—It would be more than at present, but they have now to take them on a plank, and every time a cart comes up that plank has to be removed, and it may not be removed at once, and it stops the thoroughfare. In fact nothing can be worse than Fore Street ; it is in the most disgraceful state in every way.

781. Fore Street is a narrow street ?—Very narrow.

782. And the business carried on there is inconvenienced by the necessity of removing the planks every time a cart goes by ?—Yes. Mr. Doulton's clay and coals are carried across because there is not a wharf just by there. He does not land any of his goods at a wharf.

783. You come, I think, as one of the representatives of the district to tell us what the requirements are ?—I come as a wharfinger, and as being able to speak of the nuisance which I and my neighbours are subjected to from the overflow of the tides, and I also think that we are more subject to it now than when I first remember it. I have been where I now am 25 years.

784. As regards your own premises you have already answered the question ; as regards all the other premises along there are you of opinion that if the wharf walls were raised above the level of the highest spring tides that would meet the difficulty ?—Provided it was carried all along from London Bridge say up to Battersea Bridge, not else.

785. The overflow at London Bridge would not affect your district ; but speaking of your own district, if every wharf wall were raised we will say for 300 yards right and left of you, making 600 yards altogether, that is to say, about a third of a mile, there would be no overflow there ?—Yes, because the street being lower where the water did overflow, it would flow into Fore Street.

786. Suppose that instead of 600 yards we went all the way along from Westminster Bridge to Vauxhall Bridge ?—Yes, that would do it.

787. Do you see any particular difficulty in each proprietor raising his wharf walls ?—The great difficulty would be to keep the water out of the docks ; there are several docks.

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788. Would there be any difficulty in raising the walls of the docks?—There are no walls, they are open draw docks.

789. There are walls at the sides, but of course not at the end. A cart would have to draw a little higher, the ground being raised there; could not the ground be raised so as to prevent the water running over?—The whole street must be raised too, I think; it must be raised three feet. There is a draw dock adjoining my premises, the house that I used to live in, and in the street at the end of the draw dock there is sometimes two and a half feet water, and sometimes even more.

790. How does it get there?—The river comes into the street.

791. By way of that dock?—By way of that dock.

792. Do you think that there would be a difficulty in raising the slope of that dock to such a degree as to prevent the water coming in?—The owners of horses would not like to draw up there because of the steepness, it is already steep enough, it would not do to make an incline and stop it at Fore Street. I mean that the incline must be carried further up.

793. You mean that Fore Street itself ought to be raised?—Yes, the whole of it.

794. Would there be any difficulty in raising Fore Street at the part immediately adjoining this dock?—It would be a series of inclines in that case, because there are so many draw docks; there are three in a space of a quarter of a mile.

795. Probably it would be necessary to raise the slope of the draw dock, and carry the bottom of the incline further out towards the river?—Yes.

796. That would do it?—Not altogether, because the barge always comes as near the wharf as possible, and the incline being carried out further would not have any effect, because they do not draw from the low water, but from the edge of the wharf.

797. Is there anything else which you are prepared to tell us?—There is one thing which I have observed, namely, that the shore gets lower by my premises.

798. By the shore do you mean the bank of the river?—I mean the beach.

799. Do you mean that the gravel passes away or that the mud is washed off by the steamers?—The gravel passes away. I am able to say so, because about 14 years ago I sank a mooring stone, and about six years ago I just saw it, it appeared level with the shore, and two years afterwards it was so raised up on the shore itself that I was obliged to dig it up because it stood up, and consequently in launching my boats over the shore, the corner of the stone was likely to make a hole in the boats. I also see stumps getting higher occasionally in the shore, and as they cannot rise the shore must fall.

800. (Captain Galton.) Do you mean that the shore falls at the foot of the wharf wall, or away from the wharf wall?—At the foot of the wharf wall and some distance away.

801. Does the foundation of the wharf wall become exposed at all?—Yes.

802. How is your wharf bounded—by a wall or a camp shedding?—By a wall; and although my wharves are good, yet the percolation is very great. I could keep out the water from the house that I used to live in (No. 66), but the water used to come in from the bottom.

803. The height from the level of your wharf wall to where the shingle commences is greater than it used to be?—Yes, from the shore.

804. How do you account for the water coming into your cellar now to a greater extent than it formerly did?—I do not know, unless it is that the street altogether is lower, and altogether settles down.

805. You think that the district is sinking?—I think so; I can only account for it in that way. I do not know whether the tide has risen higher more frequently at the docks and the bridges, but I know that it comes into my place more frequently.

806. You think that the district is sinking, and that the beach is sinking?—The beach is sinking I am sure.

807. And you think that the wharf wall is stationary?—No; the wharf wall is deeper than it was, that is to say, from the shore to the top the distance is greater. I attribute that to the action of the swell from the steamboats in some measure.

808. Is the wharf your own?—No; only on lease. I am a leaseholder.

809. What is its yearly value?—I have two or three properties from different landlords.

			66.	Draw dock.
Nos. 63.	64.	65.	35 ft. 6 in. frontage.	
37 ft. 6 in.	17 ft.	10 ft. 6 in.		
Total frontage, 100 ft. 6 in.				

Rent of Nos. 65 and 66, 42*l*. Rent for No. 64, my present dwelling, 22*l*. Rent for No. 63, being a boat-house and small dwelling-house, 45*l*. Total rent for water side, 109*l*. per annum.

810. Is that all for the river frontage?—Yes.

811. What extent of wharfage have you?—I should say that my frontage altogether is from 90 to 120 feet; including three small houses, it is about 120 feet.

812. If a road was made as you were suggesting, it would interfere with your wharf and compel you to leave it?—It would interfere with my particular business; it would be awkward for me to carry boats across the road.

813. The docks which you were speaking of are public draw docks?—Yes.

814. Any person can go and land goods there?—Yes.

815. Without paying any dues or rentage?—At the dock next adjoining me they sometimes object and sometimes the people will draw; it has never been taken into court; there is a doubt about it. Some people think that it is a public dock, others say that it is a private dock.

816. How many of these public docks are there along there?—There are three.

817. You were speaking of raising the street; would that inconvenience the houses or wharves adjoining?—Many of them would be below the street.

818. Then that would be an inconvenience?—Yes, it would. The water comes into the houses now, and if the street was made so high that the water could not get into the street, the houses would be below the street.

819. The way in which you have remedied the inconvenience from your cellar being overflowed is, that you have abandoned the use of your cellar?—Entirely; my basement now is not used at all, and I have made the ground floor into a boathouse to warehouse boats. I do not use the basement, and that was in use by the previous occupier. I wish to show that the tide comes into the houses more frequently than it did ten years and upwards ago.

820. But you have no way of accounting for that?—The only way in which I can account for it is that the ground lowers. I am quite sure that the beach lowers. I have given the evidence of the mooring stone. I saw it first level with the shore, and afterwards it was standing raised up.

821. You think that the beach has been washed away?—Yes.

822. And you think that there is a greater facility therefore for the water to percolate?—Yes, there is no doubt of it.

823. (Mr. Thwaites.) Do you think that the physical depression of your district to which you have referred is due to the constant floodings which take place?—I do not know whether it is because the shore is taken away, as it were,—that may account

for it. But I think that the more frequent flood intend to show that it is depressed.

824. In your opinion supposing the wharf wall should be raised, it would not prevent the water finding its way into your cellars?—No, because it does sometimes come in at the front.

825. The water gets through the imperfect wall?—Yes.

826. You have spoken of the existence of two or three public draw docks, are those much used by the manufacturers in that part of the river?—Yes.

827. Are you aware of the tonnage which is landed at those several draw docks?—At Lac's Dock and White Hart Dock there are sometimes eight or ten barges, but I should think that I might say three or four barges a-day, which giving each barge 50 tons, would make about 200 tons. I should say that on the average it would be less, but sometimes more.

828. For the purposes of trade do you think it necessary that those draw docks should be continued?—Yes, I am sure that the same number of horses could not draw up the load if the incline was increased sufficiently to keep the tide out.

829. Would it be inconvenient and a great loss to the trading population that those draw docks should be abolished?—It would be a loss to the people who draw from them; it would not affect me, for instance, and many others.

830. I speak with reference to trade generally?—It would affect those who are interested in that particular trade.

831. Am I to understand that the mere heightening of the wharf walls would not accomplish the object desired, namely, the excluding of the water?—Not unless the draw docks were raised also, and for a considerable distance.

832. Having regard to the level of Fore Street and the position of those draw docks, in your judgment the upper part of those draw docks would not be raised sufficiently to exclude the water without rendering them inefficient for trade purposes?—Exactly so.

833. Supposing that a river wall were built some few feet from the present, to inclose a part of the foreshore, and to make a roadway in front, that would give you a sufficient length so as to enable you to raise the top of the draw dock near to Fore Street without inconvenience?—I think that a few feet would not be sufficient, because the height raised should be $2\frac{1}{2}$ feet.

834. Supposing you were to take in the foreshore of the river 30 feet, and started with your incline at that point it would enable you to raise the upper part of the draw dock, would it not?—It might do so, but that is a question which I am unable to answer. I do not know much about it.

835. It would not be so steep if you started 30 feet further towards the river?—It would not, but it would be steeper than it is now, $2\frac{1}{2}$ feet in 30 feet is a great incline.

836. With the exception of your own particular trade, as far as you are able to judge, a roadway in front would not be inconvenient to the wharfingers?—I think not.

837. How far inland have you observed these floods?—I know that they extend into the South Lambeth Road and further, as I have heard into the Kennington Oval, and I think that that is caused in a great measure by a creek up which the tide runs.

838. (Captain Burstal.) You said just now that there were unoccupied premises near you, and that they had been unoccupied for some years?—Yes, next door.

839. One would presume from that that the water-side property is not very valuable there?—No, not particularly; the street is so bad that no one would live there if he could possibly help it.

840. Is that street rendered so objectionable to the public by virtue of the water coming in or by virtue

of the disagreeable smells which emanate from the premises?—Its general state is bad.

841. The bone boiling business is not very pleasant?—No; the land side of the unoccupied premises to which I have referred has now been taken by a man to melt down fat, and I have objected to it, and have applied to the magistrate to have it removed.

842. Your wharf, if I remember rightly, is on a slight elbow in the river, is it not—just above the New Lambeth Bridge?—It is just above the New Lambeth Bridge.

843. And the stream sets upon that shore at both tides; there is always a tolerably good current there?—Yes.

844. Consequently the river is rather narrow there—I mean approaching the Penitentiary?—My premises are nearer to Lambeth Church, I do not think it is so narrow there; higher up it is narrow.

845. The shore is all clean gravel there?—Yes, quite clean.

846. And I think you can walk along the shore without meeting any mud for a considerable distance, both ways?—Below the causeway it is mud.

847. But above it is clean?—Yes, up to Vauxhall Bridge.

848. You can walk along it without dirtying your shoes?—Yes.

849. That is a pretty good proof that there is scour in the river?—Yes.

850. I suppose that that is proved by your having seen your mooring stone?—I merely state the fact that I have seen it.

851. When was your mooring stone laid down?—About 15 or 16 years ago.

852. And if the river was then encumbered with mud and if since then the river steamers have come and washed away the mud and the stream has carried that muddy water away, that would easily account for some of the foreshore having been taken away and for the appearance of your mooring stone?—Yes, but when I first saw it it was raised up, and the steamers had been running for some time before I saw it.

853. With reference to the draw dock upon which you have given so much evidence you seem to think that if the top of the dock was raised to a level sufficiently high to keep out the river water it would be too steep for carts?—Yes.

854. How would it be supposing you had a tight tide gate at the top of it just to use upon these extraordinary occasions?—The high tides sometimes happen at night. I do not know how that would act.

855. Would not a tight gate at the head of the draw dock answer all the purpose of remedying a temporary inconvenience?—Possibly it might.

856. It would do away with the difficulty as to the carts?—It would.

857. It would only be for about an hour at most extreme tides?—Yes.

858. There are some flour mills in your neighbourhood, are there not?—Yes.

859. How do they conduct their business?—Nearly entirely by waggons.

860. I mean by river craft barges?—Very few river craft come to them, the flour is taken away in waggons, and the wheat comes in waggons.

861. How do they get the wheat from their barges into their mills?—It comes by carts and not by barges.

862. There is no river trade?—Not much, it is nearly all by carts and waggons; the wheat comes in carts or waggons, and other waggons come and take it away when it is ground. There are not so many barges as you might suppose would be used in such a trade.

863. Do you find any want of communication with the various parts of the metropolis on the south side of the river?—Yes, it is a very awkward road from Lambeth to almost any where. You cannot get to Vauxhall Bridge with a horse and cart or chaise

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without going round Kennington; there is a chance that you may go straight up Princes Street and Fore Street.

864. Do you mean to say that the communication between the south end of Vauxhall Bridge and London Bridge obliges you to go all round Kennington?—No, not to London Bridge. If I wanted to drive from my house to Vauxhall Bridge I should go round the Kennington Road, which would take me three quarters of a mile out of my way, because if I drove up Fore Street I should be stopped nine times out of ten by a waggon loading or unloading.

865. You think that another thoroughfare in that neighbourhood is very desirable?—Very desirable indeed.

866. (*Captain Galton.*) Did I rightly understand you to say that you pay three separate sums of 50*l.*, 45*l.*, and 30*l.* for the wharves which you occupy, and that the frontage is almost 90 feet?—I should say that it is 125 feet.

867. In fact it comes to about 1*l.* a foot frontage?

The witness withdrew.

T. A. Waring, Esq.

THOMAS ALBERT WARING, Esq., examined.

874. (*Captain Galton.*) You are a surveyor in the parish of Lambeth?—Yes.

875. You do not hold an appointment under the vestry?—No.

876. In which part of the parish do you live?—In Pratt Street, near the old Lambeth Palace.

877. Is that a part which is affected by the floods?—My house is not, but near my house is affected by the floods. Fore Street is not far from it, perhaps about 100 yards behind me towards the river.

878. Will you be so good as to give us your views upon the general question of the embankment of the southern side of the Thames?—I have been employed as surveyor to some proprietors on the banks of the river, amongst others, Mr. Beveridge, who has some property there, and is a freeholder. When it came into my management three houses were standing upon it, which were very dilapidated.

879. In which part is that?—Fore Street. At every high tide the lower parts were inundated and the houses had become rotten. About 10 years ago we rebuilt them. I took care to raise the floors about 3 feet, putting good wharf walls, and I have not found the tide come through them. The corner house stands at the side of an alley which is free, and there the tide comes through. It cannot get over my wall but it comes right round and into the front of Fore Street, so that my houses are, as it were, on an island every high tide, destroying to a great extent the value of the property.

880. I presume that the value of the houses has very much increased from what it was before, in consequence of being above the level of the tide?—We do not find that it is very much increased because we cannot get a good class of tenant in such a poor neighbourhood. If all the neighbours did as we have done it would be better, but then there are these open alleys and open docks to contend with.

881. Unless those open docks are also dealt with, you think that the neighbourhood would not be materially improved?—I did all that a private individual could do in building good wharf walls, and it has not been effectual. It has struck me, looking at the whole locality, that a road is wanted there. We have a good road down Stamford Street to come into Palace New Road, and we stop at Bishops' Walk. If there was a road from Bishops' Walk to Vauxhall along the river frontage, I think that it would be a very great improvement; we want such a communication.

882. Do you consider that the construction of such a roadway by preventing the floodings would greatly improve the value of house property in the district?—I do; I find one inconvenience from the low kind of neighbourhood, and from all these little alleys and

—Yes. There are some landward premises included in that rent.

868. On the other side of Fore Street?—Yes.

869. (*Mr. Theaites.*) What should you say is the rent of your water side premises?—I have spent about 500*l.* upon the property, and therefore I am rated at considerably more than the rent which I pay, because of the improvements which I have made. I am rated to the parish at about 150*l.*

870. For 125 feet frontage?—Yes; that includes the landward side of my premises as well.

871. Cannot you separate the two?—No, I cannot give you the exact rating of the water-side premises.

872. But cannot you give the value of the water side premises?—I consider that they are worth considerably more than I pay, because I have spent money upon them, and I have a lease.

873. But supposing that you pay 90*l.*, what would be the proportion of the premises next the river?—I should think that the river side premises are worth two thirds of the whole.

places, that is, they are receptacles for thieves and prostitutes. I cannot keep a decent tenant in the place in consequence of the abominable nuisance of the bad characters who associate upon the foreshore, and sleep in the barges and so on. The police cannot follow them there, and it is a receptacle for stolen property.

883. Can you give any idea of the improvement of the property which would take place?—I should say that I should get a fourth more rent if there was a good road in front of those houses.

884. Then it would improve the property 25 per cent.?—Yes, I should think so. I do not think that that would apply to the whole district.

885. It would apply to the district more immediately adjoining such a road, I suppose?—Perhaps it would not, because they would have to rebuild at great cost. I do not think that it would improve them to that extent elsewhere.

886. Do you consider that the construction of an embanked road would relieve the cellars from their dampness?—It would prevent the overflowing of the tide, and to a great extent I think, if not wholly, it would prevent the percolation. I do not think that the percolation extends far. About 100 yards from the river I have a well of very good water, and I never find it affected in any degree by the tide or river water.

887. If the wharf walls were raised without a roadway it would still have the advantage of freeing the district from water, that is to say, if you raised the wall of every wharf as well as the parapet wall of Bishops' Walk?—And all the alleys and draw docks; if you raised the whole of those I think we should get rid of the tide.

888. Do you see great difficulty in dealing with the draw docks?—Yes. I heard the suggestion of gates; but there must be sills to the gates, and the carts and heavy waggons which must run over them would put them out of repair, and they would not be watertight.

889. If you had a road, how would you provide for the traffic at the draw docks?—I think there must still be a draw dock, but you must have an incline.

890. You would not do away with the draw docks?—No.

891. Would you have those draw docks to come across the road?—No; I think that they should come out sufficiently far into the river, so as that they should have a sufficient incline and not touch the road. If you attempt to touch Fore Street, the whole of the property will be destroyed on both sides; you will make them underground cellars instead of houses.

892. You would place a solid embankment in the river?—Yes.

893. The draw docks must be in that road, I presume?—They must be cut through it.

894. And pass under it?—Yes; or have a bridge or something of that kind.

895. Or come by a side incline?—Yes.

896. Have you any other observations to make to us?—I have some interest in a property lower down; that is to say, between Westminster Bridge and Waterloo. I am surveyor to some property there; and I do not think that the same thing applies in that part. I think that there an embankment would be an injury.

897. An embanked road would there inconvenience very seriously the wharf proprietors?—Very seriously indeed, I consider.

898. Are the wharves with which you are conversant in that part, below the level of the highest tides?—I think there may have been one very high tide which has passed over them; but, generally speaking, they are sufficiently high to keep out the tides; they are not much inconvenienced by the tides.

899. Do you consider that in that case it would be a better plan to compel the proprietors to raise their wharves than to take any general measure of constructing an embankment?—Decidedly. Within my own knowledge walls have been raised at least three feet along that side; there may be some exceptions, but, generally speaking, they have been raised at the expense of the proprietors or occupiers; and if any of them are now below the proper level, I think the proprietors or occupiers ought to be made to raise them, and then the difficulty is done away with; it requires no other embankment.

900. Assuming it to become desirable to improve the line of embankment by projecting it uniformly further into the river below Westminster Bridge, do you consider that the private individuals owning that property would be willing, for the sake of the additional land which they would acquire, to construct a fresh river wall in front of their premises?—I do not think they would.

901. Not even the owners of the soil?—No.

902. Are the wharves which you are speaking of in freehold?—Some of them are in freehold; some of them are copyhold.

903. Who are the proprietors of the copyhold?—One proprietor whom I represent is Mr. George Warde Norman, one of the directors of the Bank of England. As to his opinion he is neutral; he does not authorize me to say anything on his behalf; though I manage his property I do not speak for him. I am also surveyor to the Pedlars Acre Estate.

904. Have you any other remarks to favour us with?—I do not know that I have anything further.

905. Are there any improvements which strike you which you wish to lay before the Commissioners?—No. It appears to me generally that below Westminster Bridge the proprietors should be obliged to raise their wharves to a line sufficiently high, and that above it, that is Westminster Bridge, for the sake of the traffic, there ought to be a solid embankment as far as Vauxhall Bridge. It is tolerably well provided by the New Palace Road up to the Palace; it would then merely be from the end of Bishops' Walk. I think that there should be a communication.

906. A thoroughfare for carriages and carts?—Yes; the traffic over Westminster Bridge, for instance, has to go so far round to get to the Nine Elms Station and Vauxhall Bridge, and all the intermediate occupiers have the same inconvenience; they cannot get down these narrow streets, such as Fore Street and High Street. Great waggons coming to the railway pass down Lambeth Walk at great inconvenience; there is a very sharp turn at Lambeth Butts, and they turn down Vauxhall Walk, which is also very narrow, and there is no proper communication between the two.

907. From your knowledge as a surveyor of the value of the wharf property along the river at that part, do you consider that it would be a very expen-

sive matter to buy up all those wharves?—Yes; you speak of the part above Westminster Bridge.

908. Above the Bishop's Palace?—Yes, I think that it would be very expensive.

909. In which part of the property would the expense be greatest, near Vauxhall Bridge or near Fore Street?—Beginning at Vauxhall Bridge I think if you attempted to meddle with Burnett's distillery it would be very expensive.

910. Is it necessary to do so? is not there a road at the back of it which is ample for all purposes?—I think not; it is rather narrow. The gas works project beyond Burnett's, and make the road narrower.

911. But opposite Burnett's the road is tolerably wide, is it not?—Yes, it is rather wide at Burnett's; but I think that the Gas Works will be partly removed. All that part which belongs to the duchy of Cornwall they have notice to quit, and must leave; but still the Gas Company own property adjoining it, called Prince's distillery, and that they will retain, and that they would want a very large sum for.

912. Is not that the only very important wharf?—No, I think not; I think that it would be a very heavy question with all the potters. They form a powerful and wealthy body there, and I think that to buy up all their interest would be something enormous.

913. They now carry their material across the street, do they not?—Many of them carry it across Fore Street.

914. Would they be placed in a worse position if there was a road in front?—Not much, I think. It would increase the carriage somewhat, of course, but not a great deal.

915. Still you think that the compensation which would have to be paid would be something very considerable to remove the riverside premises along Fore Street?—Yes; the greater part of the premises along there (there are coffee roasters, bone boilers, and all those kind of trades) are nuisances, and they cannot get other premises.

916. The premises in Fore Street do not look in good condition?—No; they do not want good looking premises for their business, but still they are very serviceable for them.

917. And they pay a high rent, I suppose?—Yes.

918. Are they equally valuable for river frontage with the wharves below Westminster Bridge?—Some of them are so for their own particular trade, because they are nuisance premises, and cannot go elsewhere, but, generally speaking, they would not be equally valuable. I have been in the habit of valuing the wharfage property in the Commercial Road for instance. It is 3*l.* a foot frontage. As we get up higher it is reduced to 2*l.*, and at Vauxhall it is 1*l.* At Pedlar's Acre the property is let for 3*l.* a foot.

919. At how much a foot should you reckon it above Lambeth Palace?—From 2*l.* to 1*l.*

920. (*Mr. Thucates.*) You have spoken of the houses being repaired and the river wall properly constructed so as to resist the tide, but you say that in consequence of some alley or draw dock near to you the water still finds its way into your basement?—I am not quite sure that it gets into the basements at all. We have no basements. I have kept up the ground floor some 2 feet 6 above the road. It may very possibly make the ground underneath which we cannot see moist and damp; I dare say it does.

921. Is it your opinion that unless an independent wall be built (I am now referring to the district above Vauxhall Bridge) and taken down a sufficient depth, the district will be flooded?—I do not think that the flooding extends very far from percolation under the bottom of the walls. I have found in High Street that there has been some percolation. They have basements there. At what was a baker's shop opposite the burial ground they have a basement of a good depth, and on one particular occasion and only one I found a percolation through the floor of that basement. I live some 30 yards further from the river, and I do not find the slightest percolation

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so far as that, therefore I cannot include the whole district; it would merely be the little strip along the river side.

922. Referring to the trade on that particular bank, the potters and others, do you think that the formation of a road in front would be a convenience to the trade?—I cannot say positively that it would, but I do not think that it would be much inconvenience.

923. If they could get land carriage as well as water carriage would it be a convenience?—They bring their clay up in barges and not by land, therefore there would be a little more inconvenience in carrying it across the road.

924. You are of opinion that the draw docks to which you have referred could not be heightened without really preventing their being useful for trade purposes?—No; not keeping Fore Street at its present level.

925. Unless you raised Fore Street?—Just so.

926. And that would destroy the property in Fore Street?—I think so.

927. To obviate that difficulty you propose that a certain part of the foreshore should be taken in, and a solid embankment carried down in front, starting with an incline further out in the river to enable you to raise it?—Yes.

928. (*Captain Burstal*.) Are the houses on the river or north side of Fore Street so valuable as to make it an expensive thing to buy them up near the river side?—I do not think that the private houses are very valuable. There are one or two good houses, but not many.

929. There are several houses I think along there where there does not seem to be any business carried on at all?—I think there are only three or four good houses, and the rest are certainly occupied by any one who will take them, in fact—fishermen, and persons of that description.

The witness withdrew.

Adjourned.

Thursday, 16th January 1862.

PRESENT:

The Right Hon. the LORD MAYOR.
Major-General SIR JOSHUA JEBB, K.C.B.
JOHN THWAITES, Esq.

Captain D. GALTON, R.E.
Captain BURSTAL, R.N.
JOHN ROBINSON MCCLEAN, Esq.

The Right Hon. the LORD MAYOR in the Chair.

THOMAS HAWKSLEY, Esq., examined.

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939. (*Sir Joshua Jebb*.) We are favoured with your company at the request of the Vestry on the Surrey side of the river?—That is so.

940. You are probably very well aware of the conditions of the Surrey side as regards an embankment, and perhaps it would be convenient to the Commission if you would give a general statement of your views, keeping in mind the objects for which we are sitting?—I will state my views in any way which may be most convenient to the Commission.

941. You have been engaged on hydraulic works for many years?—I have; for quite 30 years on my own account.

942. And you have had the subject of the embankment of the Thames under your consideration?—Yes; for from 15 to 20 years incidentally, in connexion with my own professional practice.

943. Did you ever propose a project for the embankment of either bank of the Thames?—No. In connexion with my friend Mr. Bidder I reported upon the main drainage of the Metropolis about three years ago, and in that report we saw reason to recommend that an embankment of the Thames should be made, but we did not venture to go out of our way to suggest any means by which it should be made, or any form in which it should be made.

944. You are well acquainted with the interests

930. You seem to think that a roadway is particularly required in that locality, I suppose somewhere from the Nine Elms Railway?—I think that there should be a good access to the Nine Elms Railway certainly.

931. Where do you propose to come out to the river?—There must be a turn towards Vauxhall Bridge, otherwise you could not get up.

932. Do you propose to go in front of the City of London Gas premises or behind them, below Lac's dock?—I think it must go in front of the Gas Works. I think that it might come out where the Gas Works now stand, not disturbing Burnett's premises at all.

933. You do not think that you could come out further to the eastward than that by Lac's dock?—Not very well I think. I think that the bridge would be rather an impediment.

934. Do you know Lac's dock?—I do not quite recollect the name.

935. It is the first draw dock below the City of London Gas Works, between the Gas Works and Lambeth Palace; it is a very large dock?—I do not know it by name. I think there are about three docks, but their names I do not know.

936. It is the upper of the three. Is that the locality where you propose to come into the river or above Vauxhall Bridge?—Not above Vauxhall Bridge, because then you would come in front of Burnett's premises, and not behind them.

937. Do you propose an additional roadway riverward of all the premises, and then joining into Bishops' Walk?—Yes, a continuation of Bishops' Walk. The street would not be perfectly straight, it would have to bend somewhat.

938. It would have to take the turn of the river?—Yes. I think that that would relieve the traffic of Lambeth Walk and Vauxhall Walk.

of the people who live on the South side of the Thames?—I think so.

945. What is your opinion respecting the effects in a sanitary and social point of view of embanking that part of the river?—The present state of the Thames is as bad, as I dare say you are aware, as it well can be, and my own opinion is that by an embankment the sanitary state of the Thames in the first place would be very much improved by the removal of the mud banks, which are in general the great cause of nuisance, although not exclusively so, as we have known within the last two or three years in consequence of the river having become foul from other causes, but chiefly from a deficiency in the supply of the upland water. The upland being insufficient in certain years to convey the whole of the sewage matter with sufficient rapidity, therefore the sewage matter has floated backwards and forwards, and has become exceedingly foul during hot weather. That, however, only occurs in extremely dry seasons, and will no doubt cease as soon as the main drainage works are completed. I do not think it is possible for it to occur again; but the mud banks will still remain unless the river be embanked. The effluvia which are given off from the mud banks are very perceptible indeed in the hot weather. Now an embank-

ment will, of course, by contracting the width of the river, operate in two ways. In the first place it will cover up a considerable quantity of the unnecessary foreshore which now exists, and of course the mud banks there will no longer exist as mud banks, and in the next place it will occasion a new regime of the river to be established; there will be a greater amount of scour; there will be a greater amount of depth in all parts, and particularly at the edges next the walls of the embankment; and if the river be contracted to the necessary and proper width to train the water, I have no hesitation in expressing an opinion that there will be always five feet depth of water near the walls at low water and ten feet in the centre; and the width which I consider to be the best for the purpose is a uniform width of 750 feet from near London Bridge, even up to Wandsworth; but of course that is looking far ahead, and going beyond what is necessary for immediate purposes.

946. That would reclaim a vast area of land on the convex side; that is to say, on the Surrey side, in front of the wharfs?—It would reclaim a great deal of land on both sides.

947. You must leave what the Commissioners have already determined and reported upon on the North side, and confine your observations to the South side?—Perhaps you will allow me to make this little suggestion, that supposing it should be the pleasure of the Commissioners to entertain the question of the embankment on the Surrey side, then it might be necessary in training the river by the two embankments to make a slight alteration on the North side in one part, because I think it will be found, upon looking at the plan which I shall have the honour to submit to you, that more land can be reclaimed with advantage to the river on the North side than perhaps has been proposed by the single plan which the Commissioners have as yet entertained. (*The witness produced a plan.*) Beginning from below and proceeding upwards it appears to me that the river may be trained to a uniform width of 750 feet in the manner indicated upon that plan. The line on the North side is substantially the line which has been recommended by the Commissioners.

948. It takes two arches of Waterloo Bridge instead of one?—It does; but at the same time it allows a water way of 750 feet in the manner which I have indicated. It does not contract the water way at all, because I propose to put that part of the embankment upon iron piles, so as in no case, not even under the bridges, to have less than the regular training width of water way. There should be the same water way through the arches clear of the piles that there is through any other part of the channel, and I beg to suggest, and for reasons which I am anxious to state, that a width of 750 feet will accord not only with the theory upon the subject, but with all the facts which nature indicates. It fits in remarkably at a great number of points.

949. This is invariably 750 feet?—That is invariably 750 feet. I am anxious to point out that the 750 feet agrees in a great many places with the actual present width of the river, and that although it will contract the water way as is shown very considerably in a part of London, yet it will do no harm to the river above, because it will give a greater amount of water way through this throat, (pointing to near Millbank Prison), which at present restricts the filling of the river above.

950. (*Mr. Thwaites.*) You propose to take that off?—I should propose to take that off.

951. (*Sir Joshua Jebb.*) And to dredge?—The scour will be quite sufficient.

952. (*Captain Galton.*) That is at Fore Street?—That is at Fore Street; it is very bad property; it is low; the water comes over and finds its way into the heart of the low district, which lies behind the banks of the Thames; and the communications here are so wretched that it is almost necessary, even if

this work were not executed, to have a street improvement for that particular locality.

953. (*Sir Joshua Jebb.*) Judging from this plan I infer that you propose a solid embankment on the South side?—I have not ventured to do more than to show the training of the river, but of course it is possible to make, in certain cases, docks. I think that tidal basins would be mere mud traps; a great deal of mischief would result from them; they would be no sanitary improvement, but in certain cases it is quite possible to establish very useful docks on both sides, but principally undoubtedly on the North side, because by this arrangement there is a larger width gained in some places on the North shore even than is indicated in the Report of the Commission.

954. Perhaps you are aware that the Commissioners had a great number of plans before them in which docks were provided, and after mature consideration they determined that it would be far better for the public interest to have a solid embankment doing away with those docks?—I am of that opinion, and if it pleases the Commission, I shall be willing to state what my views are and ever have been on that subject.

955. As we are now considering a Southern embankment, I think that one question which would arise would be the means of carrying on the traffic which now exists upon the South side, which is increased by its being turned away from the North side. I refer to the wharfingers who carry on traffic?—Quite so.

956. You are aware that there is a great deal of trade in timber, coals, cement, and other things. This traffic would require a great width of the river outside an embankment if it were solid?—I am quite aware of the manner in which the coal and timber trades of London are carried on. I am quite aware also that by custom (I do not mean to say by right, I presume that it is not by right,) the persons carrying on those trades use the water way of the Thames almost as if it were their own property, and they use it in a manner which I apprehend in some cases is extremely inconvenient to the public, as well as detrimental in other points of view, but I do not myself see any necessity for continuing that system. With regard to timber, we all know perfectly well that though it is advantageous to timber merchants undoubtedly to keep the timber in water, there being something like 5 per cent difference in the admeasurement, yet it is very much the worst way of keeping timber, and it is a very unusual way. In many parts of the Kingdom the timber, instead of being kept floating as it is in London, is stacked and allowed to dry, and instead of the timber going into buildings in the wet state in which it does in London, and afterwards when decomposition sets in producing dry rot, the timber in many places in the Kingdom is carefully kept dry. In many of the large towns, and in most of the inland towns, that is the practice; it is stacked. Now I apprehend that there is no difficulty in stacking that amount of timber upon the extended frontage which in many cases may be given to these wharves. I do not see that the timber trade need necessarily be greatly interfered with.

957. You would impose restrictions upon the commercial action of the owners of these wharves?—I would only alter the system. I would not destroy or unnecessarily interfere with the trades, but I certainly should not be prepared to recommend that the water way of the Thames should continue to be used in the way in which it is now.

958. If the water way of the Thames were diminished to 750 feet as you propose, under the present system of mooring barges and having floating timber outside, it would very much interfere with the steamboat traffic, and the means of going up and down the river?—Very much indeed; and I do not conceive that any proper mode of training this river can be adopted which would not interfere with that user of

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the surface of the river; if that is not to be done away with it is almost impracticable to make any substantial improvement.

959. Do you contemplate having any thoroughfare along the front?—Yes; I think that it is necessary to have a thoroughfare, both for the use of the wharves and also for the use of the public, in order to relieve the traffic through some of the interior back and crowded streets, which is now both inconvenient, costly, and dangerous; and if the wharfers were allowed to use the frontage with a good road along the front, they would, so far as regards their own traffic, be very much better off than they are now; that would be a great convenience.

960. The wharfers would derive a great benefit, but the public thoroughfare would be very much obstructed by using the road as a wharf, would it not?—I think not; for it occurs to me that the width to be obtained is in general so large that it is quite enough for both purposes.

961. For the landing of coals and timber?—Yes; and my suggestion would be that hydraulic cranes should be established and used in certain places, and that the coal instead of being brought in the lighters in the loose state in which it is now, should be brought in boxes of from 1 ton to 5 tons, according to the demand, and that they should be taken across the road on little trams running across, which would immediately take them into the wharves, where they might either be put into sacks, as is the practice in London, or be dealt with in any other way.

962. That certainly removes one difficulty which occurs to me in a solid embankment?—It is looking rather far, but there is no good and substantial reason why the coal should not come in sacks in the barges, and be lifted up in little boxes of from 1 to 5 tons of sacks at once, but whether they choose to put it previously into sacks or not, it can be lifted up in boxes with great rapidity.

963. Perhaps you will now favour us with some of your general ideas upon the advantages to be derived from an embankment on the Surrey side?—In the first place it would undoubtedly prevent the penetration of the water into the interior in high tides; that at present is a very serious evil.

964. How would you stop that in the event of your having docks inside, because they would naturally rise to the same level as the Thames?—Undoubtedly; but there would be quay walls or dock walls.

965. You would have to improve the walls?—Yes. Of course if docks were made you would have to communicate on both sides I apprehend; the one side might be narrow, but still you would want a communication, in order to utilize the docks in a proper manner.

966. Then you would raise and improve these wharves all the way along for the purpose of keeping out the water and sewage in the low districts?—I would raise the roadway to at least 4 feet above Trinity high-water mark, it might be better under certain circumstances and conditions (but those are exceptional ones) to raise it even to 5 feet, but not beyond that.

967. Will you proceed with any statement which you may have to make?—In the first place the proposed embankment on the South side would very greatly improve the sanitary condition of the interior of this large district now containing more than half a million of population; in the second place it would give very great relief to the streets; and in the third place it would effect such an improvement of the Thames as would not only do away with the sanitary evils which at present exist, but would also give a greater depth of water; vessels and small craft could always lie afloat, and larger vessels could come to the side of the walls and be discharged.

968. Assuming that the line laid down by the Commission in the former Report was adhered to, should you still be prepared to take 750 feet from that line to the south bank?—I think it would make the curve rather rapid, and if you will allow me I

will point out how it would affect it; there is no substantial difference; it only occurs to me that it would enable a little more land to be reclaimed on the north side, so as to make the curvature flatter, but substantially it is the same thing.

969. It would make this rather a sharper curve?—It would make it rather flatter on this side (*pointing to the plan*); it would bring the line out to that point, and of course it would make it rather flatter.

970. That would not affect the principle of the plan?—It does not affect the principle, nor does it affect the scheme of the Commissioners in any important degree.

971. Except that there would be a very large space in front of the present wharves; who would have the property instead?—That being reclaimed from the river would no doubt be in the parties who had to carry out the undertaking; Parliament would vest it in them. Then it would be for them of course, in discussing the question of compensation, and so on, to allot to the proprietors of those wharves any portion of that land which they might think proper, and to reserve the rest for public thoroughfares. This sheet goes up to Cremorne, and shows that at a future time (it is not a thing which is suggested for the consideration of the Commission at the present moment), without any difficulty, the river may be trained to the same width up as far as Wandsworth.

972. This is partly done on the north shore, is it not?—Yes, and it follows the proposed line. In every case I have carefully adapted the present frontages where possible, and I have done so with regard to the Houses of Parliament of course.

973. I think you very nearly adhere to the line approved by the Commission up as far as Hungerford Bridge, and then you flatten it?—Substantially it is the same throughout; it is only slightly altered to adapt it to this (the South) side (*pointing to the plan*) supposing that it should be the pleasure of the Commission to suggest that an embankment be made there. I do not in the least degree propose this as a scheme of my own, or for my own purposes, (I wish that to be understood,) but only on behalf of the parties whom I have the honour to represent before you.

974. The property of all this district would be very much increased in value by an embankment which stopped out the water, and got rid of the nuisances which are complained of?—Very much indeed; and I may state that a large portion of this district lying far back from the Thames is at the present time from six to even eight feet below the highest tides. I do not mean to say below ordinary spring tides, but below the highest tides, and that of course places them in great danger. This,—Lambeth and adjoining districts,—(*pointing to the plan*) was formerly a large lagoon communicating down here with the Thames; there are masses of gravel upon the clay, and the communication of water through it is very easy, and consequently they have been placed in such jeopardy many times that you may see almost every house in this part of the district with cellar lights fendered off against the tide; in some cases there are boards, in other cases there are stones permanently placed to a depth of from one to two feet, so that if the tide should rise in the night it may be kept out of their cellars in that way. In this part (*pointing to the plan*), which is really the part which most of all wants improving immediately, (I am speaking of the part above Westminster Bridge,) the people have really permanent boards fixed across their doorways, over which they have to step to get into their houses, for the purpose of preventing the tide from flowing in.

975. Do you think that the parties would be inclined to contribute to any scheme?—That is a question which I cannot answer in any other than this form: they say this, we do contribute; we are very large consumers of coal; we have many manufacturing; we not only consume coal in our houses, but we consume coal to a larger extent than they do

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on the North side in our manufactories, and of course we pay the thirteen-penny rate on the coal. Besides that, they say, we are contributors to the rates levied by the Metropolitan Board for main drainage and certain other purposes; and they say this,—that at present they derive very little advantage from those payments, and they think that under the pressing circumstances of their case they should be put, if possible, upon the same footing as the north side. It is believed that on this side of the water they consume nearly a million tons of coal a year; the tax upon that is over 50,000*l*. That is the interest of a million of money, which of course would build the embankment.

976. You have not placed any scheme before this Commission or any other, have you?—I have not.

977. You alluded to having formed one in your own mind?—I have, but I have only formed it in my own mind, because I have been engaged on several investigations with respect to the Thames; I have never thought of putting forward a scheme on my own behalf.

978. I am sorry that we are deprived of that advantage?—If the Commission think that any views which I entertain on the subject, or that any suggestions which I can make, will be of the least kind of assistance to them, I will put them down on paper. But what I am particularly desirous on this occasion to submit to you is, that I do not come here as an interested individual, using these gentlemen for the purpose of palming off a project of my own, but that it is simply and solely with a view to the interests of those parties whom I represent that I am here.

979. Have you examined the condition of the present wharf walls?—I have; I spent a large portion of yesterday upon them.

980. What is your opinion of them?—They are in a very wretched condition; they are very variable; a few of them are good, but I should think that two thirds of the whole are bad.

981. (*Captain Galton*.) When you say "bad," do you mean porous?—A very large proportion of them will not stop water, others of them are in a very decrepit state, rotten, and particularly upon leasehold premises; and, as I dare say you are well aware, there is a very large quantity of leasehold premises, especially in those parts of the district which belong to the church.

982. Who are the parties bound to keep those wharves in repair?—I suppose that the tenant would be bound to keep them in tenable repair; but at the end of the lease the usual condition is simply that they should be turned over in tenable repair, subject, however, to reasonable tear and wear. Now, if they were put down in the first instance, as is commonly the case, so as only to endure to the end of the lease, the tenant or the lessee is not bound to restore them, provided that the dilapidation happens only by reasonable wear and tear.

983. I understand your proposal to go to the extent of building a new river wall for some distance in front of the existing river wall?—In general.

984. That is to say, between Lambeth and Southwark Bridge?—Yes.

985. And placing a roadway, either next the river or at some little distance back from it, along the whole of that line?—A roadway next the river in all cases.

986. And extending the existing wharves along that roadway?—Certainly; but that would be subject to the arrangement which would be made with each individual frontager.

987. The existing wharves would then all have to be compensated, I presume, as regards the frontage?—The parties holding those wharves would all be entitled to compensation for any damage done to their property or trade; but I am of opinion, that as a general rule—(there will be exceptional cases),—no injury will be done to either.

988. But the usefulness of existing wharves would be annihilated, would it not, by placing that river

wall so far in front of them?—Not at all; it is only a question of landing the goods; and I may mention that at Glasgow, at Dublin, and at Cork there are river walls, walls alongside tidal rivers, exactly in the position in which these would be, and that there is no difficulty there in housing the goods or discharging the cargoes or carrying on the trades; neither would there be any difficulty here; and I would suggest this, that at intervals (I cannot say how often, that would depend upon the particular trades to be convenience,) hydraulic cranes might be erected, and that from those hydraulic cranes little trams might go across; the goods would be raised upon those trams, and they would be run at once into the wharves and the warehouses. It would simply amount to this, that the wharves instead of having bad roads as now would then have good roads in front of them, which they could all use. I do not see any difficulty, with the exception of some change, no doubt, in their mode of carrying on their business, chiefly with regard to the timber trade and the coal trade.

989. The barges instead of lying, as at present, on a camp shed during a great part of the tide, would lie adjacent to the wall, and would float the whole time?—Yes; and would be discharged in one tenth of the time, and probably at one fourth of the expense at which they are now discharged.

990. And therefore a much smaller number of barges would be used for doing the same amount of trade?—Certainly; and in many cases, no doubt, they might be discharged in the night, because they could come up and lie alongside the walls, and there would be water at all times to float them, and to bring them to their places; and in other cases, nothing would be easier than to have small overhead railways communicating with the different warehouses; the goods could be lifted on to those overhead railways and be trammed into the warehouses. I am speaking in the presence of my friend Mr. McClean, who knows exactly how these things can be done, both by experience and otherwise.

991. (*Mr. Thwaites*.) If I understand your statement, you have examined the wharf walls on the principal part of the Surrey shore, and, in your judgment, two thirds of the wharf walls are in a bad condition?—Bad or imperfect.

992. Are they of brick construction, or are they camp shedded?—Some of them are old brickwork walls, and others of them are mere timber piling with timber sheeting at the back of them.

993. Do you think that by raising those wharf walls, or mending them, the evil complained of would be cured?—Not efficiently. As a matter of course, if you raised the walls the water would not go over in a stream, but raising the walls would not stop the existing percolations.

994. Have you examined any of the basement stories?—I have.

995. In what condition have you found them?—Do you mean opposite the river, or within the interior?

996. Both?—Many of them are very bad indeed. And I may mention, that in the part of Lambeth to which I have already alluded, I went into some of the manufactories, and I actually found that in the recent high tides the fires under the boilers had been put out by the entry of the water from the Thames.

997. Is that from percolation or from an overflow over the bank?—I believe that it began by percolation, but finished undoubtedly by the overflow. You may see in some places where there are wooden buildings erected upon a wooden foundation, a whole wharf wall, all manner of contrivances are resorted to, such as putting in bricks and stuffing at intervals in order to keep out the water.

998. Then in your judgment in order to cure the evil, first of the overflow of the banks which takes place now, and secondly from the percolation which goes on and saturates the basement stories of the houses, better walls are necessary?—Undoubtedly. I think that the state of the water frontage on the

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Surrey side is quite discreditable to a city of the importance of London, and it is no doubt injurious to the great population living behind, who have no interest whatever in those wharves.

999. Are you of opinion that a roadway might be formed in front of those wharves possessing the means of lifting the goods by a hydraulic crane without any injury to the business?—Certainly.

1000. That the goods might be lifted to such a height as to give sufficient head of roadway, and for them to be passed into the warehouse on an upper story?—Yes, but that is in exceptional cases; but as a general rule the better way, undoubtedly, would be to lift them on to the level of the roadway, which might be quite sufficiently wide for the purpose, and then to draw them across; but in exceptional cases, such as sack goods and boxes, which are usually kept in the upper floors of warehouses, it is quite possible to lift them to the height of the second floor, and then to allow them to run on a little tramway immediately into the warehouse.

1001. And with those conveniences are you of opinion that the wharfingers would not require compensation for placing a roadway in front of their wharves?—I believe that every one of them would ask for compensation, but I do not believe that in many cases they would be entitled to compensation, or at all events to large compensation.

1002. I am asking you whether, in your judgment, they would be entitled to compensation for placing a roadway in front?—My own impression is, that in general they would not—that they would not have a good moral claim for compensation in general. But there are exceptional cases, in which, no doubt, they might make some claim. I allude particularly to such cases as those of timber merchants, and, perhaps, some gentlemen engaged in the coal trade, who might think that the altered mode of conducting their business would be more costly than the present mode, and, of course, they would send in a claim, which would have to be considered by the parties to whom the work was intrusted; and in case of dispute it would no doubt be referred to arbitration in the usual way. But it would be impossible for me to say that there are no cases in which claims would be justifiable. There are some cases undoubtedly, but I do not think that the amount of compensation would be anything very serious, because in most cases it would be quite possible to add a considerable amount of very valuable land, if thought necessary, to the present frontage—in most cases, not in all.

1003. I understood you to state that in reference to the coal trade you are of opinion that the wharfingers would house their coals at a much less expense under the arrangement which you have suggested than at present by carrying them over a series of barges for a considerable distance on the backs of men?—Quite so, as regards that operation; but they have now, of course, some advantage in being enabled to use the river as a part of their wharf, and they would not hereafter be enabled to use the river as a part of their wharf. Now, I observe that they, having little or no coals upon their wharf proper, use the river as an additional wharf, and they let a fleet of lighters lie there, not for the purpose of being discharged, but really as stores for their own convenience.

1004. Do you think that the mode which you suggest would enable them to warehouse the necessary quantity, and would render unnecessary an occupation of the river space, as if it were a part of their own wharf, for storing coals?—In many cases that would be so, but it might not be so in every case; and if not in every case, then there might be a reasonable claim for some pecuniary compensation.

1005. My point is this, whether the system which you propose for lifting the coal would not be more expeditious than the one which is now adopted, namely, carrying the coal on the backs of men over a series of barges?—It would; but the case which I have in my own mind's eye is this—the case where

a man conducts a large trade in coal, with only a very limited area of wharf, and where, consequently, he cannot store upon his wharf any very large quantity. At present he uses the river as his store. In such a case as that, there is no doubt that the wharfinger would sustain injury, and he would be entitled, in such a case as that, to claim for some injury done to his trade.

1006. Governed by his right?—Governed by his right of course. Although I am inclined to think quite the opposite, yet I assume, for the purpose of answering your question, that he has the right.

1007. It is the practice?—Yes. I believe that he has no right at all, but I assume, for the purpose of answering the question, that he has a right, because it would ill become me to express an opinion upon that subject. I know that at the present time, in one exceedingly wide part of the river, the lighters lie out as much as 600 feet from the front of the wharf.

1008. To carry out your views I suppose would involve a considerable amount of dredging of the existing banks?—Scarcely any, as far as I am aware. The existing banks would, I apprehend, disappear in most cases. There may be cases where there is hard gravel, of course that could not be moved by any ordinary power of the stream. In that case some dredging must be resorted to; but as a general rule I believe that the river will adjust itself, and that in the course of a few years, as has occurred since London Bridge was removed, the river will adopt its own proper regime.

1009. If you give a uniform current to the river, you are of opinion that the result will be a uniform breadth?—Not quite uniform; because in some parts of the river, no doubt, the material is harder than in others. There will always be, even if you dredge, irregularities of that kind; but, inasmuch as the bed of the Thames is pretty generally of the same degree of hardness, in most cases the river will adjust itself very evenly; and I observe, by the sections which have been taken by Captain Bursdal for the purpose of showing the alterations which have been produced in the river by the removal of old London Bridge, that a most remarkable adjustment has taken place, and that almost throughout the whole course of the river, except where it is unduly wide, in some part of the channel there is a depth of 30 feet.

1010. (*Sir Joshua Jebb.*) At high water?—At high water. Captain Bursdal has shown upon these sections the amount of the alteration, and it affords the most remarkable instance of natural scour and of natural adjustment which, I believe, is known to engineers.

1011. Do you think that that scour has arisen from a difference in the solidity of the bottom of the river, or from the velocity of the current?—Undoubtedly from the velocity of the current.

1012. (*Mr. Thwaites.*) In forming your lines with a uniform curve in the river,—what you call training the river,—have you had regard to the position of the piers of the bridges?—I have, all the way through; and I think it is indicated upon the plans which I have had the honour of laying before the Commission that I have regarded that condition.

1013. In your judgment, such a curve as you propose to give to the river would not have an injurious effect upon the foundations of those bridges?—I think not as a rule; but some of the foundations are already injured. If they give way still further, it must not be attributed to the alterations made by training the river properly that they have given way. Several of them have given way, and they will continue to go, notwithstanding that no river embankment may be made. But it is easy enough to prevent that, because nothing is more simple than to drive a double row of piles across the river immediately above each bridge, and another double row immediately below, and between those double rows you may keep a sufficient quantity of stone or anything else that you may desire to put in to prevent the water scouring away

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the foundations of the piers. It is neither a very difficult nor a very expensive operation.

1014. (*Captain Burstal*.) I suppose your object for putting the river into such a state of uniformity, 750 feet in width, is really for the purpose of giving uniformity to the current?—It is.

1015. And thus improving the general regime of the river?—Yes.

1016. You said, I think, that there was a great quantity of unnecessary foreshore?—A very large quantity, in many cases.

1017. You propose, I suppose, to have no foreshore at all with the river 750 feet wide?—Precisely so.

1018. So that vessels should lie alongside the wharves?—Yes. I should propose that there should be five feet depth of water at low-water spring tides.

1019. Alongside the wharf at both sides?—Yes.

1020. In one of the alterations which you propose I think you cut off a point of the river at Fore Street, near the Whiting Works, do you not?—I do.

1021. Is that with the object of conducting the stream straighter, or for widening the river at that particular point?—The object is to let the tidal water more freely up the river to Teddington Lock, because it is perfectly obvious that by training the river through London you diminish to a certain extent its sectional area, and, unless you compensated that by widening the throat which now resists the passage of the water to the upper part of the channel, you would still further delay its progress.

1022. That is your reason for cutting off that unnecessary point?—That is one reason, amongst many; but I admit that that is a principal reason, and I have no doubt that, after that alteration is effected, and after the walls below are trained to a smaller width than the river now is, the flood tide will proceed to the upper part of the river quicker than it does now.

1023. You think that if you were to bring the river to the same width as at Southwark Bridge all the way up to Westminster you would have as much tidal water in the river above Southwark Bridge as there is now?—Yes, and I am very desirous to effect that object; because, if not, you would have a smaller scour in the lower parts of the river where you did not embank, say in the Pool, than you have now, and I regard it as a very important matter indeed to have an eye to the possibility of such a consequence resulting, and to prevent the evil.

1024. If that is the case, one would imagine that where the river is wide now the water would be lower than it is in narrow places?—I do not quite understand the question.

1025. If that is the argument, one would think that where the river is wide, such as it is at Hungerford, the surface of the river would be lower at high water than it is at the Penitentiary and at Southwark Bridge?—No; because in all cases, in order that there may be a head to produce motion beyond, the water must be higher on the seaward side (I am speaking of flood tides) than upon the landward side, or else you cannot get a run forward; every inch of water must be higher on the seaward side than it is on the landward side, or you cannot have motion.

1026. Is not high water made in the upper parts of the river by the fact of the water being low at the lower parts of the river?—I do not quite understand the question.

1027. Supposing the tide ebbed two or three feet at Woolwich, the disposition of the water at the upper parts to go downwards would be made by the tide wave coming down to find its level?—In every case of a river similar to the Thames, that is to say a long sack, proceeding from the sea many miles inward, there is always a point of greatest convexity, and the water will be running upwards and downwards from that point of greatest convexity at the same moment.

1028. In some rivers there are two or three high waters at the same time?—Yes, if it is long enough for two or three successive tides to be in action in

the same river at the same time. In the large rivers of America that is the case.

1029. Then you do not think that there would be any diminution of tidal water by the embankment which you propose?—None whatever, but there would be some increase of velocity; but that increase of velocity would not tell upon the pool, because there the sectional area remaining the same, of course if the volume passing through remained the same the velocity would be the same as it is now.

1030. With respect to a roadway in front of the embankment from Vauxhall Bridge down to Southwark Bridge, does it strike you as being one of the requirements of the public that a roadway should be placed there on the convex side of the river?—I think so. I think that it would be a great convenience to the wharfingers, and a great convenience to the public also, as a better means of communication than now exists through the back streets; and I think that, in another point of view, it would be exceedingly beneficial, although I do not attach much weight to that when we are speaking of business matters. It would be a very fine promenade for the population, as is the case in other similar instances.

1031. With respect to the mud, if the mud banks are only the mud occasioned by the breaking off of the banks in the lower part of the river mixed up with the water; after the main drainage is done, do you think that the mud banks will then be as offensive as they are now?—Not as offensive as they are now, but they will always be offensive, because there is a certain amount of organic matter mixed up with them which will always be giving off malarious odours, just the same as you see in the case of the Medway. The banks up the Medway, before you get to Maidstone, in the hot weather of summer, become at times exceedingly offensive; and yet there is no large quantity of fecal or other sewage matter or deposit upon them.

1032. Did it ever strike you that the districts are swamped at Lambeth by water coming up the drains?—Yes, that has undoubtedly very often happened.

1033. It very seldom happens that it really comes over the walls?—Not very often, but still sufficiently often to be a great annoyance; those permanent protections and fenderings would not otherwise exist.

1034. Do you happen to be acquainted with the description of the ground, or have you seen any specimens of the strata at Lambeth?—Yes; I have seen the strata varying. In some cases it is gravel, and in other cases it is the usual London clay.

1035. I mean taking the level between high and low water marks?—In some cases it is gravel, in other cases it is mud, and of course in all cases it reposes on the London clay. The London clay, as a rule, is the staple bottom of the valley of the Thames in and near London.

1036. That is a long way down?—I should not think so on the shores. I do not know in all cases what it may be, but I am quite certain that, with regard to the parts of the shore near the wharves, the London clay must come tolerably near the surface, say within eight or ten feet.

1037. If the water from the river percolates inland, it can only percolate to injure the district from about two hours before high water until two hours after it I should think; that is to say, the water would not be sufficiently high after that time to come to any level to be injurious to the district?—I do not think it would. I think that four hours in a tide would be about the time.

1038. Then there would be eight hours during which time the water that found its way in would have an opportunity of draining its way back again?—It would endeavour to drain back, but it would, of course, be also making its way inward to the sewers; that would be the effect of it.

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1039. (*Mr. McClean.*)—At what places do you find this percolation take place?—Up at Lambeth; a little above Lambeth Palace.

1040. Is it only during very high tides, or is it at all periods?—When it becomes sensible and annoying it is principally during high tides—spring tides.

1041. Extraordinary tides?—Not only during those extraordinary tides.

1042. When the low-level sewer is completed will not it remove all the water which percolates through?—Yes, it will remove it ultimately, but only by reason of its getting into the subsidiary sewers which communicate with the main sewer. The main sewer does not run in that district near the Thames. The main sewer runs inward, and the sewers which now discharge by the Thames are so near the level that they will be enabled to discharge their contents inland instead of into the Thames.

1043. And any water which percolates will make its way with the low level sewers?—No doubt; but still it is an annoyance, because it cannot get to these sewers without passing through the ground which is occupied by buildings.

1044. (*Mr. Thwaites.*) I understand that there are two sources of annoyance; one from floods coming over the banks, and the other from the damp arising from the percolation through the walls?—Undoubtedly; but the latter is of course the greater inconvenience when it occurs.

1045. It is perfectly clear, that however many main sewers we may have, that will not immediately remove the damp?—No; it improves the condition of things, but it does not immediately remove it. In fact, you have as many sewers now as you will have hereafter extending into this district. The sewers are there now, and it is a only a question whether they shall discharge into an inland sewer, or whether they shall discharge, as now, into the Thames.

1046. My point is this: if the effect of the percolation be to saturate bricks and foundations and basement stories, the fact of a sewer being in the street contiguous, would not remove, or at all events for a very long period, the damp which is complained of?—No; but it will operate in this way:—A change of circumstances is taking place. When the contemplated main sewer is completed, and the engines are set to work, the sewers will, as a rule, be kept empty, and, therefore, will be more capable of receiving this percolation; whereas now the main sewers are all tide-locked, and they become reservoirs of sewage and percolation. A better state of things will occur when the main drainage is completed.

1047. (*Captain Burstal.*) The tributary local sewers will run along all those streets which are now parallel with the Thames?—They do run along them now.

1048. They will then?—Yes.

1049. Therefore, surely those sewers will intercept any percolation from the river which would otherwise go inland, will they not, in your opinion?—Ultimately they will intercept it; but the water must make its way from the river to those sewers. They do not intercept it immediately; there are houses lying between the two.

1050. (*Mr. Thwaites.*) They would only carry off the water which escaped the absorbing power of the bricks and the earth of those basements; the surface water would be carried off, but the damp which people complain of would be present?—The general effect of it no doubt will be that the water will be kept at a lower level than it is now, and consequently that the percolation after the engines are set to work at Deptford will not be so seriously felt as it is now; it will exist, but not the same as at present.

1051. (*Mr. McClean.*) The low-level sewer will produce the same effect I suppose as if the whole district were raised 15 or 20 feet?—It will have a very beneficial effect, but not quite to that extent.

1052. (*Captain Galton.*) Do you not think that some portion of the percolation comes from under-

neath the wharf walls, through the gravel on which they are built?—Undoubtedly; and there is another cause of what is called percolation, but which is improperly called so. There are many apertures, small, old, unstopped drains, communicating with the river up which the water now gets; those drains, of course, proceed inland, and do mischief. Perhaps there is one thing which I may state in addition to what I have said; I have this morning taken out a list of the widths of the river at different points, for the purpose of showing its amazing irregularity, and that really the determination of the volume of water which shall come up the river takes place at or about London Bridge; and then again, there is another check up at Lambeth, opposite the Penitentiary; consequently, no harm will be done, but on the contrary a great deal of good will be effected by diminishing the width of the river between those two points. At St. Mary Ottery, just above London Bridge, the width of the river between the walls is exactly 750 feet; at Southwark Bridge it is only 650; at Queenhithe it is only 690; at Blackfriars Bridge it is 925; opposite to Norfolk Street it swells out to 1,300 feet; at Waterloo Bridge it is 1,240 feet; opposite Buckingham Street in the Strand it is 1,360 feet; although all the water has to come through the gut of 750 feet at St. Mary Ottery.

1053. (*Sir Joshua Jebb.*) Have you the sectional area due to those widths?—I have not; but supposing that these sections of Captain Burstal's still remain pretty correct, and that there has been no scour of any consequence since these sections were taken, I have the means of obtaining it. At Hungerford Bridge the width is about 1,330 feet; a little higher up it diminishes to 1,000 feet. Opposite the Houses of Parliament it is 880 feet; at Millbank it is only 600 feet. At Vauxhall Bridge it is 820 feet; and again at Nine Elms it is reduced to 650 feet; it then widens out again till at the Grosvenor Canal it becomes 1,060 feet, and exposes a large area of mud. At the Royal Hospital Stairs it contracts itself to 790 feet, and at Battersea it is again 750 feet, exactly the same as it is at St. Mary Ottery. Then again, I may mention with regard to these plans, that it suddenly expands opposite Cremorne and exposes again a great mud bank. It expands there to 1010 feet, and then it contracts again at Wandsworth to 640 feet. But the remarkable thing is that at St. Mary Ottery and at Battersea the width is 750 feet exactly.

1054. (*Chairman.*) You are of opinion that the river should be made of a uniform breadth?—I am.

1055. You consider that the flow would be more equal, and the current more regular by that being done?—Yes.

1056. But in a great tidal river is not the water holding capacity a question of some importance with regard to the shipping lying lower down?—Certainly; I have had that in my mind in laying out those plans which are now before your lordship.

1057. If you were to contract the river according to these lines you would diminish its water holding capacity to an extent at high water of somewhere about one fourth probably?—Yes; that would be true if the river were not at the same time deepened, which it would be by the scour, and if the tide were not let up with greater rapidity and to a larger amount into the upper portion of the river, which would be the case by properly training the sides.

1058. Do you imagine that there is much difference in the level of the bottom of the river between those parts where the river is very wide and those parts where it is very narrow, in that portion of the river where the current flows?—There is not much difference in the deepest portion of the channel—there is a great difference taking the whole section into account; but in the deepest part of the channel there is not much difference, because that has been scoured out by the ebb to nearly a uniform depth.

1059. Do you think that by dredging or by scour you could restore the water-holding capacity of which

this narrowing would deprive the river?—I have no doubt upon that subject.

1060. Then you are of opinion that the quantity of water in the pool at the ebb would not be at all influenced by this arrangement, provided dredging were to be applied and scouring availed of?—On the contrary, so far as the lower part of the ebb is concerned, the water would be let down necessarily more rapidly by the deepening of the channel above.

1061. And you are of opinion that as much tidal water would flow up under this arrangement as now flows up?—I am, and I give that opinion not without having gone into some calculations on the subject, although I did not know that any question of that sort would be asked.

1062. I ask these questions, because I know that there is an uneasy apprehension in the minds of persons who are much concerned in the shipping interest lest something might be done here which might interfere with the quantity of water at the ebb?—I suppose that that refers to the effect of that quantity whatever that quantity may be—not the absolute quantity, but its power to keep open the river below in an efficient manner.

1063. No, it is the absolute quantity; that is the notion which I have entertained for a long while, and which has been pressed upon my mind, that to whatever extent you diminish the water-holding capacity within the tidal range to that extent you interfere with the navigation?—It is a question of absolute quantity so far as regards flood, but it is not necessarily a question of absolute quantity so far as regards ebb, and the proof of that may be offered from what actually took place by the obstruction which the old London Bridge occasioned by the detention of the water above; the water could not get from the upper part of the Thames as rapidly as it ought to do, and consequently, although it was ultimately discharged in pretty nearly the same volume, it was not discharged in the same time, and, therefore, did not produce the same scour below London Bridge which is produced now.

1064. I apprehend that to whatever extent you narrow the river all the country water will go out, but it is a very different thing with regard to the flood. The tide is simply a question of level?—No doubt.

1065. And if you diminish the water-holding capacity of the river anywhere within the tidal range, to that extent you diminish the quantity of water which is to go up; but with regard to the ebb and the country water, of course all that must and will go out, and if the channel is narrowed you get a greater rapidity of current—that is with regard to country water—but with regard to the tide there will be no

The witness withdrew.

WILLIAM CARPMAEL, Esq., C.E., examined.

1068. (Chairman.) You are good enough to come, I think, as one of the gentlemen deputed by the inhabitants represented by Mr. Roffey?—No; I am a member of the Metropolitan Board of Works, and represent a large portion of the area from Putney down to Lambeth, and therefore I am one of the Surrey members of that Board, and in that capacity I have no doubt that Mr. Roffey has requested that I should be called.

1069. We thought that the gentlemen who were summoned at the request of Mr. Roffey would come here to represent the wants and wishes and requirements of that locality?—I do not represent them, although I have gone over the whole area by myself from time to time, I have not gone over with them any portion of the area in which they are more particularly interested, but I know it.

1070. Then probably you have come here prepared to advise us upon the question, and perhaps the better way would be, not that I should ask you, or that any of us should ask you, any questions first, but that you would be pleased to give us your notions about the

increased rapidity of current unless there are some large spaces to fill up within the tidal range beyond the part which you narrow?—My observations have gone entirely to the question of tidal water. As a general rule, and especially in the summer months, the quantity coming down the Thames from above is very insignificant indeed as compared with the tidal water, and therefore the observation which I made with regard to the time in which the water would be let out, and consequently the effect which it would produce on the river below, had rather reference to the tidal water than to the natural yield of the streams above. But what I wanted to observe, if your lordship will permit me, is this, that I conceive (and I think I have good data for maintaining that opinion) that as much water will be held, and probably more, in the river above, after this improvement is effected, as is held in the river now, for although it is true that by the embankment of the Thames the water-holding capacity within the Port of London will be diminished, yet if the water be let up with greater facility, for instance, by the suggested improvement of Nine Elms, by increasing the sectional area of the river, and by training the flow of the water by walls, if by these means the rate at which the water goes up be increased, the level of the water in the higher parts of the river will be sooner established, and not only will the level be sooner established, but the level will be higher than it was before, and consequently, by means of that additional height of the water in the river above, you will be enabled to have an additional volume quite equal to that of which you deprive the river by embanking its shores within the Port of London.

1066. At what part of the river do you conceive that it would be higher than it is now?—All the way between Nine Elms and Teddington Lock. I am speaking now of course of spring tides, because it is not all tides which reach Teddington Lock, but I mean when they do.

1067. (Mr. Thwaites.) You propose to increase the sectional area of the river by dredging?—I only propose to increase the sectional area of the river by dredging where the river itself proves to be incapable of effecting that object. As a matter of course, you will have to dredge in some instances at the foot of the walls to assist the tidal action, and you must dredge some of the harder shoals. There are shoals below Westminster Bridge, in the middle of the Thames, which appear to be of a gravelly character. The velocity of the current will not be sufficient to remove those shoals spontaneously; as a matter of course, in that case, dredging must be resorted to; indeed, dredging ought to be resorted to now.

matter, and then we might, any of us, elucidate anything which to our mind was not clear, by putting questions?—I have for very many years entertained the opinion that the Thames generally is in as bad a state as any tidal river can be, which has so important a duty to perform in carrying the merchandise of this great metropolis. From my boyhood upwards I have been intimately acquainted with the Thames, and with its general condition, and I have entertained views of what might be done, not only in improving the action of the Thames itself, but in improving it with regard to the mercantile uses that may be made of it, and also with regard to the sanitary state of the neighbourhoods immediately upon its banks. I entertain, and always have entertained, a very strong opinion that that portion of the Thames which is in the metropolis should be thoroughly embanked on both sides. I also entertain the view that the Surrey side of the Thames, between London Bridge and Vauxhall Bridge, requires embankment as thoroughly as that which the former Commission recommended in regard to the north side, and which has been partly

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done opposite the Penitentiary. I think that that which the former Commission recommended was an exceedingly good remedy, indeed as good a remedy as could be recommended for the state of things on the north side of the river, between Blackfriars Bridge and Westminster Bridge, and I think that the same remedy is required on the south side of the river, between Vauxhall Bridge and Southwark Bridge. The present state of the southern side is shelving shores, as well as mud islands or mud banks, at different places, tending to produce a very offensive state of things, more particularly in hot weather, and at times when there is very little water coming down. I think that it would be very unwise to leave any part of the shores uncovered with water at any period of the tide, and therefore I think that there should be a river wall, and an efficient river wall, running from Vauxhall Bridge to Southwark Bridge. I think that dredging, where it may be wanted, should be had recourse to so as to aid the scour, in order to maintain a good floating depth at the lowest tides. Those are the general views which I entertain with regard to the southern portion of the Thames, between those limits. I walked from Vauxhall Bridge to London Bridge about three weeks ago, and very carefully examined the present state of things in those localities, and I think that I should go very much further than Mr. Hawksley does, in stating that the walls of two thirds of the wharves are defective and weak. I should say that none of them, or scarcely any portion of them, would bear to have a scour and the assistance of dredging, so that there should be a 5 feet depth at low-water mark. By far the largest portion of what does exist I do not think would admit of any dredging, so as to bring a depth of water at low water equal to 5 feet. I think that most of them would tumble down. A very large portion would not bear dredging, even to a much less extent than that. I ventured to send in two plans, the one representing Walker's lines, as he originally laid them down on behalf of the city, but with this alteration, that there should be no indents or recesses, and that the embankment should be carried along under the bridges, in place of having recesses, as he proposed, at the several bridges. That plan I think would give a minimum of about 100 feet or more from end to end of that district which I have spoken of, and as to that space my view is this, that you might have a roadway of some 50 feet wide, with an intermediate portion of the abstracted and new area from the water of some 30 or 40 feet, for landing quays. I recommended further, that there should be power for parties having travelling cranes across these ways, in order to facilitate the carriage of stone and other heavy goods across; also other conveniences for landing. I entertain the opinion (and I ventured to state it before, when I had the pleasure of giving information to this Commission, or rather the former Commission,) that nothing can be more rude and more wanting of the ability which is displayed in other places of landing and shipping goods than that which is displayed on the Thames in London. I do not think it is conceivable that the landing and shipping of goods can be worse carried on than is the case in the port of London. I believe that that might be so largely improved as to benefit the whole of the parties in that district. None of the mechanical appliances, whether of hydraulic cranes or of travelling cranes, or of transverse tram-roads in the warehouses, exist, and yet they exist elsewhere, and they might exist here, very largely to the advantage of this part of the country. I think that the metropolis might be very largely benefited, if that unhappy state of things which is in Thames Street and below London Bridge on the south side, where there is such a large concentration of warehouses and very narrow streets, could be expended and spread over a larger area. I do not know a mode of getting that done which is more likely ultimately to be for the benefit of the metropolis than by getting a good roadway alongside the river between London Bridge and

Vauxhall Bridge. You have proposed that all business of a landing and shipping character should be got rid of between the Temple Gardens and Westminster Bridge in future. That will induce, more or less, a desire to get water-side premises on the other side of the river. But my own opinion is, that a very large number of manufactories, and a very large quantity of first-class warehousing, would exist, if there were a convenient means of coming to and getting away from the Thames on the south side of the river, between Vauxhall Bridge and London Bridge. The other plan which I have sent in is this:—that, supposing the Commission should not be prepared to go to the expense of having a roadway, and all the benefits consequent upon a roadway, I propose only to trim, so to speak, or to re-arrange, the southern bank between Vauxhall Bridge and Southwark Bridge, so as to get the best out of the present state of things that I think can be got at a very small cost, so that the river would be improved in its scour, and in its navigable character, and it would also be improved by getting rid of all the sand-banks and shoals, and would admit of the river being dredged or carried by the scour to a depth so that the banks would always be covered even at low water.

1071. You began with speaking of mercantile uses, and you afterwards talked about the port of London. The existing mercantile uses between Blackfriars Bridge and Westminster Bridge consist chiefly in coal wharves, timber yards, lime wharves, and occasionally some manufactories?—Stone and slate wharves, I would add, as being important.

1072. There are some stone and slate wharves. Do you think that the mercantile uses could be improved by any embankment along that line; do you think that anything which the Commissioners or anybody else could do would give greater facilities to the timber yards and the coal wharves, and the stone and slate wharves, than they now enjoy?—As regards timber yards, I think not; but as regards the others, I think yes; and I think that in regard even to timber yards their use would be greatly facilitated if they could land their timber more readily into waggons, and carry it to distant places, than they can do at the present time. The present mode in practise, even in the timber yards, is certainly not the most convenient; but the timber yards would be most inconvenienced and least benefited.

1073. You are aware that there are great quantities of timber lying on the slope of the shore?—Yes.

1074. And you are aware that that timber comes up in floats from below?—In rafts.

1075. Do you think that it would be convenient to the wharfingers if they were compelled to land that timber?—I think that if they had premises suitable for landing it would be desirable that they should land it, and that they should keep it dry rather than wet. I think that the use of wet timber is highly prejudicial, as a general thing, to the buildings of the metropolis. I think that the system of keeping timber afloat on the river is a practice which ought not to be permitted, to the prejudice of the general public, for the benefit of a few individuals; they are for the time being taking possession of that which is a public highway for their own personal uses. For instance, if I were to set up to be a timber merchant to-morrow I could occupy a large area of the Thames, if I chose, with no one to interfere with me. If I had a frontage I could keep a certain quantity of timber floating. I should receive notice, no doubt, from the Thames Conservancy Board, from time to time; but still there would be a large area which I could monopolise, only promising to take the timber away from time to time when they found fault with me. But my opinion is, that that ought not to be permitted to exist, even to anything like the extent to which it now exists.

1076. If certain persons have acquired a right, could you send them away without compensation?—If your Lordship tells me that they have acquired a right, as a matter of course I will bow; but I am not

prepared to believe that parties in that position have any legal right which would entitle them to compensation, beyond interfering with any frontage which they may possess. As respects any frontage which they may have, I think they might have a claim for compensation; but as for occupying the Thames over a large area with timber, I cannot imagine that they have such a legal right. But I may be wrong.

1077. With regard to coal barges, where they have two tiers of barges lying end on, do you think that you could deprive the existing wharf-holders and occupiers of that privilege without compensation?—I think that you could deprive them of the right of keeping a large quantity of coals in barges if it becomes a public inconvenience; as they may have the means of loading and unloading with greater despatch, and therefore have less requirement for making the Thames their storehouse.

1078. You spoke of the water being such as to give you five feet of water at low water?—Yes.

1079. What do you want with five feet? Do you want more than is sufficient to prevent any exhalation from the mud?—I want more than that; I want the means of floating the barges at all times at low water, because my opinion is that you ought to give every facility to the wharfingers to bring up their barges, and take away their barges and other craft, so that they may make the most beneficial use of the frontage which they have.

1080. With regard to the mud banks, I gather from you that you deem them to be unwholesome?—Certainly unwholesome.

1081. When the main drainage scheme shall be completed, will they any longer be unwholesome?—The mud banks would be still there, though their offensive character would be materially reduced. It would not be done away with, because the large quantities of vegetable and other matter coming down and getting into the river would always accumulate in those places.

1082. Where do you imagine that the great quantity of mud comes from?—From the upper districts. Very large quantities of vegetable matter will decompose and be deposited on these banks; I mean after the intercepting sewers have been carried out. At present there is a very large accumulation consequent upon the sewers, and consequent upon the sewage being permitted to flow into the Thames.

1083. The question is this, whether the unwholesome state of the banks which now exists does not result from the discharge of faecal matter from the sewers?—So far as the faecal matter is concerned, it will be removed, but so far as vegetable and other accumulations of organic matter are concerned they will still be sufficient, in my opinion, to make the river very offensive.

1084. Do you not think that the organic matter contained in the water would be so deodorized, so to speak, in coming down the river before it got to these banks, as to render it innocuous?—We do not find it so in the several rivers which lead into the Thames, near their mouths, or even above their mouths. We find that they are very offensive in hot weather; even those where there is practically no sewage introduced. On all rivers where there are alluvial and clayey matters brought down, together with vegetable matter, you will always have offensive banks, and those offensive banks ought not to exist in a city.

1085. Is there anything offensive from mere alluvial deposit?—No, certainly not; but plus vegetable and other organic matter it is offensive.

1086. You think that that quantity of vegetable matter in the Thames which would not become deodorized in coming down would be offensive?—Yes.

1087. (*Sir Joshua Jebb*.) Have you formed any opinion as to the proper width at which to retain the surface of the river?—If one could have one's own way, without cost or inconvenience, or without material cost or inconvenience, I should agree with what Mr. Hawksley has told you to-day; but as I look at

things as they are, and at things as they probably will be required by the public to remain, more or less, I am not prepared to say that there is any chance of reducing the Thames to such a state of regularity as Mr. Hawksley has proposed. My feeling goes strongly to this, that the first duty in regard to this Commission, or any other parties dealing with the Thames, is to see to its condition and its capacity for tidal water. Whatever you do you must provide for not reducing the capacity for tidal water, otherwise you will do infinite injury below London Bridge, and injury which you cannot alleviate in any way. That is one of the points upon which I ventured to dwell on the former occasion when I was here. I again reiterate that, because I am of opinion that that is the first thing to be considered, whatever you do with the Thames. Wherever you abstract any portion from the Thames in regard to its banks you must provide for adding as large cubic contents, or larger, for the tidal waters as you had before.

1088. In one of your plans you propose to improve the present wharves, and still to have alongside those wharves a depth of water of five feet at low water?—Yes.

1089. That would very materially add to the tidal capacity, would it not?—No; it would not add to the tidal capacity, because any capacity which is below the low-water mark does not add to the tidal capacity; it adds to the capacity of the river, but does not add to the tidal capacity. Draw a horizontal line across the river at low-water mark, and all above that between the banks may be considered as capacity for tidal water.

1090. (*Mr. Theobald*.) You have examined the condition of the wharf walls from Vauxhall Bridge to London Bridge?—Yes.

1091. I think you stated that a very large proportion of those walls were in a very bad condition?—Very bad.

1092. In such a condition as not to resist the influence of the tide?—Whilst they have shelving banks the tide does not act upon them; but if you are to reduce those tidal banks, so that they are covered at low water, you will not then have banks which would uphold the wharves.

1093. I will come to that presently; I am speaking of their present condition; the walls at present do not resist the tide, but it finds its way through?—In many places no doubt it finds its way through.

1094. And in order to prevent a still greater evil, supposing you were to dredge, it would be necessary to sink the foundations deeper to construct a new wall?—You must construct a new wall, if you at all cover the banks at low water.

1095. If I rightly understand you none of the existing walls would bear the application of dredging?—I will not say none of them, but a very large proportion would not admit of it at all. I am not prepared to say that there are not some portions which have gone sufficiently deep for foundations.

1096. Have you examined that portion of the shore in Lambeth where they have those landing docks; draw docks as they are called?—Yes.

1097. How would you keep the tide from those draw docks?—The surface there must be raised so as to prevent any overflow, and the whole of the foundations below must be made so sound as to prevent the water from coming in.

1098. How would you prevent the overflow at the top?—Simply by raising the whole of the levels; nothing short of that. If you are still to have the means of landing by carts and waggons descending to them, you must elevate all above them where the water from time to time at high tides flows over.

1099. In order to raise the upper part of the draw-dock a sufficient height, so as to prevent the overflow of the tide, you would increase the incline?—Or carry it further; wherever you could not carry it further you must increase the incline.

1100. Would not it necessitate the commencement of the incline in the river at some further point?—In

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order to prevent the overflow of the tide you must raise the draw dock; say to that pitch (*describing the same*); you would increase it?—You must carry it further inland.

1101. Would it not be necessary to commence further out in the river?—There is this inconvenience in going further into the river, that you have a jetty running out which is the precursor of sand banks.

1102. I am assuming that to cure the evil in question you would construct a river wall, say 40, 50, or 60 feet into the foreshore of the river, and thus be enabled to increase the height of the draw dock?—Supposing that we make an embankment, there is no difficulty whatever in getting very good inclines from low-water mark up to the levels, and yet having the upper portions raised sufficiently to prevent any overflow of the river into the streets or surfaces beyond.

1103. From your observation would it be possible to raise the upper part of those draw docks without at the same time raising the street into which they come?—No, certainly not; a large portion of that area must at some period or other be raised.

1104. As far as you are able to judge, are those draw docks necessary for the trade to be carried on in that part of the river?—I should say that the sooner they are done away with the better. I used to know Vauxhall very intimately. I used to advise, and do still advise, several manufacturers in that direction, but I do not so often go there as I did some 25 years ago, but even now the quantity of landing by that means is comparatively small, and by having hydraulic cranes and other means of lifting I think that without prejudice those places might be got rid of altogether. I do not think that they are of that value that they ought to cause inconvenience for any greater length of time.

1105. Do not potters land their clay there?—They do, and also coals; but if the embankment wall were continued flush all the way, and with cranes for lifting the clay or coals into the waggons and other carriages, it might be done with greater facility and greater benefit to the parties.

1106. If a roadway were constructed in front of those wharves in Lambeth, do you think that it would interfere with the traffic?—On the contrary, I think that the whole of the manufacturer's premises, and the whole of that line, and area and district, might be largely improved by having a roadway, and a convenient arrangement for landing and shipping goods. I think that Lambeth would be enormously improved by having a roadway from Vauxhall Bridge to Bishop's Walk, so that they might take in their clay and their coal, and ship back any goods going either east or west up the river. I think that that would be of the greatest benefit to them.

1107. By having public cranes, I presume?—By having general cranes, or cranes belonging to the district.

1108. (*Sir Joshua Jebb.*) In one of your plans I think you propose a wharf outside the road?—All public wharves, I think, ought to be outside the road. There should be a considerable area immediately on the banks of the Thames to facilitate the shipping and unshipping of goods, which could be immediately carried away, so that the waggons might back towards the river and be out of the way of the main traffic, and so that the loading and unloading might not interfere with the traffic on the road.

1109. About 40 feet, you think, would do?—About 40 feet from the river wall.

1110. (*Mr. Thwaites.*) You have had a good deal to do with the manufacturers of Lambeth; have you heard them complain that the flooding does interfere with their business?—That has been a source of complaint ever since I can remember it, which is now more than 35 years ago. Thirty years ago I used to be very constantly at Lambeth; in modern times I do not go there above once in a year or so.

1111. (*Captain Burstal.*) Can you tell us of any

mud islands between London Bridge and Putney which you say make the river so very bad to navigate?—There are shoals all the way up. Take the one at Westminster Bridge and the one at Waterloo Bridge.

1112. We will take Westminster Bridge first. Westminster Bridge would never have shown itself to daylight had it not been for the additional drainage caused by the water running off through the new London Bridge; therefore that was originally a shelf, a part of the mainland of Middlesex, that is, not the normal channel of the river?—If I read history aright, none of it is the normal channel of the river.

1113. I mean the river proper?—The river proper would probably be more on the Surrey side, if the maps of the olden times are correct.

1114. The deep-water channel of the river proper, according to the latest map, tells us that the real river runs over to the south side?—Yes.

1115. Therefore that at the present time is really a shoal, and no doubt ought to be removed, and the corporation of London cut a channel to the northward of that, merely for the purpose of accommodating the steamboats which went to Westminster, otherwise I dare say it would have been a shelf still, and the passage would have been on the south shore. If it is agreed that a barge will go of itself without any propelling power 15 miles in a flood tide, I do not think that the river is in a very bad state?—I do not say that the navigation is in a very bad state, but it may be made much better. I am not one of those who are inclined to stand still even with regard to the river Thames.

1116. Have you ever heard of any such occupancy of the foreshore as placing barges on barge beds and putting timber on the foreshore interfering with the use of the public highway?—No; nor do I think that it would, within reasonable bounds, interfere with it, after an embankment is made; but I only object to this, that parties having premises on the shores of the Thames consider that they have an unlimited right to put any quantity of barges and any quantity of timber in front of their places.

1117. But do not you think that the rental charged for wharf property beyond the limit of the tide above high-water mark on the banks of the river is actually increased sometimes two or three fold by virtue simply of the accommodation which there is in front of it for carrying on wharf business?—I have no reason to think so, because there is a very large portion of the area between Vauxhall Bridge and Waterloo Bridge which is anything but well occupied at the present time.

1118. Then you think that between Westminster Bridge and Vauxhall Bridge, by a judicious embankment being made there, the waterside property would be very much improved?—A large portion of it. If you have a map I will show you what part I mean. There is a large portion of property all along from Stangate nearly up to Bishop's Walk, and I imagine that if there were a ready transit for merchandise from Vauxhall Bridge to Waterloo Bridge, and from Waterloo Bridge to Blackfriars, the whole frontage of this property might become a most valuable manufacturing and warehousing property.

1119. So low down as Waterloo Bridge?—Yes; commencing at Blackfriars Bridge, following the Belvidere Road and the Commercial Road, they have only got those very awkward and narrow streets to deal with; the whole frontage of the Thames is not beneficially used.

1120. Do you not think that the Belvidere Road and the Commercial Road, with Stamford Street at the rear, are enough for general purposes?—No; at present they are very inaccessible. The branch roads are not fit for waggons; very few of them admit of two waggons getting down. Waggons with timber cannot get down; they cannot turn the angles.

1121. Do you propose to cross the Westminster Bridge Road?—No; I would cross underneath the

Westminster Bridge Road. I would prefer keeping that level, and not crossing the traffic.

1122. The particular part of the river which you say would be very much improved, would be up by Lambeth?—Yes; the whole distance from Lambeth Palace to Vauxhall Bridge would be made most valuable property, and which is now for the greater part useless.

1123. That in effect really would be to spend a large amount of public money which would have the result of improving the property of private individuals, would it not?—No. I hold this; that at present the carrying traffic to and from the Thames is too much concentrated in Thames Street on the one side, and below London Bridge for some distance on the other side, and that it is very desirable that the area of storing and the area of shipping and unshipping should be extended as far up the river as possible.

1124. Then you would anticipate bringing some of the small craft above London Bridge?—Largish craft, if possible.

1125. How would you get the masts down?—I mean billy-boys, and the larger class of craft.

1126. Then you would carry on something of the same sort of water-side business above London Bridge as there is below London Bridge?—Yes; and I think that the metropolis would be greatly benefited by that distribution; at present it is too much concentrated, and concentrated greatly to the prejudice of the city of London, Bermondsey, and the borough of Southwark. I think that in all these matters we should look not for that which will immediately patch up the difficulties and the inconveniences of the present time, but for that which in futurity will give to the public the largest benefit, not with an extravagant but with a fair expenditure of money.

1127. Supposing that an additional amount of territory was put in front of a man's property, enabling him to build warehouses, and to have so much more valuable property than he has now, do you think that it would not be fair to make him pay something towards the expense of the embankment?—Whenever you can improve a man's property, as a matter of course that should be the case, but generally he will not believe in improvement till he has got compensation for some imaginary thing; but whenever you can improve a man's property he ought to contribute according to the benefit which he has received. On the other hand, I do not think that you ought to object to improve a neighbourhood simply because it will improve a certain property, and you have no means of getting payment for it from the owner. In my opinion, with all deference to the Commission, you ought to look with a broad eye, in order to see how to enlarge the benefits which the Thames offers the public in this part of the metropolis, and to see what a reasonable expenditure of money will bring about in futurity; that is the way in which I think that this subject ought to be looked at. Personally, I have no interest in property on the one side or the other, and I have no interest, save and except as one of the public, and also as having a duty to perform as long as I happen to remain a member of the Board of Works.

1128. (*Chairman.*) You spoke of the bad condition of some of the wharf walls, and their letting in the water. Do not you think that the duty of repairing the walls, so as to make them water-tight, devolves on the proprietors, without reference to embankment?—I think it does. With reference to one of the plans which I have sent in to the Commission, I merely say that if it is to become a question of expense, and a question of expense only, then give the public a new wall; one which will embank the Thames thoroughly, and which will admit of the tidal-way and the way between the walls on the two sides being covered with water at all times. I say that I think the proprietors of the frontages ought to be compelled by Parliament, if powers do not at present exist, to make such walls as shall enable the Thames to be used

with the most efficient advantages that can be; that is the feeling which I have.

1129. Speaking of the existing powers, allow me to read a passage from a memorial which has been addressed to us: "Your memorialists submit that by the Sewers Act and the Metropolis Local Management Act full powers are vested in the Lambeth vestry for providing remedies for this evil, and particularly, and in express terms, by the 59th section of the last-mentioned Act, which authorizes the vestries to cause all banks, wharves, docks, or defences abutting on or adjoining any river, &c. to be raised, strengthened, or altered or repaired, where it may be necessary to do so, for effectually draining or protecting from floods or inundation such parish or district." Supposing such powers to exist, are you of opinion that such powers ought to be put into execution?—Unquestionably; they ought to have been put into execution many years since.

1130. With regard to the draw docks, I presume that whatever will have to be done with those draw docks, they being in some degree public ways, will have to be done by the paving boards, at the public expense, that is to say, the expense of the district?—That I should imagine. I have not gone specially into the statutes referred to in that memorial with regard to this particular subject, and therefore I should not like to give any opinion, and if I did give an opinion it would not be a legal one, which would be of little worth here.

1131. Supposing that you and I were standing at Fore Street, Lambeth, at the mouth of one of those draw docks, we could easily see that at a very high tide the water comes up and flows along the street?—It flows up for some hundreds of feet. I have seen the result of the overflow some hundreds of feet up.

1132. As a practical engineer, if you were desired to remedy that, I presume you would raise the side walls, and you would raise the public way immediately at the end of the dock. You would lift the whole surface up, so as to prevent the water coming in?—Certainly I should.

1133. And that would involve a continuation of the incline either further inland or further into the river?—Unquestionably. There is not the slightest difficulty in doing that.

1134. And you agree with me, that supposing this embankment question had not been raised, the duty of doing that devolves upon local boards?—So far as your lordships as read that paper, I agree with you, and I always entertained the opinion that the owners of the river side properties had a duty upon them to keep the banks in such a state that the river could be most advantageously used as a public highway; but whether there is a possibility of carrying that into execution by the present law or not I am not prepared to give an opinion either one way or the other.

1135. But, law or not law, are you of opinion that the owner of the property is morally bound to prevent the river coming over and getting into the houses of his neighbours?—I have not a doubt of it. I feel that it is a moral duty, if it is not a legal one. I should imagine that it is a legal duty also.

1136. (*Mr. Thwaites.*) Supposing that the requirements of the river were such as that a considerable amount of dredging should be carried on in front of any one of these wharf walls, would you have power, under the Metropolis Local Management Act, to call upon A. to deepen the foundations of his wall 10 or 12 feet, as the case may be, and to erect a new one?—Certainly not. His lordship does not put that to me at all. His lordship puts it to me, as I understand him thus:—Here is a state of law; ought not the parties who have been subject to this state of things to have it remedied by the parties whose duty it is to remedy it?—I say that the present state of things remaining, it is a moral, and, I think, a legal duty; but as regards the question now before this Commission, which I understand to be, shall a Thames em-

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bankment be made on the south side of the river, and if it be made shall it be done with reference to carrying out that which the Commissioners have already recommended, and I think properly recommended on the north side, namely, that there should be upright banks, with 5 feet of water at low tide. Such a structure is just as much required on the south side as it is on the north; and I think that this Commission would be, if I may so express it, exceedingly antagonistic to itself, if it did not provide for the south side a state of the river similar to that which the Commission is proposing, and I think properly proposing, for the north. In such case the private responsibility by the owners of property in regard to the walls is all gone.

1137. The question which his lordship put to you has reference rather to the past,—the neglect of those wharfingers in not keeping their walls in a proper condition. The object of this inquiry is not simply to go back to find what state of things has existed, but how to remedy that state of things; and if you have arrived at the conclusion that it is necessary to have on the south side a Thames embankment of a similar character to that which has been recommended on the north side, giving a depth of water of 5 feet in front of the wharves, that would render necessary a distinct river wall being built?—Certainly, from end to end.

1138. Then there is an end of the liability of the wharfingers to erect such a wall?—I do not think there is an end of the liability of the wharfingers to erect a wall, because I think that their duty would still exist to the extent that it now does, and I think that it would be reasonable in Parliament to ask and require that the wharfingers, if there only was a wall, and no other alteration than a wall was made, should bear part of the expense.

1139. My point is this:—can you, with the powers possessed under the Metropolis Local Management Act, call upon wharfinger A either to build a new wharf wall on the old foundations or near the same spot, or to build a wall 20 feet out in the river for the purpose of forming an embankment?—My own opinion is that you can do nothing of the sort. The law, so far as my knowledge goes, never contemplated it, and therefore you could not now legally or morally, or for any other reason, call upon the wharfingers to do it.

1140. Then I understood you to state that the powers which you possess (the Wandsworth district Board of works possess the same powers as those of the district of Lambeth) are insufficient in your judgment to meet the requirements of the river as you have suggested them?—They have no bearing upon it at all.

1141. Then they have no bearing upon this inquiry?—I asked when I came in to have an opportunity of reading the Commission, which I have not had an opportunity of doing, and therefore I cannot give an opinion upon that point; but having read the former Commission I imagine that the powers of the Commission, limited between points A. and B., would be similar in language to what the powers of the former Commission were, and therefore I assume that the Commissioners are looking into what should be the state of things in future, and are not going into the past, taking the past only as materials for evidence and information to enable them to ascertain what is required for the future.

1142. (Chairman.) There is no strict analogy between the two inquiries. The object of the former Commission was to make a new line of thoroughfare,—a capacious thoroughfare, or some such word as that, from Westminster to the city. That was one of the things which we were directed to do, so as to relieve the traffic of the most crowded streets. That was one distinct object. Another object was to find a means of making the low level sewer without going through the Strand and Fleet Street. Those were the two objects which we had. Now there are no such objects on the Surrey side, and no such necessity?—So I understand.

1143. And I must confess that I cannot see my way to an easy solution of the difficulties by which this question is surrounded, and I am a little apprehensive that in many cases at all events we shall be compelled to leave the wharf walls where they are. But then the people on the Surrey side say, our walls are so low that the water runs over them, and the walls are so defective that the water comes through them. Then I say in that case it seems to me to be within their own power to remedy those two defects. They are bound to raise the walls so as to prevent the water running over, and they are bound to repair them so as to prevent the water coming through; and it was with a view to that that I asked you those two questions. In addition to that, the people on the Surrey side say, we have as much right to have an embankment as the people on the Middlesex side. Now the answer to that is this, in laying down our plan for the Middlesex side we have not done anything at the request of the inhabitants. What we have recommended has been rather in spite of them; and we have said, in a great many cases, we are quite sure that this will not suit you, but it must be done, and you must go away. The requirements which we have sought to meet do not exist along the edge of the river; they exist in an immense district, and comprise a large amount of traffic between the great offices and the great population of Westminster and all the adjacent parts and the city. Now there is nothing of the sort on the other side; there is no such amount of traffic required along the edge of the river on the Surrey side, and the Surrey side is far better provided with streets, with, however, just this one exception, namely, in that part of Lambeth where Fore Street is, undoubtedly there a better line of thoroughfare is required from the Vauxhall Station down as far as Lambeth Church, or somewhere there, and from there to Westminster?—Am I to understand your lordship to say that the river proper, not looking to the property on the banks of it, can reasonably and fairly in regard to the Surrey side be left in its present condition, leaving the foreshores as they now are?

1144. I hold in my hand a memorial sent in from the owners and occupiers of wharves on the Surrey side of the Thames between Lambeth Palace and Southwark Bridge, and it is signed by great numbers of people of the highest respectability, who say this:—“Your memorialists consider that any of the plans for an embanked roadway which have been laid before the public would materially impede such traffic in the various trades now carried on,” and so it goes on. When you talk of the Surrey side, do you mean the people who live on the banks of the river, or do you mean the people living at Streatham?—In the last observation which I made I was speaking of the Thames, and the Thames proper, without reference to any one on the banks anywhere. I am not looking to the trade of the Thames immediately; I am rather looking, first, as to the action of the Thames, its sanitary state consequent upon its present condition, and the present state of the banks on the southern side. And I would ask your lordship, if you will allow me to ask a question in place of answering any questions which you may put to me, whether you are prepared to say that the state of the banks on the south side is such that it does not require that they should be covered with water at low tide?

1145. I say that when your great system of main drainage is carried out there will be such an amelioration of the condition of the banks that they will not be at all what they are now considered to be, in a sanitary point of view. If you ask me whether I should very much prefer seeing that bank of the river with a design realized which Sir Charles Barry showed me some few years ago, I should say that I should rejoice in seeing it so. The question is, is it practicable? The question is, whether you can get rid of all the people who occupy wharves between Westminster Bridge and Southwark Bridge? What

do you say to Messrs. Maudslay, for instance, and I will not mention other names, but great numbers of persons carrying on business there? Will you send them away, or will you make compensation to them? Will you venture to say to people who have large businesses on the banks of the Thames, that for the sake of the appearance of the thing they must be removed?—No; I am not putting it upon the appearance at all; from the very first I have never ventured to allude to the appearance. You mention Messrs. Maudslay. Messrs. Maudslay's business might be as well, and even better, carried on with a road passing in front of their works as it is now carried on. Give them an opportunity of having a transverse tram and a travelling crane, and the privilege of having 40 feet of greater depth of frontage, and you will give them, as engineers, a greater benefit than you can possibly imagine.

1146. Here are their names to this memorial?—I can imagine that; but the question is, not what people will say, such as "Do not come and interfere with us?" but the question is this, there are times (and it is occurring every day in the progress of events) when you must alter the existing state of things, and to the apparent injury of the parties, or against their feelings and wishes, and against what they imagine to be their interests; but private interests must give way at times.

1147. We felt that on the Middlesex side there was such an amount of vacant space, and such a great amount of land to be reclaimed, that we could afford to buy up interests; but on the Surrey side there is not a single linear yard which is not occu-

The witness withdrew.

WILLIAM LAWRENCE, Esq., examined.

1149. (*Chairman.*) You occupy Palace Wharf, Lambeth?—I do.

1150. What is your business?—I am a coal merchant. I have also a wharf at the corner of Fore Street by the side of one of those draw-docks which have been alluded to by one or two of the previous witnesses.

1151. Will you be pleased to tell us anything which you have to say with regard to this great question?—All I can do is to point out the very great inconvenience which I and my neighbours suffer from the overflow of the tide at certain periods. It frequently happens that my wharf, or a great part of it, is under water, owing principally to the water coming up this dock, not so much from its coming over the front, but from its coming up this dock. It frequently happens that my horses and waggons are detained for two or three hours unable to get through the water, the water at the corner of the dock and at the end of the dock being above the knees of the horses, and it is impossible to get out with a load of coals.

1152. What is the name of that dock?—Whitehart Dock.

1153. Your wharf is at the very corner of it, and your camp shed is high enough to keep out the tide, but at every spring tide the water flows up this draw-dock, and then it comes into the street, and from the street into your wharf and warehouse?—At ordinary tides it does not come over my camp shed, but perhaps four or five times a year it does come over—sometimes to the extent of a foot or 15 inches.

1154. If you or your landlord were to raise your camp shed 18 inches, I suppose the water would not come over as it now does?—It would not come in over the front.

1155. If the parochial authorities, the Paving Board, were to take up the paving of the street opposite to you, and raise it, extending that draw-dock further into the river, so as to get the same incline, and raise the entrance of it high enough to prevent the water flowing over, you would then be safe from the inundation?—I should myself, but I think that that would interfere very materially with

ped. I quite agree with you that it would be a very desirable thing if we could embank all the way along and make handsome quays. I should rejoice in seeing it; but as a practical man I know that you cannot do it without spending an enormous amount of money, and I know that the public will not give you the money to spend?—But going with your lordship, and even assuming that your lordship is correct in stating that an embankment cannot be obtained, I think that your lordship will agree with me in saying, that the condition of the Thames from Southwark Bridge to Vauxhall Bridge will not admit of a state of things corresponding with that which is to be on the north side of the river, namely, that the whole of the banks shall be covered with water, without having at least a thoroughly good river wall; you must have a new river wall, even according to your lordship; I should be delighted to find that you could also embank; but that you must have a new river wall I entertain the strongest conviction, and without that you cannot do anything with the Thames. You cannot get rid of the present fore shores; and notwithstanding your lordship's opinion, you must always have to a large extent that offensive state of things in hot weather which you have on the shores of all rivers where there is clay and alluvial matter with vegetable matter coming down together.

1148. We will not go again into the question of alluvial and vegetable matter. I entertain great hope that when your labours are accomplished there will be nothing very offensive?—It will do a great deal, but it will not do enough for that.

the basements of the houses about; they would have to cover the entrances in raising the pavement.

1156. If the mouth of that draw-dock was raised, so that the tide could not flow over, it would not flow into the basements of any of the houses?—No; but in raising the street you would have to raise it above the existing entrances to the houses, which are now in some cases below the road.

1157. Are not the steps of all the doors high enough to admit of that; is not the house opposite to you with three stone steps leading into it high enough?—There is a warehouse immediately opposite my place into which the water very often flows, and half way across, inside, they have three stone steps placed to prevent the water getting over into the part which they are using.

1158. Is the overflow of the water the only subject which you have come to talk to us about?—That is the great subject.

1159. Do you agree with me in this, that if you and all the other proprietors raised your wharves, and the Paving Boards raised the level of the streets, you would be safe?—Yes, as far as the water goes; but there would still remain the miserable streets, which it would be desirable to get rid of.

1160. Fore Street, for instance, which is 15 feet wide?—Yes. I speak more particularly of the neighbourhood between the Palace and Vauxhall Bridge. I think that an embankment is necessary, partly to get rid of those miserable places, but it is also necessary for the benefit of the occupiers of wharves and premises upon the river side, to prevent the injury and inconvenience which they constantly sustain by the overflow of the tide; and it appears to me that the only practicable way, or the best way, of getting rid of those injuries, is to cause a new river wall at all events, if not an embankment, to be made.

1161. But if the existing river wall is not high enough, cannot it be made higher, and if it is out of repair cannot it be put in repair?—It can certainly; but then, in my case for instance, if I made a new wall in front of my wharf, and raised it some 16 or 18 inches, which would be necessary, I should still be

W. Carpmael,
Esq., C.E.

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Esq.

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inundated by the water which flows up the dock unless the parochial authorities were to raise their street, and in that case they would interfere, in my opinion, with the basements of the houses there.

1162. Do you know of any instance where public money has been spent in building a river wall?—I cannot say that I do.

1163. With regard to the money which is proposed to be spent on the Middlesex side, do you imagine that that is on account of the property immediately behind, because I can tell you that it is not. It is proposed to spend 1,000,000*l.*, or thereabouts, from Westminster Bridge to Blackfriars Bridge. I can tell you that that is not on account of the property immediately in the rear, it is to provide two great desiderata—one, a site for the low level sewer, and the other a new and spacious thoroughfare from Westminster to the City; it is not for the sake of the property thereabouts, it is for great public results far beyond that. I do not know of any instance in which public money has ever been spent in building a wharf wall anywhere on the Thames?—But I think that there is great need of a thoroughfare between Westminster and Vauxhall Bridges. There is an immense traffic now from the Nine Elms Railway Station to all parts of London. Those heavy railway waggons have to go round through a number of little streets, by Lambeth Walk, until at last they get to Vauxhall; whereas, in my opinion, a new street should be formed, not only for the benefit of those waggons, but for the general traffic. It is my opinion that a new street should be formed from Westminster to Vauxhall. In that case you would get rid of those nasty little houses and streets, and neighbourhoods, to which I allude, and you would also give improved accommodation to the wharfingers on the river bank.

1164. I quite agree with you that it would be very desirable to have a new line of street to the Vauxhall Station; but that has nothing to do with the Thames, that is quite another question?—Except that by embanking the Thames you would give that increased accommodation.

1165. If by embanking the Thames we could make a roadway which should answer the double purpose of affording a means of communication for traffic and keeping out the water it would be very desirable. But in talking to your neighbours Messrs. Doulton, Mr. Doulton said, we do not propose to have a roadway in front of the houses which abut upon Fore Street, what we should like would be, to have a new line of street made in the rear of Fore Street; but we should like also to have an embankment in that part which comes opposite the Palace Gardens, and to carry on a new line of street from thence to come into Stangate Street. Just go with me from Westminster Bridge towards Lambeth;

you go along Stangate Street?—You go along Stangate Street and Palace Road.

1166. And at last you come close to the Bishop's Garden, and there you are stopped by posts and rails?—Yes.

1167. Those posts and rails might be taken away, and you might pull down a house or two, and carry on your line till you got to the edge of the Thames; you might make an embankment along there, and carry your roadway along there, till you got as far as where they are now about to build the new bridge. I think that that was the notion which Messrs. Doulton had, and then from there to leave the river and make a street in the rear of Fore Street. You have not gone into that question?—Rather than do that I should be inclined to carry it in front of Fore Street, and open it some little distance back, and make the warehouses on the waters edge.

1168. You will find that it is very narrow there?—I confess that my object would be rather to improve Lambeth than to cause an embankment to be erected all the way along the South side of the Thames; but I see my way to improving Lambeth only by making an embankment, or a new street which would necessitate an embankment, unless you raised the river wall higher.

1169. (*Mr. Thwaites.*) Do you mean a roadway in front of the present wharves?—No; I should rather have the wharves on the river's bank.

1170. Would you increase the width of Fore Street?—I would pull down all Fore Street, and erect new warehouses or wharves on the embankment, with a new street in the rear.

1171. (*Chairman.*) You might widen Fore Street by pulling down the houses on the south side, or you might make a new street entirely in the rear of it?—Yes.

1172. (*Mr. Thwaites.*) Supposing you were to heighten your wharf wall 18 inches and to prevent the flooding as far as you are concerned, but still supposing that the percolation through the wall was such as to render your own premises and the premises adjacent damp and unhealthy, supposing that the Vestry of Lambeth were to call upon you to build a new wall, to carry down the foundations of your present wall 8 or 10 feet with concrete and to build it up with solid brick work, would you be prepared to do it?—I cannot say that I should certainly. I would rather have the water over my wharf occasionally than go to the expense of building a new wall of that description.

1173. (*Chairman.*) I met you on your premises?—Yes.

1174. And you and I had some talk on the spot?—We had.

The witness withdrew.

Adjourned.

Tuesday, 4th February 1862.

PRESENT :

The Right Hon. The LORD MAYOR.
Major Genl. Sir JOSHUA JEBB, K.C.B.

Captain DOUGLAS GALTON.
Captain BURSTAL, R.N.

THE RIGHT HON. THE LORD MAYOR IN THE CHAIR.

JAMES CARTER, Esq. examined.

J. Carter, Esq.

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1175. (*Chairman.*) You are a civil engineer, I presume?—Yes.

1176. You have presented us with a plan for embanking the river, all the way along on the Surrey side from Lambeth to Deptford?—Yes.

1177. With a roadway upon arches of from 80 to 100 feet?—That is to say, 30 feet is proposed for the lower level wharfage; and presuming that the three

spaces would take up 100 feet, I allot, in my humble opinion, 30 feet for the outer wharf, 50 feet for the roadway and railway, or whatever the judgment of the Commission may please to make it, and 20 feet from that roadway to the present wharves to give light and air to the existing premises; making altogether 100 feet.

(*The Witness pointed out the same upon the plan.*)

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1178. The elevation of your roadway is double the scale of the map?—Yes; the projecting part at a low level nearest to the water is a quarter of an inch to a foot.

1179. You have a margin 30 feet wide close to the water's edge?—Yes.

1180. At high water at what level is it with reference to the water?—This is about three or four feet above the very highest tide in the month of March or September, when the floods affect the river.

1181. Then how do you manage to show a barge lying on the top of it?—This floats in. This is a barge half loaded, drawing about three feet of water.

1182. Then, when you propose to that margin, 30 feet wide, you have every here and there a dock for a barge to come in?—Yes, every dock now existing upon the line of the river, in my idea, I take liberty to reserve as long as time shall last, if possible, so that there shall be even no displeasure from those who have already vested rights. I have had a little to do with matters of this kind in my progress in life, and I find that it is a difficult matter to please everybody; but if you oppose them in the least degree you make every one your enemy.

1183. What I call the margin next to the river is, in fact, a continuation of wharves?—Yes, where no dock or opening is; so that if a vessel arrives with a cargo, and is compelled to deliver it on the same day, supposing that one merchant has a frontage of 50 feet and another of 100 feet, and another of 200 feet, it would be more convenient for a barge of 80, 90, 100, or 120 feet, as she could not divide herself into each of those small spaces, to deliver for the three different proprietors: therefore, I would divide the different portions of her cargo on the 30 feet wharfage without disturbing the barge or waiting for the next tide to float her.

1184. What is that upright red line showing a wall?—Below London Bridge the river is very narrow in some places, and the building may be brought closer.

1185. Does that lofty wall indicate anything now existing?—No, this is only supposed to be a skeleton of a future building which is brought up to the side of the railway where you are compelled to pinch the space.

1186. That is the wall of a warehouse to be constructed anywhere?—Yes.

1187. Going out towards the river from that wall, what is that which I look at coloured yellow?—This is supposed to be the brickwork of the piers which carry the archway.

1188. That is to say, that is a structure to carry a railway?—Yes; but I pierce them to save expense, and to give the privilege if a barge is shoved in, as we call it. They would be very glad to unload barrels or what not into the wharves, as the case may be; and those openings are considerably below high-water mark, so that when a vessel was lying at half-tide they would be able to pass her cargo into those openings.

1189. Is that a common road, or is it a railway, because I see by the paper which I hold in my hand, that you mention a "railroad," therefore I presume that that is a railroad?—Yes.

1190. All the way along the edge of the river?—Yes; as far as in the wisdom of the Commission it may be allowed to go. In fifty feet width there is sufficient room for two lines of railway and also a tramway, and likewise footpaths.

1191. Then you propose to have a structure going the whole length, fifty feet wide, and raised how much above Trinity high water?—Level with all the bridges.

1192. Then there would be traffic of all sorts on the top of that road?—Just the same as there is on any one of the bridges.

1193. Only that you would have rails?—I would have a couple of rails to allow railway trucks or vans to come off from the different railways to fetch loads from each wharfinger's premises.

1194. It would be rather a tramway than a railway?—Yes.

1195. That is fifty feet wide?—Yes.

1196. How do you propose to appropriate that width of fifty feet on the surface?—I would have a footpath next to the houses and one on the water side; but I propose to have two lines of railway going and coming, so that it might suit the convenience of the different great railway companies to send their carriages to fetch a load away from any of the shipping.

1197. And you would make that to connect in some way or other with the railways which are about to be made?—Yes; particularly the Charing Cross Railway. I have not a shadow of interest in it, nor do I know any of the parties, but the idea struck me.

1198. Next to the buildings there would be a footpath; how wide would you make that?—About nine feet.

1199. And you would have a corresponding footpath; next the parapet looking over the water?—Yes.

1200. There would be 32 feet left and in that space you would have two lines of rails; how much would that occupy; eight feet each?—About that.

1201. That would give you sixteen feet for common traffic?—Yes.

1202. So that you would have two footpaths, two railroads, and about sixteen feet of ordinary Macadam?—Yes; there would be two cart roads and two tramways.

1203. In some places that structure will be close against existing properties. In some places would it be carried further out into the river?—Opposite Hungerford, I think you may take in 300 or 400 feet.

1204. But you have not taken in above 150 feet there, I think?—It is about 200 feet; the river being so wide there you may take a great number of feet.

1205. The structure of which we have been talking is fifty feet wide carrying your roads?—Yes.

1206. And where you go more than fifty feet into the river you have a space between this structure and existing buildings?—Yes; to be filled up and to be appropriated for whatever the judgment of the Commission may think desirable.

1207. Do you mean to fill it up?—Yes, unless it is a dock. I do not presume to touch one particle of right belonging to any merchant or wharfinger; only the vacant land.

1208. Supposing that in some parts you go 100 feet into the river, would those piers which you have been pointing out cover the whole of the 100 feet?—No.

1209. It would, in fact, be a longitudinal bridge 50 feet wide?—Yes.

1210. Leaving every here and there, and indeed, generally, a space between the bridge and existing buildings?—Yes; for light and air and other purposes which circumstances may require.

1211. As to the estimate, you think that it will cost 75,000*l.* a mile?—Yes.

1212. Presuming the arch and road and railway to cost 100,000*l.* a mile; is that a mere assumption, or is it the result of calculation?—There is a little speculation in that estimate, because until a specification is given as to the thickness of walls, thickness of arches, and the material, it is almost impossible for a man to form a right idea of what the cost will be. In a little pamphlet which I beg to hand in, I speak of managing the construction of the great wall in the Island of Guernsey, and I am almost ashamed to say how low the price there was, because it would be detrimental perhaps to the builders of London if I were to make such a remark. If the material was taken from the shores of our islands, and even round our bays, and put together in the manner that that great wall was put together it would be a very cheap affair indeed, particularly as you would have every thing brought by the water.

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1213. (*Sir Joshua Jebb.*) Is that concrete blocks? — I think that the granite stone which you find on the scattered beaches of our islands would become even much cheaper than that. I will put down on paper, if you please, what those walls were built for, and then it will not be detrimental to the builders of London. (*The witness did so, and handed it in to the Commissioners.*) In London wages are higher, so that we could not expect it to be done for that price.

1214. (*Captain Galton.*) I see that you show a sewer; what is the object of that?—The object of making the sewer large is to save the expense of filling in; the larger the sewer is, in reason, the more it will save.

1215. They do not require a sewer on the southern side, I believe now, for an intercepting sewer, because they are making it through the centre of the district?—Very likely they may be able to do without it, but still I think that it would be almost necessary to have a sewer. Every yard of materials filled up would be worth 2s. to 2s. 6d. a ton, and therefore a vacuum would be a saving.

1216. Do you propose to build warehouses along the line of the embankment?—No; that is left to the discretion of private individuals to do what they please. All I venture to propose is to make this roadway so that to every man's warehouse, instead of going through the crooked and troublesome streets of London, and narrow spaces where it is almost impossible to pass (Thames Street for instance), everybody would have an opportunity of bringing any weight off the bridges. And now that we have hydraulic power tons go up like feathers, it is of very little consequence about the weight.

1217. But barges with masts to them could scarcely get through that opening, could they?—They could drop their masts; whatever will come under one of the bridges will go through those arches.

1218. But they cannot unload their cargo when the masts are down, can they?—Partly they can; but there are thousands of barges which are without masts.

1219. There are large numbers without, but there are also many with them?—Yes. The wharfingers would soon accommodate themselves to their various duties. There might be some of the billyboys schooner-rigged. Mr. Dixon was the first who brought coals by a billyboy from Newcastle, and strange to say that man unloaded his first cargo of coals at my wharf at Paddington. He has made a large fortune by having those billyboys, and he takes them a considerable way up the Thames.

1220. Do you have a railway along the top of your embankment?—A railway and a tramway also.

1221. How would you cross the bridges with a railway?—The same as in any other case. At various places they shut a bar; but I do not propose to have any steam engines to draw those carriages; I should draw them by horses, with reins, and being upon a level line a pair of horses would move 8 or 9 or 10 tons very easily.

1222. Where would this railway end?—It must end at the end of our structure, wherever it may be, but it would branch off to the different bridges and places, where the union of the railway happened to be.

1223. You would require to have other railways laid down in the streets to join on with it, would you not?—No. The London Bridge Railway is now likely to go on to Westminster. I have letters in my pocket from some of the chairmen of railways who highly approve of this idea, and though they would not venture to go to any expense in a matter of this kind, which is almost a government affair, or a great city one, they would be very glad to unite their railways in some way according to your approbation, which would enable them to fetch and carry their loads.

1224. What is the number of miles for which your plan extends down the river?—About four or five miles.

1225.—And the expense would be 75,000*l.* a mile?—About 75,000*l.* a mile, after deducting the produce of a portion of the space. It would be about 100,000*l.* a mile; but then you would have something to sell, which would reduce it to about 75,000*l.*

1226. What would you have to sell?—The service that would be derived from the railway in transporting earth from the waste hills of Kent would be worth at least, 25,000*l.*

1227. (*Chairman.*) The question is what you are going to sell to the public?—It is not to sell, but it is a deduction from the cost.

1228. You have another element; you have something to sell?—Yes; there would be a toll on the railway and a toll on the road.

1229. (*Captain Galton.*) Then the 100,000*l.* would be the cost per mile, and out of that you would get a toll?—Yes; the toll of the railway would produce at least per mile 25,000*l.* Against the cost, 117 archways, 40 feet broad, 50 feet deep, and 25 feet high, at the smallest rent would produce per annum, 25*l.* each, making an aggregate of 2,925*l.* a year. Presuming that we built those arches, which cost 100,000*l.*, we should have 117 of those arches to let; but some of those arches would fetch 100*l.* a year as landing places for passengers.

1230. (*Chairman.*) Where are those arches; are they over the existing water?—They are within this 30 feet (*pointing out the same*). They are within the existing water.

1231. (*Captain Galton.*) Then you destroy the existing wharves along a great length, do you not?—Not one. I add to their depth.

1232. How do you make the archways which you let, if you do not build them in front of the wharves?—I must build them in front of the wharves if they are built at all.

1233. If you let them you are letting property in front of the existing wharves?—Yes; but the ground is exceedingly valuable there, and by adding to the depth of frontage of their premises it would be worth their while, and they would be very glad, I dare say, to pay something like 20*l.* a year for such a space.

1234. Supposing that they objected to pay anything; would they not be entitled to compensation for your interference with their water right?—Even supposing they said that there was a damage done to them, then you would say "We do not see how the damage is done, but rather than go to law with you we will give you the additional piece. We have added to your valuable premises, and have given you more than you had before." They could not quarrel. Indeed, some of the merchants that I have spoken to have said that they would be very glad to build arches themselves, and also said, "It is the very thing which we want."

1235. (*Capt. Burstal.*) You would prevent people from having direct communication from their premises to the waterside, I presume?—Not at all.

1236. Of course by this plan you would press vessels more out into the stream?—You must do so.

1237. You would contract the in-shore passage for a vessel between the piers and the shore?—My plan only occupies a portion of the mud bank, which, by filling up, would improve the river.

1238. Many vessels lie on the shore now, whether mud or not?—I do not think that it is possible to build any kind of structure without reducing the river a little.

1239. Do you make those openings at right angles with the line of the stream?—As nearly as possible.

1240. Should you not think that in consequence of the contraction so made in the river, and the increased velocity of the river, it would be rather difficult to get barges in at right angles to the stream?—No; it is not so serious a matter as that, at the proper time of the tide.

1241. You shut out to a great extent the ground floors of the warehouses from light and so on?—I beg your pardon; I propose to give 20 feet.

1242. A man with two stories to his warehouse would be prevented from advertising his name for his business?—He could put it on in front of the arches.

J. Carter, Esq.

4 Feb. 1862.

The witness withdrew.

FRANCIS W. SHEILDS, Esq., examined.

F. W. Shields, Esq.

The witness delivered in the following document.

1243. To the Commissioners of the Thames Embankment.

Gentlemen,

I have the honour to submit for your consideration a plan of the boundary line which I propose for the south or Surrey side of the Thames between the bridges of Southwark and Westminster; also a plan with sections and an estimate, for the construction of an embankment on a portion of the Surrey shore of the Thames above Westminster Bridge, and its ultimate prolongation to Vauxhall Bridge.

I propose to describe separately the conditions of each of these portions of the river, as shown on the two large scale ordnance maps which accompany this Report.

1st. The boundary of the Surrey shore between the bridges of Southwark and Westminster.

I have carefully examined this locality, and think it on the whole inadvisable to recommend any large measure of alteration in the river bank comprised in it. I will state the reasons which have led me to this conclusion.

The necessity of an embankment to provide a new thoroughfare and a site for a low level sewer, so urgently felt on the Middlesex shore, are less needed on this side of the water. A river route would be very circuitous for either of these works; moreover, a new thoroughfare is in course of construction by the prolongation of Stamford Street; and it may be doubted whether the quaying of the river in this district would not involve the buying up of wharfage property of such enormous value as would be incommensurate with the advantages to accrue from it.

The question is also affected by the condition and régime of the river, and the advisability of so regulating its banks as to maintain some degree of uniformity in its channel. The results drawn from my best consideration of these matters are as follow:—

Commencing at the Southwark Bridge end of the district referred to, there exists already such a contraction of the channel at this point, as to make it clearly inadvisable to form any projection upon it. Proceeding to Blackfriars Bridge, it appears to me on inspecting the plan, that the line already adopted by your Commission for the Middlesex embankment extends sufficiently into the river to render further encroachment upon the channel at this point inadvisable. I should recommend, therefore, that the Surrey abutment face of new Blackfriars Bridge be retained in the same position that the abutment face of the present bridge occupies, and should mark the line of river boundary at this point.

Between the bridges of Blackfriars and Westminster the river is concave on the Middlesex, and convex upon the Surrey shore. The current, in consequence of this formation, is thrown upon the Middlesex side, while on the Surrey side there is comparatively still water even at the greatest run of tide. This condition, and the formation of the foreshore in a gentle slope undisturbed by the scouring action of the stream, renders the Surrey shore extremely advantageous for the conduct of wharfage traffic, enabling barges to be grounded and worked with great facility, and timber rafts to be deposited with safety. The wharfage property in this neighbourhood is accordingly of a highly valuable character.

An unfavourable effect of these conditions however results in the formation of mud banks, which are exposed to a large extent at low water. For this reason, had no serious obstacles interposed, I should have preferred at Waterloo Bridge, where the width

of the river is considerable, to have carried out an embankment so as to include the first arch of the bridge. This course however, would act injuriously to the wharfingers in depriving them of a large portion of the foreshore on which their barges lie; and no increase in the quantity of water ascending the river at flow tide would accrue from such an extension of the convex bank. As, moreover, the formation of mud banks will much diminish or cease on the approaching completion of the London sewerage, I think, on the whole, there is not sufficient reason for altering the present river boundary, as defined by the abutment of Waterloo Bridge and the wharfage line in its neighbourhood.

These remarks apply equally to the abutment of Hungerford Bridge, and I propose accordingly that it should form a point in the Surrey river-side boundary. On the lower Surrey side of Westminster Bridge, it appears desirable for the sake of uniformity with the upper and two Middlesex sides (where the river boundary may be considered as fixed), that the wharfage line be finally extended to the face of the abutment, and I have accordingly so marked it on the plan.

Between the bridges of Southwark and Westminster, therefore, I should recommend the adoption of a boundary line corresponding with the four existing bridge abutments, and generally with the present line of wharfage. This line is shown on the plan herewith submitted, and I should accordingly propose its adoption for new river-side constructions, and that no encroachment be permitted beyond it.

2nd. The embankment of a portion of the Middlesex Shore above Westminster Bridge, and its ultimate prolongation to Vauxhall Bridge.

On a careful examination of this locality I found its condition as follows:—

Adjoining Westminster Bridge there are some valuable and well constructed wharves, though the amount of water-side business done at them is less extensive than in other parts of the river. Beyond these are some small boat-building premises, and an unbuilto-on road before the grounds of Lambeth Palace which is called Bishop's Walk, and extends to Church Street and the new Lambeth Bridge, the construction of which is just commencing. Thence to about midway between Lambeth and Vauxhall Bridges the water side is occupied by premises for the most part of comparatively little value. The river bank is imperfect, and the low lying district adjoining is liable to flooding in consequence, causing very great and serious inconvenience to the inhabitants of the neighbourhood. Beyond this point there are mills and works of various kinds, some of them being of a noxious description, but well constructed for the purpose of an embankment and for preventing overflow of the river. These wharves extend to the place marked New Street on the plan; and between this point and Vauxhall Bridge are the premises of the London Gas Company and Mr. Burnett's distillery, the river walls to both of which are constructed in the most permanent manner.

There are two free landing places between Lambeth and Vauxhall Bridges which appear essential to the various factories in their neighbourhood, and cannot be closed without great injury to them.

The thoroughfares through this district are of the most inferior description. Between Vauxhall and Lambeth Bridges the road is narrow and liable to flooding; and from Lambeth to Westminster Bridge there is a direct way for foot passengers only, as horse traffic on Bishop's Walk is forbidden, and a lengthened detour is requisite for vehicles passing between these bridges.

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I shall now describe the considerations which have guided me in recommending the improvement of this locality, and the works I should propose to be constructed.

It is evident that any such works in this district would be imperfect, did they not include the formation of a new main thoroughfare as well as the banking of the river; and it will be seen from the foregoing description of the water-side property, that its acquisition for that portion of the distance in which an embankment is most required, can be effected at a very moderate cost. But it seems to me that a still larger measure of public advantage is requisite to justify the construction of these works. The benefits of an embankment and of a thoroughfare through a district in fact neglected from the want of them, however greatly desirable, would be to some extent local in their character. But it is not difficult to extend their utility. To make them available to the general public who contribute to their construction, it appears requisite not only to form a road along the river, but to give it such width and capacity for improvement by planting or otherwise, that it shall take the character of an esplanade, and contribute in some measure as an additional public park would have done, to the recreation and health of the inhabitants of the whole surrounding district.

A solid embankment with a road next the river, designed in accordance with these principles, is, therefore, shown upon the plan submitted to you. It is my intention to exhibit in this drawing, both the least expensive design for the work, and the portion which most requires immediate execution; leaving for further consideration the advisability of increasing the extent of the works, by adding either to the length, or to the width, of the proposed quay and roadway.

I shall now give a brief description of the design.

The embankment line commences at the abutment of Westminster Bridge, in a corresponding position to that of the embankment for the Houses of Parliament on the opposite side of the river. It is carried thence in a straight line to Lambeth Bridge as shown on the drawing, a little in advance of the proposed place of its abutment, and continued from thence with a slight curvature to the abutment of Vauxhall Bridge.

The road is marked eighty feet as the least width which would answer the conditions. Each side of it may be occupied by broad footpaths with rows of trees planted along them; and the grounds behind may be resold for the erection of good buildings of a determined elevation. It is conceived that such arrangements, especially opposite the new Houses of Parliament, may give this work more distinctly the character of a great metropolitan improvement.

The road surface is at an uniform level of eight feet above Trinity high water. This height is adopted for the purposes of shortening the slope or approach to Westminster Bridge, of suiting the intended level of Lambeth Bridge at its abutment, of giving headway for the reconstruction of the free landing docks, and of forming a well raised site for the erection of the new buildings above referred to.

I propose to carry the embankment, in the first instance, from Westminster Bridge to just beyond the low and flooded district. It would, therefore, terminate for the present about midway between Lambeth and Vauxhall Bridges, as shown on the plan. My reasons for this are chiefly owing to the costly character of the wharves above that point, and which wharves are now sufficient to prevent flooding; and especially to the objections of carrying the embankment past the London Gas Company's premises. I believe, however, that there is a probability of the removal of these works to another site within a comparatively short period, and such a circumstance would materially diminish the difficulty of extending the line of quay to Vauxhall Bridge.

The embankment shown on the plan would suffice to prevent the flooding of the low districts; but it

would be also beneficial to the neighbourhood to continue it as early as possible up to the gas company's premises, so as to remove the noxious river-side works already alluded to. Should it terminate, however, as I propose, it would be desirable in conjunction with it to effect the widening of Princes Street as shown on the plan, so as to form a direct and sufficient thoroughfare between Westminster Bridge and Vauxhall, especially as the houses requiring removal for this purpose are of very little value.

I propose that the future extension of the river boundary take the line of Vauxhall Bridge abutment, as the costly works of the Phoenix Gas Company and other wharves above the bridge on that line, appear to render it almost impracticable to carry an embankment further out from the shore.

I beg, in conclusion, to lay before you an estimate of the cost of the engineering works proposed, but exclusive of the purchase of property.

Estimate of Works.

	Cube Yards.	£	s.	d.	£
Embankment -	205,000		1	6	15,375
Brickwork in retaining walls -	Rods. 1,860	13	0	0	24,180
Concrete -	Cube Yards. 3,000		6	8	1,000
Granite coping -	Cube Feet. 10,800		6	6	3,510
Iron piling -	Tons. 4,950	10	0	0	49,500
Formation of draw dock -					6,000
Road-metalling, hand-railing, and minor works, say -					10,435
					£110,000
Contingencies, say -					10,000
					£120,000

Total cost of construction of works, one hundred and twenty thousand pounds.

I have the honour to be,

Gentlemen,

Your obedient Servant,

FRANCIS W. SHEILDS, M.I.C.E.
Civil Engineer.

3, Delahay Street,
Westminster, January 13, 1862.

1244. (Chairman.) Are you a civil engineer?—I am.

1245. You have laid before us a plan showing a mode of embanking the river Thames from Southwark Bridge to Vauxhall Bridge?—I have submitted to you a plan showing the proposed line of river boundary from Southwark Bridge to Westminster Bridge, and also a plan showing a proposed embankment between Westminster Bridge and Vauxhall Bridge.

1246. Do you not propose any works between Southwark Bridge and Westminster?—No; I merely propose that a uniform line of river boundary be adopted, following as nearly as possible the line of the present shore, without executing any immediate works.

1247. Your estimate of 120,000*l.* includes what?—It includes the works of construction for an embankment between Westminster Bridge and a point about midway between New Lambeth Bridge and Vauxhall Bridge.

1248. It includes the cutting off of a projecting part. I think you intend to widen the river in one place?—Yes; it includes the widening of the river at that projecting point where my proposed embankment terminates.

1249. And does your estimate include the cost of taking that property and pulling down the buildings?—Not the cost of the purchase of property, only the cost of engineering construction.

1250. Let us go back to Southwark Bridge and travel upwards. Is your red line a rectification of the present river boundary?—It is; but following the

present river boundary as nearly as possible, in effect, straightening the present river boundary without materially deviating from it.

1251. From Southwark Bridge to Westminster Bridge you have not included any part of the cost of that in your estimate?—I have not. I have merely proposed that in all future constructions that line should be followed, and that that should be understood to be the permanent river boundary line.

1252. Let us go to Westminster Bridge and travel a little way eastward. The first property below Westminster Bridge I think, are some flour mills, and then there are Messrs. Maudslay's works?—Yes.

1253. With regard to Messrs. Maudslay's works, what would you propose to do there; how would you deal with those works? You propose to narrow the river there, and there would be a good deal of space opposite Messrs. Maudslay's; would that be added to their premises?—I should give the parties who had river-side property in that space the power of extending their wharves up to that line, but I do not propose to construct any works there at the public expense. I have stated in detail the reasons for that recommendation in the Report which I have submitted to the Commission.

1254. You do not contemplate a public way of any sort there, either roadway or pathway along the edge of the river?—I do not. In fact, I believe that under present circumstances, such a measure would be impracticable.

1255. Going higher up the river, you propose to make a roadway from Westminster Bridge to a point midway between Lambeth Bridge and Vauxhall Bridge?—Yes.

1256. And then you propose to carry your road inland?—Yes. Between Westminster Bridge and Lambeth Bridge the road would be carried outside of the present river boundary. From new Lambeth Bridge to the point where I propose to terminate the riverside road, it would be carried partly inside and partly outside.

1257. Have you been induced to make a roadway there because you feel that the public requirements demand a road?—I have. I consider that the district is at present neglected, and abandoned in a great measure from the want of such an improvement, and that the neighbourhood of that part of London would be greatly benefited by the construction of the road which I have proposed, and which may be made at a reasonable cost.

1258. The 120,000*l.*, I presume, includes the making of the embankment and the making of the road?—It does; it includes all engineering expenses and works connected with the formation of the proposed road.

1259. But it does not include compensation to owners and occupiers of property past which this road would go?—It does not; neither does it include, per contra, the value of a large quantity of very inferior property which would be purchased, and which after the construction of the road, would be increased in its value and available for re-sale; it includes merely the works of construction, what may be termed the engineering expenses.

1260. Would your scheme have the effect of driving away some of the trades which are now carried on there; for instance, the boat-building?—It would, I have no doubt.

1261. They would have to go elsewhere?—They would.

1262. Then you would have a very nice road with a river frontage, and you look upon the existing properties being removed, and getting sites for terraces probably?—I do.

1263. For residences?—For residences, or for business purposes, shops, as the case may be.

1264. You do not mean waterside business?—No.

1265. As far as regards the water side you would altogether abandon the river for coal barges or for boat building, or for any purposes for which wharfage is required?—Completely so.

1266. And you would make the river available as a place for residences and for shops with a roadway along the front?—Yes; that is the principle upon which I have designed this road; the residences or shops being on the inland side, and the road next the river.

1267. (*Capt. Galton.*) You propose, if I understand rightly, between Southwark Bridge and Westminster Bridge that the existing owners of property should themselves, by degrees, rectify the line of the river by rebuilding the river walls?—Yes; as a river wall was rebuilt, which it would naturally be from time to time, when it had decayed from long use, I propose that the owner should be required to rebuild it upon that particular line.

1268. You consider that a roadway along the front of those wharves is not wanted?—It would be an undoubted improvement to have a roadway in front, but I think that the cost of its construction would be more than commensurate with the advantages derived from it.

1269. Will you explain in what way such a road would be an improvement?—It would be an improvement to the appearance of the river, and of London. It would also be an improvement to remove coal trades and other such trades.

1270. I am speaking of the part between Westminster and Southwark; you think that it would be an improvement to the beauty of the river and also as regards the removal of trades from the edge of the river?—It would undoubtedly be an improvement, inasmuch as I think that, as a general rule, it is better that a river should be quayed than that it should not be quayed.

1271. Do you mean that it would be more convenient for the traffic?—No. I mean that it would be an improvement to the city if the river side traffic were altogether removed from that locality, and especially between Blackfriars and Westminster, where it is already arranged that the river should be quayed on the opposite side, so as to make both banks uniform.

1272. You mean that it would be an improvement to the appearance of the river?—Yes. It would be an improvement, inasmuch as a quayed river has a better appearance than one which is not quayed. But in respect to the necessity for a new thoroughfare or for a main level sewer, which was so urgently felt on the other side, I think that the same necessity does not exist on this side of the river.

1273. Do you think that if that road was made on the south side it would be much used as a thoroughfare?—Not so much I think, inasmuch as it is a very circuitous road.

1274. Do you think that it would be of any use for the purposes of traffic for the wharves themselves?—It could not be so, as its formation would necessitate the removal of the wharves.

1275. Are there existing roads at the back which are suitable to the wharves?—Yes; there are existing roads at the back, which, although very narrow, answer the wharfingers' purposes; and, as regards a main thoroughfare, I think that when the prolongation of Stamford Street to London Bridge is completed, it will provide for the immediate wants of the locality in respect of a main thoroughfare, and that if further accommodation in the way of thoroughfare to the south district were required, it would be obtained better by the prolongation of the New Marsh to London Bridge Road than by the formation of a road along the river side: both those latter roads being on the chord of the arc, whereas the road by the river side is on the line of the arc itself, and consequently longer.

1276. Why do you think that the formation of a road on the side of the river would be impracticable?—Because the expense would be so enormous and the opposition so great. When I look at the powerful opposition which the wharfingers have so often under similar circumstances made to the construction of a road on the Middlesex shore of the river, where it was

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so very much needed, I have very little hope that it would be found practicable to construct a road on the south side where the public necessities for it are very much less and where the opposition would be rather greater than otherwise.

1277. I suppose that in the course of your making these plans you have examined the river to some extent?—I have founded all my recommendations to the Commission upon a close examination of the ground.

1278. You said that you did not think it necessary immediately to rebuild the wharf walls between Southwark and Vauxhall Bridges?—I do not think it is.

1279. Do you consider that that district suffers at all from percolation?—Not that I am aware of.

1280. Have you observed in many cases the walls to be below the level of the highest tides at the present time?—I have observed some which are slightly below the level of the highest tide; but I do not think that the tide runs up to the end of the wharves so as to flood the nearest public road in that district.

1281. You think that the streets along that district do not become flooded?—I think not.

1282. Do you think then that any flooding takes place through the sewers?—Yes, I think that may be so.

1283. I am speaking of the part between Southwark and Westminster?—Yes. I think that any flooding takes place through the sewers and not from the low level of the walls. The high floods come over the wharf frontages occasionally, but their damage is confined to the wharfingers themselves, and they appear to prefer to put up with it rather than raise their wharf walls, and so increase the labour of landing their goods.

1284. The high floods run up the yard for a certain distance?—They run up the yard for a certain distance, and then run back again.

1285. Then for the purposes of the protection of the district, either from percolation or from flooding, a new wharf wall between Southwark and Westminster is, in your opinion, not required?—It is, in my opinion, unnecessary for those purposes.

1286. With respect to the other portion of your scheme in which you propose to provide an embankment and a roadway; have you any idea what the value of the property would be between Westminster Bridge and the Bishop's Palace Gardens?—I have formed no estimate of the value of the property there for the simple reason that I am an engineer rather than a valuator, and my estimate might not be thoroughly depended upon; but I can state generally, that with very few exceptions the property is of a low class and of small value.

1287. That is to say, between Westminster and the Bishop's Palace Gardens?—Between Westminster Bridge and the point where I propose my road to terminate.

1288. I am dividing it into two parts?—Between Westminster Bridge and the Bishop's Palace Gardens there are five or six valuable wharves? There are.

1289. In Stangate?—Yes.

1290. Beyond Lambeth Bridge there are several wharves; do you consider those to be of inferior value?—I consider those generally to be of inferior value. Between the point where I propose to terminate, for the present, and Vauxhall Bridge, there are again wharves of a high value.

1291. Does your estimate include the road at the back of the gas works?—I do not quite understand.

1292. I see that you show a new street?—My estimate includes the metalling of that street; everything except the purchase of property; it includes the removal of the buildings and the formation of the street.

1293. What led you to the conclusion that a thoroughfare was necessary on that side; did you take the traffic between Westminster Bridge and Vauxhall Bridge?—I have not taken that traffic, but I know that the traffic is at present obliged to go in an extremely circuitous direction; in fact, horse traffic is forbidden altogether along the direct route.

1294. Do you know anything about the amount of the traffic which goes in that way?—I do not; but I know that the amount of the traffic is very largely diminished from the inconvenience of the thoroughfares.

1295. Are other streets at the back glutted with the traffic, or do you mean that the traffic does not take place at all?—I mean that there is scarcely any traffic at all; the neighbourhood has been greatly neglected and abandoned on account of the want of a thoroughfare and the inconvenience of flooding to which it is subject. In fact the district seems quite shut up.

1296. Do you think that the inconvenience of flooding could be remedied in any other way than by the construction of that embankment?—It could be remedied by partial measures, for the water only comes in at points.

1297. And those points you think could be improved?—Those points could be improved, but still the measure would be very imperfect.

1298. Would it answer if gates were provided at the free docks, with a man to watch them at the high tides?—That measure might be adopted, but I do not think with satisfactory result.

1299. Would it not prevent the flooding?—The flooding might be prevented in that way undoubtedly to some extent; but it would be a very imperfect and unsatisfactory means of remedying that evil.

1300. (*Capt. Burstal.*) Have you observed in your peregrinations about Fore Street, Lambeth, that the gratings of the drains are considerably lower than the level of the coping of the river walls?—I have observed that in various points the levels of the streets are considerably lower than a high tide. The gratings are in the streets, and naturally at the lowest points, so that there is no doubt that what you say is the case.

1301. Do you happen to know whether the water comes through holes in the walls up these drains, and so into the streets?—I do not know that; I have not looked at that point; but there is a direct access for the water into the streets without its going into the gratings at all, on account of the low levels of the streets.

1302. Supposing that no alterations were made in the levels of the streets do you think that traps could be made and properly attended to so as to prevent the water coming up through the drains on a flood tide and swamping the district?—I do.

1303. I think you also say that you are of opinion that the various five-feet ways and draw-docks might be raised so as to prevent that being a source of flooding from the river?—I think that in a great measure you would destroy the use of the draw-docks by doing so. The stairs, or five feet ways, which are there, may be raised of course, because people on foot may go up stairs from the street and down again to the river side; but I think that you would destroy the use of the draw-docks by doing so. My reason for thinking so is, that the embankment which I propose does away, in fact, with one of the draw-docks; and I had a good deal of difficulty in designing another draw-dock to take its place, which should be accessible, and at the same time keep out the water. I scarcely think that it would be practicable to make the draw-docks so as to keep out the water without making the approaches to them so exceedingly steep that they would be, in fact, useless.

1304. Have you had an opportunity of looking at all at the quality of the subsoil at Lambeth, a short distance under ground?—I have seen some material excavated where they have now begun the excavation for the abutment of new Lambeth Bridge, and as well as I recollect they have thrown out a quantity of sand and gravel.

1305. How deep had they gone into the sand and gravel?—I cannot say precisely. I should say five or six feet.

1306. What was the soil above it nearest the shore?

—All along the shore there is gravel, with a layer of mud deposited upon it.

1307. You do not propose to extend your river-wall at Blackfriars Bridge, on the south side, do you?—I do not; I think that the embankment recommended already by your Commission, which is carried into the river to a distance of 130 feet from the present Middlesex abutment of Blackfriars Bridge, narrows the river sufficiently at that point, and that the Surrey abutment of new Blackfriars Bridge ought not, in consequence, to be extended beyond the position of the present Surrey abutment.

1308. I think you also said that you were of opinion that, from Westminster Bridge, eastward, whatever was done should be done at the expense of the proprietors of the existing premises?—I think so.

1309. Have you examined the soil at the Surrey abutment of Lambeth Bridge with sufficient care to be quite certain as to its nature?—I have merely seen it in passing in a steamer. I have not examined it; but I saw enough to show that it was sand and gravel which had been thrown up.

The witness withdrew.

Adjourned to Wednesday the 19th instant, at half-past two o'clock.

Wednesday, 19th February 1862.

PRESENT :

Major-Gen. Sir JOSHUA JEBB, K.C.B.
JOHN THWAITES, Esq.
Captain DOUGLAS GALTON, R.E.

Captain BURSTAL, R.N.
JOHN ROBINSON M'CLEAN, Esq.

MAJOR-GEN. SIR JOSHUA JEBB, K.C.B., IN THE CHAIR.

HENRY HARRINGTON BIRD, Esq., examined.

1313. (*Chairman.*) You are a civil engineer?—I am.

1314. You have sent in a plan for the consideration of the Commissioners?—I have.

1315. Will you have the kindness to describe that plan?—The plan which I have the honour to submit to the Commission, varies very considerably in its principles from that which I had the honour of submitting to them before, as regards the northern bank of the river, this being for the right or what is commonly called the southern bank. Before explaining the plan perhaps the Commissioners will allow me to point out the difference of principles which I apprehend exists, as between the two sides of the river. On the northern bank the very pressing points no doubt were a metropolitan communication and the sewage; on the southern bank those points are also very necessary to be taken into consideration, but are not of that urgent nature in my opinion that they are on the northern side. The question also of the navigation of the river I think is one in which it must be admitted that the balance of pressure is also on the northern side. But still there are very material points upon which an embankment on the southern side is, I contend, essential for the eventual interests of the river and also for those who reside on the Surrey shore. The Commission will observe that on the Surrey side there are communications now in existence which in consequence of the bend of the river produce a shorter communication, between, for instance, the points of Vauxhall Bridge and London Bridge, or Southwark, or Blackfriars Bridges. There are good communications by means of the route by the Elephant and Castle and also the Commercial Road, and the new roads and streets which are being made, which would certainly cut off a very considerable portion of the distance as regards all the traffic proceeding from the neighbourhood of Vauxhall to the City. On the northern side of the river the bend of the river being the

1310. You did not go there for the express purpose of examining it?—No; but a glance is quite sufficient to show what it is.

1311. There being such valuable wharf property on the south shore, as you mention in your report, you are of opinion that the communications by road from High Street, Borough, along the new road which is being made, and then along York Road, and Commercial and Belvidere Roads, are sufficient for all the purposes which are necessary there?—They are sufficient for present purposes, and if the district requires a future increase of accommodation for traffic, I think that that increase may be more advantageously given to it by the prolongation of the New Marsh to High Street, Borough, than by a road along the river side.

1312. It being a shorter distance?—It being a shorter distance. In fact, the line of Stamford Street is in the immediate neighbourhood of the river side, and I do not see the use of two main thoroughfares being made so close together; one being, moreover, less direct than the other.

F. W. Shields,
Esq.

4 Feb. 1862.

H. H. Bird,
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reverse way that facility does not exist, and therefore the urgency as far as communication is concerned, is less on the Surrey side. But if it were considered (which I trust will be the opinion of the Commissioners eventually) that an embankment on the southern side is essential for the interests of the public, then I think that it would be a very great pity if the opportunity were lost of giving such additional facilities as could be afforded without seriously interfering with the very important trades on the bank of the river. I think that the Commissioners must also bear in mind, that on the Surrey side there is a population inhabiting those parts of Southwark and Lambeth who require facilities for getting fresh air during hot seasons far more than those who are on the northern side; and any embankment which would not afford such facilities so far as was reasonable and compatible with the interests of the trades, would, I think, fail in carrying out that which is for the public interest. In examining carefully the question of a southern embankment, I took care, in the first instance, to acquaint myself as much as possible with the variety of trades existing on that shore; and when I tell the Commission that I find that there are no less than between 30 or 40 different trades carried on, most of them of great magnitude, I need hardly say that it is a question of the very greatest possible importance how you are to deal with the river so as not affect those trades. I have a summary of the different trades, and, without attempting to go through the whole, I will shortly state that I find that the timber trade occupy on the south side a distance of 1,794 linear feet. The next most important trades, in point of frontage, are those of the barge and boat builders, which occupy 1,129 linear feet. Then the lime, brick, and cement trades occupy 1,052 feet. The building trade occupy 694 feet; the railway contractors and general contractors occupy 691 feet; the coal trade occupy 628 feet; the corn and flour trades occupy 511 feet; the iron

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trades occupy 358 feet. The rest I have given under the head of "Miscellaneous," because none of them exceed about from 100 to 200 feet in length. There are the gas works close against Vauxhall Bridge, which occupy 600 feet, but I do not regard them exactly as a trade. Those being the principal trades, my object has been, as far as possible, to ascertain what would be the feelings of the persons carrying on those trades as regards an embankment of the river, and what would be the system which could be pursued with the least inconvenience to their interests. With that object, I forwarded a circular to each occupier of a wharf along that side of the river comprising the distance for which I proposed to carry the embankment; and though I am sorry to say that in a great many instances the answers to those circulars have not been returned, gentlemen being very much afraid of committing themselves, yet at the same time I have had answers from a considerable number, and certainly from the average of the trades, and more than the average of the large trades, and from those answers, which I can lay before the Commissioners if they desire it, I think that I have arrived tolerably nearly at a conclusion as to what would be least injurious to the trades. At the same time, I am bound to say, that the matter was so placed before the different occupiers, that their answer was not in any kind of way to be considered as committing them to wishing for an embankment, but simply pointing out that which would be the least objectionable to them in the event of an embankment being made. Perhaps the Commissioners will allow me to read the circular which I sent, because it will show better what the value of the answers are. It is as follows:—"Having undertaken the preparation of the details of a plan to be laid before the Royal Commission with reference to a Bill for the construction of an embankment from Lambeth Stairs to near Southwark Bridge, for which notices have been given of an application to Parliament in the ensuing session, I shall feel obliged by your favouring me, at your earliest convenience, with replies to the questions submitted to you herewith in the accompanying paper, so far as your personal interests are concerned. Any general remarks you may at the same time think proper to make will meet with respectful attention. It is, of course, to be distinctly understood that in acceding to my request you will not be considered as thereby committing yourself to an approval of any plan of embankment, but as merely stating what is your present impression as to the particular system which would be the least inconvenient to your property and business, assuming that Parliament should hereafter determine in favour of the construction of some embankment. I would venture also to observe, in order to guard against possible misapprehension, that this inquiry must not be considered as offering any pledge that the particular system you may prefer will be submitted to Parliament, but is made for the purpose of ascertaining your wishes, with an earnest desire of giving them effect, so far as can be done consistently with the general interests of the whole body of wharfingers who would be affected by the works, and of the public." The postscript adds, "Have the goodness to write your replies to the questions asked on the opposite page, which please to tear off and return to me in the addressed envelope sent herewith." The questions which were asked were accompanied by some diagrams which I will lay before the Commissioners. "Note; the following questions have been framed under the belief that some trades require the use of the foreshore of the river, as at present, alternately covered with water and dry; that to others greater convenience would be afforded by a system of basins never dry; that some businesses would be better served by an increase of wharf room, without so much regard being paid to water accommo-

dation; and that there are cases in which the present amount of water frontage could be conveniently dispensed with, if in lieu thereof an increased amount of wharf room, with a private canal or dock were substituted. The above four systems are shown in the sketches A, A a, B, and B b, hereafter appended." The questions were these,—1st, Would a river wall, constructed so as to leave waterway in front of the wharf, with facility of access to the river through openings, (say, 30 feet in width), left in the wall, (the water rising and falling, as at present, with the tide), suit your trade? (See plan A.) 2nd, If your reply to the last be in the affirmative, be so good as to state the least amount of space between your wharf frontage and the proposed river wall that would suffice for your business? 3rd, Would a floating basin with gates, giving facilities of ingress or egress for two hours each tide, be more convenient than a tidal basin? (See Plan A a.) 4th, If the ground intervening between your present wharf frontage and the new frontage to be formed by the proposed river wall, were filled up as a solid embankment, thus extending your wharf inwards from 50 to 200 feet, as the case might be, would such increase of ground be more convenient for your business than a 'tidal' or 'floating' basin. (See Plan B.) 5th, Would the increase of your wharf ground, as last suggested, be of equal value to you if you were deprived of your present amount of water frontage, but received in lieu of it a private canal or dock, (say, from 25 to 40 feet in width,) passing up through the river wall into your premises? (See Plan B b.) 6th, Do you consider it desirable that a number of 'dummies' should be moored at certain distances apart along the front of the river wall, so as to enable craft to be 'brought up' when required? (*The witness delivered in the accompanying paper. Paper A.*)—Those questions embraced what, in my humble opinion, comprehended the whole of the systems which could be adopted for the embankment of the south side of the river. In framing those questions my notion was this, and it appears that I was mistaken,—I thought that the timber trades would prefer floating docks. I thought that the coal trades would prefer floating docks. I supposed that the lime and the brick trades, who occupy a very large amount of frontage, would prefer solid embankment, and I thought it was very possible that, in many instances, a private canal running up into solid embankment, thus forming a sort of private draw dock for themselves, giving them a frontage on each side of the canal, would be still more convenient where space was an object, and at the same time water accommodation. Those three principles in fact carry out the three plans which were laid before the Commission of 1843, which are commonly known by the names of Mr. Page's plan, Mr. Walker's plan, and the plan of one of the Commissioners called Plan C; it was Sir Charles Barry's plan. Now I find the result of the answers very strongly in favour of floating basins; there is only one answer in favour of a solid embankment. There are some who prefer a tidal basin without gates, but the great majority certainly prefer having the water brought up to their wharves, as at present.

1316. With a two hours' access?—When I say two hours, one or two parties have said that two hours is hardly sufficient; but they prefer the principle of a floating dock to that of a tidal basin, but either a floating dock or a tidal basin they much prefer to an embankment. That is the result as far as I could arrive at it; and though I have not got so many answers as I should have been glad to have got, yet they have come from all parts of the shore, and they cover such a variety of trades, that it gives one a fair idea as to what the general feeling is. Now, I must point out that I cannot claim this principle as a novelty at all, because I feel bound to refer the Commissioners to the Report of 1843, where they will see that it is exceedingly similar to that of Mr. Page, and

therefore I should be very wrong in claiming any credit for it. All that I desire to do is to point out that which, in my humble judgment, is the course which is most desirable, and in doing so I cannot help trespassing upon those who have gone before me, because every principle of embankment on that side has been suggested. I have purposely kept clear from mixing up with this question anything else, excepting a road and the question of the trades. I believe that a railway will be found of very little value on that side of the river, certainly nothing at all equivalent to the extreme inconvenience which, carry it out in any way you can, it will inflict, therefore I have steadily kept clear from that; and I do not believe that there is any principle which I can adopt which will enable it to be self-supporting. I think that any idea of carrying it out with buildings, for instance, in connexion with it, would hamper you so very much with reference to the different trades, and that there would be so very large an amount of compensation to be paid, that it would be almost useless to think of it. As far as I have been able to judge, the general feeling is, that the embankment of the southern side of the river is exceedingly important, but that it must not be permitted to cripple financially the carrying out of the embankments on the northern side, and therefore economy has been a point which I have especially borne in view. I will now proceed to explain the embankment as it is shown on this plan. I propose to commence near Southwark Bridge at the point where the river is now the narrowest. The Commissioners will observe that this yellow line upon the plan is a road extending from near Southwark Bridge to the new bridge now building at Lambeth, near the Archbishop's Palace. At the Southwark Bridge end of it there is a road, now called Emerson Street, which is about 40 feet in width, and which would afford a facility of communication through Summer Street, by Bridge Street, Southwark, to about the foot of the incline now leading over Southwark Bridge. Finding that the space between Southwark Bridge and Blackfriars Bridge did not admit of going so far into the river, and finding that the streets of which I have spoken are now only 40 feet wide, I thought it not desirable to increase that width as regards that part of the road lying between Southwark and Blackfriars Bridges; but on the Westminster side of Blackfriars Bridge I propose that the road should be 50 feet in width, and I should extend that width up to the new Lambeth Bridge. I propose also that there should be at intervals, which the Commissioners will see marked upon the plan, coloured yellow, communications with the shore. In one or two cases those communications would have to be made by means of purchasing up a wharf, but they would afford great facilities for the use of the road; and they might be made use of for another purpose, which I will point out shortly. The part of the road between Southwark and Blackfriars Bridges I do not think would be very largely used for carriage traffic or cart traffic, although there would be some. I think that it would be more used for the accommodation of those people living in those close dens on that side of the river, who would be very glad to get a little fresh air there whenever they could. Those who pass up and down the river now, especially in the summer time, must have observed that at the dinner hour and in the afternoon the shore where the present road comes to the river side is crowded with a dense mass of people, who appear anxious to get as much air as they possibly can, and to get down to the water whenever they can; at least all the younger portion of them. Now, I think that my plan would afford very great comfort and accommodation to that class of persons, who certainly need it as much as any one in London. That there would be a certain amount of traffic passing over Southwark Bridge, especially if the bridge toll should cease from some arrangement which might be made, I do not doubt,—but I have not laid out the plan so specially with that view; but from Blackfriars Bridge, I think there would be a considerable amount of traffic passing

up the river side, especially as these new roads would give a great convenience for the carts passing at once on to the embankment, and travelling along it as far as they went, instead of going along the different streets. I do not propose that there should be any communication on a level with the different bridges, excepting that at Westminster Bridge, on the Surrey side, I propose that the road should curve in on either side, so that there should be two inclines on to the approach of Westminster Bridge. Above Lambeth Bridge I have not proposed any road, and for the reason that the river is now so exceedingly contracted, that being the narrowest part of the whole of the river, that I am afraid that any attempt to bring an embankment sufficiently far into the river for the purpose of forming a road would not meet with a very friendly reception on the part of those who guard the interests of the river; and, on the other hand, if it were attempted to form a road leaving the present shore line where it is, the result would be that you would have to purchase up a very large amount of wharf property and incur a very serious expense. Nor do I think that on the whole it is a point to be very much striven after, because though there is between Vauxhall Bridge and Lambeth Palace a dense mass of business population, and, no doubt, very considerable traffic going backwards and forwards to and from the different wharves, yet there are very considerable facilities for getting away as soon as you get to those two points, Vauxhall and Lambeth. And with great submission to the Commission, I think that any question as to whether or not a new road through those parts should come near the river side, is more a question for the Metropolitan Board of Works than for a Commission which is investigating the subject of the Thames embankment, as it would not interfere with the river side; and though it might be a very desirable thing to be done when money was plentiful and other matters completed, yet I do not think that it affects this question of the embankment of the Thames, and therefore I have not attempted to carry the road beyond the point of Lambeth Bridge. The principle of my plan commencing near Southwark Bridge is to have just a short piece of solid embankment where the road now abuts upon the river side. That would give a starting point for the population who wish to come out into the air, and who cluster in this part to get upon the road. From the point which I have mentioned, nearly opposite Emerson Street, I would continue a dock the whole of the way up to within a short distance of the Lambeth Pier, with certain intervals of roads which I have mentioned; and I propose that under those roads sluices should be constructed, so that the docks which were formed between each of the roads might be scoured by the water being let out at low tide in the one and retained at high water in the other, and let out so that one dock should sluice the other out. The principle proposed also, is, that the whole of the docks should be formed to a regular inclination and new bottomed; and I believe that by means of the sluice system and those docks there would be no difficulty in getting rid of the mud. The main object, therefore, which I would venture to submit to the Commission as desirable and which I have endeavoured to carry out here, is first of all by means of an embankment, not only to prevent the overflow on the Lambeth shore, but also to protect the foundations of all the different buildings and wharf property along that side of the river. I may just point to the map. The Commissioners will observe that wherever a dark line is shown along the edge there are buildings now constructed, and many of them are buildings of very considerable importance, and which no doubt would be seriously affected if the embankment were carried out upon the other side of the river without a protection to them. The next object would be the covering of the mud banks continuously by having water always over them, giving equal facilities to the trades; and the third point would be giving an

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increased facility of transit between Southwark Bridge and Lambeth Bridge. The Commission may probably observe that along these docks there are certain marks which signify openings for the craft, and that at each of those openings there are double gates, not in the form of a lock but double gates opening reverse ways. The object of those gates which open inwards is to keep the dock as a floating dock. The object of those gates which open outwards is to prevent the tide ever rising above a certain level, because, if the principle of the floating docks were adhered to and the water were allowed freely to pass in and out, there would be no protection against overflow from the rise of the tide; but the gates are proposed to be self-acting, so that whenever the tide rises to a certain height those gates would close and would re-open as soon as the tide had fallen again. Therefore, above a certain level the tide could never rise and the shore would be thoroughly protected from any overflow or from an undue pressure which would cause percolation through the banks. The numbers which the Commission may observe upon the plan show the different wharves between Southwark and Vauxhall, and a glance at the different colours will show the space which is occupied by them. I will just point out two or three of the colours which prevail, and which will give the Commission a fair idea of what the trades are. The yellow colour, which extends over a considerable space, is the timber trade. The dark green, which chiefly prevails above Westminster Bridge, represents the barge and boat builders. The dark pink colours show the builders. The coal trade is the purple. The contractors, including railway contractors, and also dust contractors, and so forth, are represented by the light pink, which the Commission will observe at several places. The iron merchants are shown by the brown colour. The lime and brick and cement manufacturers, who occupy a great space, are represented by the burnt sienna. The millers and flour trades are shown by a light green, and what I call the miscellaneous are shown by a neutral tint. The Commission will perceive that the timber and coal trades occupy a very large space, and those are the trades which will very much settle the question as to what embankment you can carry out on that side, because the timber trades have their rafts of timber floating out to a very great distance, and the coal merchants also have their barges lying out to a very great distance. I do not think that there are any other trades which would materially affect the question. Although I must speak with bated breath of the timber trades because they are very influential on that side of the river, yet I must confess that they cause more nuisance as regards the mud than any other trade on that side of the river; their rafts accumulate the mud to a very great extent, and I believe you will find that if there is any place along the river side where the mud accumulates it is where the timber rafts are. That will be got rid of to a very great extent by having a floating dock, because the water will pass freely underneath the timber, instead of the mud lodging against it as it does now. The Commission may remember, that one of the questions which were asked of wharfingers was with regard to the floating dummies, which the Commission observe are marked upon the plan. It is proposed to have one of these dummy barges moored near each of the entrances, so that craft in passing down the river will be able to hitch on and check their speed in passing. I have found that among those who are very desirous of assisting in carrying out any public improvement, subject of course to fair compensation for any damage which they may sustain, the one feeling which they have is of danger to their trade on account of the increased velocity of the water. They are afraid that the increased velocity of the water will prevent their getting an entrance through the wall to their wharves, and I believe it will be found that the dummies which I have mentioned, without at all interfering with the trade or with the

navigation, will enable the men to check their velocity so much that they can get in at any time that they think fit. The plan which I have the honour to show the Commission is rather more extensive than that which has been submitted to Parliament in a Bill which is now pending before the House, and is waiting the decision of this Commission. That Bill proposes an embankment from Southwark Bridge to Lambeth only, but it is proposed as an instalment of the embankment, which I think it is quite clear, if continued so far, must eventually go farther. The notice was only given to that extent for this reason, that when the matter was brought before the First Lord of the Treasury some time ago by those interested in the southern side of the river, the point chiefly then submitted was that an embankment ought to be made on the Surrey side, which would at all events protect that shore in respect of any works which might be carried out on the northern side. As the embankment on the northern side, was only intended from Westminster Bridge to Blackfriars, an embankment extending from Southwark to Lambeth would certainly guard them, so far as that particular work was proposed. But I think it will be seen, that for the sake of the navigation of the river, when you get as far as Lambeth it will be desirable to carry it up to Nine Elms. I have not attempted to go into any larger question of going farther down the river, because, I believe that it will be found almost impracticable, chiefly on the score of expense; and to this extent it would improve the navigation in a very great degree; it would get rid of the danger of extra flooding owing to the embankment of the northern side, and it could be carried out at a moderate cost, which would not make it one of those grand schemes, which are, in fact, impracticable on the score of expense. The estimate for the first section from Southwark Bridge to Lambeth, which is comprised in a Bill now before Parliament, is 339,000*l.*; the second section from Lambeth to Nine Elms, would cost about 130,000*l.*, making a total of about 470,000*l.* That is not a very serious cost, and I believe that it will be the outside. In the estimate I have very carefully taken figures which I believe are outside figures; and I believe that any embankment which the Commission would recommend to be carried out could be carried out within those figures. Now I will advert for a moment to the Bill which I have mentioned. The notice was given for a Bill on the southern side of the river from Southwark Bridge to Lambeth. That notice originated in a communication which took place between some gentlemen who are interested in the matter, and the Chief Commissioner for Works. Without venturing for a single moment to commit the Chief Commissioner or any member of the Government with regard to that Bill, I may say that it was with his sanction that the notices were given with the object that the Bill should be framed so comprehensively that it should reach anything which this Commission might recommend, assuming that they did recommend some embankment. Very great pains were taken with it, and when I mention that the Bill was prepared under the care of Mr. John Bullar, the eminent conveyancer, Mr. Pritt, the Parliamentary agent, and Mr. Gascoigne Roy, the Parliamentary Solicitor, three gentlemen who are perhaps as competent to deal with a subject of that kind as any three that you could easily find, I need hardly say, that no care was omitted which would enable a Bill to be framed capable of carrying out what might be recommended. The Bill at first sight upon reading it over may appear to be a mere skeleton; and that is the particular object, because if the promoters had for one moment attempted to carry out any particular plan, it might not have comprehended what this Commission might recommend; and though the Bill looks like a skeleton, and though the deposited plan looks like a skeleton, I believe I am justified in telling you that there is no system of embankment which you can recommend as between those two points

which cannot be comprised within the terms of that Bill.

1317. It is made comprehensive for that purpose?—It is. Though it has been introduced into the House as a private Bill, it is not intended for a moment to be carried out by private parties. It is simply for the sake of saving the session, so that in the event of this Commission recommending to the Government that an embankment on the southern side should be carried out, a bill should be ready to be taken up by the Government, or by the Metropolitan Board of Works, or by whomever the Government might determine upon, so that it could be proceeded with in the present year, and the works might be carried out simultaneously with the embankment of the northern side. But I am desirous of pointing out that it is not at all put forward as a private scheme, or with any object of private advantage; the object simply is, [that any embankment which might be recommended should be able to be carried out at once under the terms of that Bill. I do not know that there is any other point with which I need trouble the Commission. I shall be happy to answer any questions.

1318. You have given very comprehensive evidence. There are, however, one or two questions on which I should like information. With respect to the thoroughfare which you have proposed, I think that if the other thoroughfares between Vauxhall Bridge and Southwark Bridge were coloured upon the map they would be seen to be so much shorter, and that there would be but little chance of traffic upon your proposed thoroughfare?—I have pointed that out; but I think that there would still be from the various wharves a considerable amount of traffic. If I take the point of the wharves near Waterloo Bridge, and traffic from them, wishing to go to the City, the new road which I should propose a little below Waterloo Bridge would enable it to go in a straight line, and either to turn upon Southwark Bridge, or to go through to London Bridge. It would certainly relieve those streets, and as London is increasing so very much, it is a great object to get as much thoroughfare as possible. I do not think that it is by any means essential; but I think that when an embankment is being carried out, that would be a desirable way of affording additional facilities.

1319. You stated that you thought the means of obtaining fresh air was the point to be considered rather than the traffic?—I did as regards that lower portion between Southwark Bridge and Blackfriars. I think that the traffic there would not be so much as on the upper part, and I think that there is a very dense population there who would be very glad to get to the river side. I pass up and down the river continually, and I find that whenever their hours admit of of their doing so, they get to the river side for fresh air.

1320. The roadway would be fixed over the entrances to the docks?—Yes. I have omitted to mention two points where I think it would be desirable to have the opening bridges. One would be a little below Westminster Bridge, opposite Messrs. Maudsley's works, at which they are making some very large Government boilers, which require an unusual headway, and the other point would be at Messrs. Rennie's, a little below Blackfriars Bridge, upon the same principle; but I presume that those openings would not be necessary above three or four times in the year. With those exceptions, I propose that the roadway should be fixed, and the average height of the road I should propose to be about eight feet above high-water mark.

1321. With respect to the silting up of these docks; have you considered that point?—Yes; I propose to get rid of any silt which might be accumulated by means of sluices formed under the roads leading to the shore; and by retaining the water in one dock at near high-water level, and letting out the water in the other, and then opening the sluices, I think you would find that the docks would be kept very free from mud.

1322. What depth of water do you propose outside the road?—It would be very nearly down to the present low-water mark; but that would depend very much upon the extent to which the river might be deepened in consequence of the embankment on the other side. The foundations would be carried down 14 feet below the bed.

1323. (*Capt. Galton.*) At what time of the tide would the docks be accessible?—For about two to three hours each tide is what we propose.

1324. At what time of the tide?—At the top of the tide; for an equal period before and after high water.

1325. Then how would you prevent the flooding, in case of high tides?—I have mentioned that there would be two pairs of gates, one opening inward to the dock, and the other outward to the river, and whenever the tide rose above a certain level, which would be fixed, namely, above the water level of the ordinary working of the docks, the gates would close of themselves, so that during a short period while the tide was rising and falling to that point, those gates would be closed, and the docks would not then be accessible; those would be extraordinary cases.

1326. How would those gates be worked?—They might be worked in two ways; there might be self-acting gates, in which case I should propose a cylinder sunk on each side, and by the water rising in the cylinder a very simple machinery would release a catch, which would hold the gate back; a spring attached to it would give it sufficient impetus to be acted upon by the water coming in, and then it would close of itself by the pressure of the water. The action of the machinery would only put the gate forward about 18 inches, and then the pressure of the water coming in would close it, and the reverse would take place on the tide going out. I did not trouble the Commission with working drawings, not thinking it desirable at the present stage of the inquiry.

1327. The bridges, you say, would be eight feet above Trinity?—Yes.

1328. How would barges with masts which came there pass?—I think there are no barges with masts which do not lower; I believe that the highest which come on that side would be the straw barges; a good many straw barges come there now, and if a straw barge could get in anything else could do so; and I believe that it was decided some time ago that eight feet would give ample access for the barges if they came there about two feet or three feet before high water, so that they would have 11 feet, and I do not think that there is any trade there which requires above 11 to 12 feet. There would be, no doubt, some cases in which the barges would require to lower their masts, but they do so now, and I do not think there is anything but what could get in.

1329. (*Chairman.*) During the time of tide for which you propose to give access to these docks, what height would there be under the roadway for a barge to enter. The road is to be eight feet above the water, and then there is a certain thickness beneath?—The bridge will be slightly higher; the soffit of the arch of the bridge will be the same level as the road; there will be eight feet above high water. When the previous Commission of 1843 was discussing the question, it was a question whether it should be eight feet or 10 feet. Of course with a small additional expense it could easily be made 10 feet if it were thought desirable.

1330. (*Capt. Galton.*) How far would your plan interfere with the barges which now lie in the river; would there be ample space for them within the docks, or would any lie outside the docks?—There would be ample space within the docks in almost every instance.

1331. Take the large number of coal barges which lie at Dixon's or Cory's?—Dixon's is a little above Hungerford bridge, there they would have ample space.

1332. Take Cory's?—Cory's would have ample space. There is very considerable space there—220 feet.

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1333. Still his barges occupy a considerable space?—180 feet.

1334. But they also lie out above other people's wharves as well as his own?—Yes; but the answer which I got upon that point from one of the barge owners was, that 200 feet would be required; that was the largest amount asked for by any of them; namely, 120 feet, and 80 feet to turn.

1335. Two hundred feet in front of their wharves?—Yes.

1336. Do you give 200 feet there?—Here (*pointing to the plan*) we exceed 200 feet; the scale is 88 feet to an inch; it is about 200 feet, I think, at that point. The most modest requirement was 30 feet; 90 to 100, 180, and 200 were the largest amounts of space that were asked.

1337. Would the plan interfere much with the barge builders?—No.

1338. Below Waterloo Bridge?—Below Waterloo Bridge it would not; there would be building space.

1339. Many of the barge builders have to work when the barges are at low water, have they not?—That is so in some few cases, but I think that any single difficulty of that kind might very easily be got rid of by a stage. That trade is chiefly above Westminster Bridge, and there I propose a tidal dock, and not a floating dock, for that reason; namely, to give a greater facility for getting in and out.

1340. The tide rising and falling?—Yes; there would be the same access as now, but they would be protected from the wash of the steamers.

1341. You said that you thought that your scheme would improve the navigation; will you explain how?—I think that by making the flow of the river more uniform, by having the two banks parallel, you would get rid of obstructions, and keep them got rid of better than by having an embankment on one side and not on the other.

1342. Are there many obstructions now on that side of the river?—There are banks all the way along, and those shallows extend out for a considerable distance, especially in the neighbourhood of Waterloo Bridge.

1343. You think that your plan would remove those shallows?—It would keep them removed. I presume that they would be dredged out for the purpose of making the embankment.

1344. That would be the case near Waterloo Bridge?—Yes.

1345. Do you think that it would act upon the bridge at all?—I think that there are one or two arches of the bridge which would require protection. I think that those must be protected under any circumstances, if the embankment were carried out on the other side.

1346. You estimate the cost of your scheme at 339,000*l.*; does that include compensation?—Yes.

1347. Do you recollect what the relative figures are, how much is for the cost of the work?—The cost I have taken at 25*l.* per foot linear, and 30*l.* per foot linear.

1348. Have you formed any idea as to the material of which you would make the embankment?—Yes; what I proposed was that on the inner side it should be formed of iron construction, and on the outer side of whatever material might be adopted on the northern bank.

1349. Stone or granite?—Yes, whatever might be adopted. I have put a very considerable margin to cover anything. If it were carried out simply as that is in the proposal, namely, with iron, it would not come to anything like that sum.

1350. You put 25*l.* to 30*l.* per foot linear?—Yes.

1351. Upon the existing wharves you would spend nothing?—Nothing.

1352. Should you have to pay much compensation?—I think not; there might be a little temporary inconvenience while we were constructing the work, but beyond that I think there would be none. I have allowed a considerable margin for that.

1353. That is for the part between Southwark and Lambeth?—Yes.

1354. For the part between Lambeth and Nine Elms should you have to pay any compensation?—I think not, because where we made solid embankment it would be given up to the present owners.

1355. What should you do with the existing public draw docks?—I believe that there is only one which would be affected on the upper side.

1356. There are two or three places where there is access to the river on that side?—Yes, but I think that there is only one draw dock.

1357. I mean places where carts go down to be loaded?—I think that they would have the same facility as now; the only difference would be that the bank would be a little higher than at present. I am told that there are two or three draw docks where they go down to the water.

1358. Do you propose to prevent the water flowing up through those draw docks as it does now at high tides?—Yes; where we do not make a floating dock and make it solid, I should propose to close the draw dock.

1359. Where you make a floating dock, would it be a draw dock?—Where we make a floating dock it would not affect the question of the draw docks, they would not have to go so far into the water as now.

1360. You would entirely destroy them, would you not, if you kept the water always up to a certain level in which the barges could float, because the principle of those docks now is that the carts load and unload at low water, when they can draw up on the shore by the side of the barge?—They also load as the water is rising, and you will find horses standing up to their stomachs in water for a considerable time. The only difference would be that instead of having a continual shifting as the water was rising and falling, they would load at one level. I think that it would be rather an advantage than a disadvantage.

1361. You do not consider it desirable, I think you said, to construct a road between Vauxhall and Lambeth?—I am afraid that it could not be done without paying a very large amount of compensation. You will see that at the part of the river some short distance below Vauxhall opposite the Penitentiary it is very much contracted, and any road to be formed would have to be taken from the existing wharves and would cost a very large sum.

1362. Then you think that the cost of the construction of such a road would be much more than the value of the road itself?—I am afraid so.

1363. You do not attach much importance to such a road?—I think every road which can be made in London of importance, but I do not think that it would be worth while to make that road in relation to the very large cost.

1364. Is it the case that the communication now between Westminster Bridge and Vauxhall is rather roundabout?—Between Westminster Bridge and Vauxhall it is certainly somewhat roundabout, but on the other hand there is a very good road from Vauxhall Bridge directly down on the northern side and there is facility for getting on that side; even coming round it is no great distance to come round by the existing roads.

1365. Do you know whether there is much traffic now between those places?—I cannot answer the question; there is no doubt a very large traffic coming from Vauxhall, but I think that that is chiefly down to the City.

1366. As a means of through communication I suppose that the road which you propose would be of very great importance between Westminster and the City, for instance?—Not of so great importance, comparatively speaking, certainly as on the northern side, but still I think it would be of very great importance, considering how the London traffic is increasing.

1367. (*Mr. Thwaites.*) Can you state the amount of money for the structure of the work which you propose, and the amount for compensation?—I am

rather afraid to state; that is rather a dangerous question to go into with regard to compensation.

1368. It is only dangerous so far as it comes to the knowledge of individuals, but you can give it to me in the gross?—£50,000 is the amount which I put down for compensation.

1369. That is in your 339,000l.?—Yes. That is not with reference to permanent injury, that is only with reference of course to temporary inconvenience, because we contend that we do not inflict any permanent injury upon this principle.

1370. All compensation which you would be liable for, supposing you constructed the work, would be included in making the estimate, both permanent injury, and temporary?—I do not think there would be any permanent injury, and therefore my view is confined to the temporary inconvenience during construction. I do not think that the principle which we propose would inflict a permanent injury.

1371. Then the 50,000l., as I understood it, is simply for compensation for inconvenience to the trades during the construction of the work?—That is so.

1372. And not for compensation proper for injury to property; supposing that such a state of things should arise you have made no calculation regarding it?—I have made no calculation as to the compensation which would arise subsequently, excepting as part of construction. For instance, it might be necessary to shift cranes or anything of that kind,—that perhaps you can hardly call a temporary inconvenience,—the cost of that I have included; but supposing that claims were set up that the property was injured subsequently to the construction of the works I have not included them.

1373. The form of construction which you propose, namely, inner floating docks giving access to the wharves, would not in your judgment give the parties any claim to compensation beyond the temporary inconvenience which they would sustain during the progress of the works?—Just so.

1374. You have stated that a roadway on the southern side is not so necessary as on the northern; at the same time you have stated that in your judgment an embankment on the southern side is necessary?—Yes.

1375. Will you state to the Commissioners some few of the reasons why you think that an embankment on the southern side is necessary?—I think that you could not carry out an embankment on the northern side without inflicting a considerable amount of damage to the property on the southern side. I think also that you would not maintain the uniformity of the channel so well.

1376. Let us deal with one question at a time; you state that if you embanked the northern shore you would necessarily injure the property on the southern, will you state to the Commissioners in what manner that property would be injured?—The greater part of the wharves and of the buildings have been constructed with reference to the existing shores of the Surrey side. Those foreshores are much higher in point of level than on the northern side, and the foundations are not carried down to the depth that they would have been if there had been the same amount of water on the southern side as on the northern. I think, therefore, that in compensating the river by dredging for the amount taken away from it by the embankment you would have to deepen it to such an extent that you would materially affect the banks on the southern side, and that a very large amount of damage would be inflicted by the carrying out of your works on the northern side, unless you also constructed works of protection on the southern side, and while those works of protection were being carried out I believe that the most economical way and the most valuable way as regards the public interests would be to construct an embankment wall on some such principle as I have laid down, rather than to remodel the whole of the southern shore.

1377. Then, in your judgment, an embankment enclosing a large portion of the foreshore of the river on the northern side would render it necessary that a considerable amount of dredging should be carried on for the purpose of compensating for the water which you would displace?—There is no doubt of it; the sectional area of the river must be maintained.

1378. And that dredging might cause a slipping of the southern bank, which might endanger the existing wharf walls?—I think so.

1379. Have you examined those wharf walls on the southern shore?—I have not made a particular examination of them; there are several of them which I know, and which are not carried down to the depth which I think would be necessary, assuming that the river were deepened.

1380. Higher up the river I suppose a great many of the so-called wharf walls are little better than camp shedding?—They are very little better, and there are many places in the neighbourhood of Waterloo Bridge, both above and below, where the walls have not been carried down, and have very properly not been carried down, when there was no intention of the river being deepened on that side; but I think that if you deepen the river to the extent to which it ought to be deepened, you will find that those walls will be materially affected, and in many cases very important trades are carried on upon the very shore of the river.

1381. In fact, if any portion of the northern shore is embanked; having regard to that fact, in your judgment, you must have an independent deeper river wall and deeper foundations than now exist on the southern side?—That is my opinion, certainly.

1382. Are there any other reasons than that which you have given why, in your judgment, it is necessary to have a wall built on the southern side?—I think that the question of the damage done to the southern side, which has been done for many years by the overflow of the tides, is one which has a very important bearing upon the subject, and one which can be more cheaply effected, that is to say, the protection can be more cheaply given, by means of a river wall, than by what otherwise would be necessary, namely, a remodelling of the whole of the shore. That is a very important question, and I have no doubt that evidence has been given before this Commission to show that very serious damage is inflicted by the overflow of the water. I, myself, have seen it in Lambeth flowing over the streets, and into the kitchens, till the kitchens have been nearly up to their ceilings with water, and there can be no doubt that very serious damage is done to property, and that a very unhealthy state of things is produced by it; and it would be very desirable, especially bearing in view the great improvements carried out by the drainage, at the same time to effect every possible reclamation, if I may so term it, of that shore from the dampness owing to the tides overflowing. I omitted to mention one point, namely, that we propose to carry a sewer along the river front in front of the present wharves, a short distance from them, so that the existing sewers which now empty themselves into the river, might be opened into that one, and a communication made back to the main sewer afterwards, so as to prevent reversing all that.

1383. There is no necessity for that in that district?—You are a better judge of that than I am.

1384. You were about to state some other reason why you thought an embankment necessary on the southern side?—I think that the bed of the river would be maintained much better after it has been once dredged to the depth which is intended, by having a uniform flow of the river, the river being confined as nearly as possible to an average distance of from 700 to 80 feet; and I think that that would be found much more desirable than it would be to have the river at various widths, and the tide in places forcing holes on one side and throwing the soil up on the other. I think that you would find, that

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when the shoals were once got rid of, the bed of the river would be maintained at a regular level without those shoals forming again, and therefore I think that, as regards navigation, it would be a very great advantage. Then, as I said before, though I do not look upon the question of roads on the southern side as so important as on the northern side, I think that they are important, and as London increases they are likely to become more important; and I think that if by a little extra cost when you are about it, while giving the facilities to the wharfage trade, which it must have, you can give facilities to the poorer classes to get to the river side; it will be a very great public advantage.

1385. Do you see any great difficulty in raising the present wharf walls, adding 18 inches or two feet, so as to resist the overflow?—I think that you might do it occasionally, but in a very great many instances you would cause a very great inconvenience to the trades; I am not sure that you would not find the question of compensation there interfere very seriously indeed. The body of wharfingers are very important, and their trade is very large, and they are exceedingly jealous of being interfered with. I think that the less you actually interfere with those wharves the more economically you will find that any plan of this kind can be carried out.

1386. (*Capt. Burstal*.) Anything which would prevent shoals forming in the river would be a most desirable thing; what shoals do you allude to which have formed in the river from the want of a uniform and sufficiently strong current?—The shoals are now in the neighbourhood chiefly of Waterloo Bridge.

1387. I mean such shoals as have been formed, because the current of the river is so sluggish that deposits necessarily take place; where are there any shoals of that sort? I do not mean gravel shoals, I mean silt or mud deposits?—The chief mud deposits are between Blackfriars and Waterloo; no doubt, to a great extent, they have been assisted by the timber rafts.

1388. Those would be shelves; they would not be shoals?—“Shelves,” perhaps, is the more correct way of expressing it.

1389. A shoal is a thing which generally makes its appearance in the middle of the river, where it is so very wide that the stream is reduced to almost nothing, and consequently the deposits take place, and the navigation is thereby impeded. I must confess that I am not quite aware of any such shoals as that in our river in the district of which you are speaking?—There may not be such shoals as that; but I think that if you had the velocity of the river increased, and you had it confined to one side, which you would to a great extent, it would to a certain degree throw up shoals on the other side.

1390. Have you ever tried any drifts of the stream, so as to know the comparative velocities of the current between Southwark and Westminster Bridges?—I have tried it at Southwark Bridge, and I have found it there about three and a half miles.

1391. With reference to the docks, at what time of tide do you propose to let the water from one dock into another, so as to sluice it?—Whenever the tide has fallen sufficiently low to be able to open the gates and flush the water out; nearly at low water.

1392. Then the muddy water will have been in the docks in a quiescent state for at least three or four hours?—It does not follow that the water shall have been in a quiescent state, because craft would be moving about in the dock, and keeping it pretty well stirred up.

1393. There would be no current?—There would be no current.

1394. How would you manage to get rid of the mud in the upper dock, where there would be no sluicing. I mean the dock next to Westminster Bridge?—That would be sluiced in the same kind of way as the adjoining docks; but it would only be reversing the operation.

1395. Sluicing upwards?—Yes.

1396. The muddy water would find its way through the sluices out into the river every tide, and then I suppose you expect it to be carried away by the stream?—I do not propose to do it every tide. I presume that when the river has been purified to the extent to which it is to be hoped it will be purified, there will be by no means such a deposit as there is now, and that it would only be occasionally that such an operation would be necessary.

1397. You do not think that the purification of the river by the main drainage system will to a very great extent affect its turbid character as being muddy, do you?—I think so, to a very great extent. I do not mean to say that it will make it pure.

1398. It will make it clearer?—It will make it much clearer than it is now. I have noticed that in the morning before the river has been disturbed, the surface of it has been covered with a very thick scum of sewage, which is stirred about by the steamers and craft, and gets mixed up with the water; at all events the whole of that would be removed.

1399. I did not understand your answer to Mr. Thwaites's question, with reference to the southern side being affected by a northern embankment; in what way can it be affected? Do you imagine that the tide will flow over its banks with more readiness than it does now?—I do not; at all events, that will not take place when the sectional area of the river has been increased. Temporarily I dare say it may, but not more.

1400. You mentioned, in one part of your evidence, something about percolation; have you any facts as to percolation, to any extent, of river water into the interior of such a character as to make the district marshy and swampy?—I have no facts within my own knowledge. I have only information which I have received from persons who have been residing in Lambeth. I am speaking chiefly of the neighbourhood of the Belvedere Road when I mention that.

1401. Have you ever seen in the docks which are now existing in the river, such as Belgrave Dock and some of those docks at Chelsea, what the effect has been of mud depositing in the docks?—I have.

1402. How do they get rid of their mud?—I have not noticed it at Belgrave Dock, but I have noticed it lower down the river. There are a variety of ways of getting rid of it. In some cases men go in and rake the bottom a little before low water, and there are cases where they have a machine which is drawn about to stir it up.

1403. Have you ever examined the bottom of the river to find what kind of stuff there was outside after that process had been in operation?—No; I cannot say that I have.

1404. Supposing that these docks are sluiced out in the way that you propose, it is quite clear that the muddy water will go out of the sluices and be dispersed along the foot and sides of the embankment. Supposing that the current of the river should not be sufficiently strong to carry that away, more particularly in an ebb tide, and that it should be left dry, do not you think that there would be some reason to apprehend that a new fore shore of mud would very soon be formed along the front of that embankment?—I think that you would have, either by means of the increased sectional area of the river by dredging, or by what I believe must eventually be made if these embankments are carried out, namely, a reservoir constructed higher up the river, quite sufficient scour to get rid of anything of the kind.

1405. Then you do think that tidal water is displaced by any embankment which is made?—Unquestionably.

1406. If it should be found to affect the river in the Pool it will be necessary to make a reservoir farther up?—I have always thought that it would be very desirable to have such a reservoir.

1407. With reference to the mode of working these tidal entrances, which is a very serious matter, your theory is that they will be self-acting?—The outer gates.

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1408. How are the inner gates to work?—I propose that there should be a staff of persons employed, for instance, river police, whose business it would be to attend to the gates, and who, at the same time, would be a very great protection to the wharfingers as regards their trades along the shore. There is a great deal of pilfering along the shore, and I think that a small rate might very easily be levied upon them, which would be very slight, and which would fully answer the purpose of protection and also get rid of the difficulty as to the gates.

1409. You think that the advantages to the wharfingers would be commensurate to whatever expense it might occasion?—Yes.

1410. The dock entrances are 35 feet wide?—Yes.

1411. Supposing that a stream was created equal in velocity probably to three miles or to two and a half miles an hour, do you think that the ordinary class of barges which are used on the river could be fairly docked and undocked to go clean in and out as they ought to do, the docks being constructed at right angles with the stream?—I think that they could with the assistance of the dummies.

1412. And without any men on shore to haul them in?—I think so. There might be certain cases in which assistance might have to be rendered, but the same parties who attended to the entrances might give that assistance. That was one of the points which I had considered, and when I ventured to submit my plan last year to the Commissioners with regard to the other side, I particularly stated that I proposed to have a staff for the purpose of assisting the craft in, and I propose that these men, whether Thames Police or not, should do the same thing.

1413. Do you think that the dock entrances would be equally available for timber rafts as for barges?—I will not say equally available, because there might be cases in which, as the rafts come up at present, there might be a certain amount of inconvenience; but I think that that could be very easily got rid of, because they would regulate the rafts accordingly.

1414. They would reduce the width of their raft to something less than 35 feet?—Yes.

1415. (Mr. McClean.) Do you propose that the new embankment road should be used as a wharf either in connexion with the river or with the basins?—No, not at all.

1416. Then the wharfingers would be deprived of any accommodation from this new embankment road?—They would derive no accommodation excepting the facility which there might be of getting along it at different points from one place to another.

The witness withdrew.

THOMAS HENRY HARTLEY, Esq., examined.

The witness delivered in the following paper:

To the Commissioners of the Thames Embankment.
Gentlemen,

In the plans submitted for your inspection I have set out the embankments in the requisite proportions for the requirements of the metropolis. I propose such alterations in the waterway as to greatly facilitate the transit of craft and barges up and down the river, and increase the wharf accommodation on the Surrey side by an intermediate embankment (as shown in the plan), which would be so constructed as not to interfere with the wharf property between London Bridge and Battersea Church. On the Surrey side, by the construction of locks at each end, I form the waterway into a canal two feet lower than high-water mark, which would prevent any inundation at spring tides on that side.

On the proposed intermediate embankment, the width of which varies from 120 to 175 feet, I contemplate having four lines of railway for goods and passengers from London Bridge to Battersea Railway Bridge; also that the land should be let for building warehouses upon, with handsome architectural fronts as a screen to the factories on the Surrey side from

1417. In connexion with the new road what means of communication would they have?—In many cases they would have almost immediate access to that new road from the different roads which are proposed to be connected with the shore. They would also have the great advantage of being protected from any wash. They would also have their craft always able to move about.

1418. They would have no thoroughfare, would they?—They would have a new thoroughfare undoubtedly, by means of the present access. If it were found that the road was sufficiently little used by the public to justify it, no doubt it could be done, and in many cases where the widths are very great a wharf might be formed on the inner side, but I apprehend that the public would be very soon found to use a road of that kind, and a road 50 feet wide would be considered very desirable.

1419. (Captain Burstal.) As you are apprehensive of scouring, do you propose to reconstruct all the present wharf walls?—Not at all.

1420. You stop the water at rather a low level to prevent its coming up too high?—Yes; and there would be less pressure and less percolation than otherwise, the head would be less.

1421. (Chairman.) You referred to the dredging as if it were a fixed point; supposing the dredging were confined to a breadth of 700 or 800 feet from the proposed northern embankment, without approaching the south shore within 200 or 300 feet, do you think that then it would be possible that the alteration might affect the foundations of those walls?—Some parts of the river are so wide that dredging for 700 or 800 feet would not have so much effect as at other parts; but when that new river frontage is made on the north side, the 700 feet will go very far towards the shore on the south side, and I think that there are very few places which you would carry down to a uniform depth for the purpose of the traffic where you would not find that the shore would slip in.

1422. Do you not think that a sectional area might be adopted which would leave safety to the south side?—Just at one particular part for a certain distance above and below Waterloo Bridge, no doubt you might be more protected, but I think that if you had anything like 700 feet of dredging, taking the general length of the embankment, you would find that the south side would be seriously affected.

1423. (Mr. Thwaites.) In fact it is a question of compensation as much as a question of uniformity of scour?—Just so.

the north side, where I propose building handsome boulevards. I reduce the width of the river to 300 feet, and with the canal on the Surrey side I allow an average width of about 500 feet, which will leave more waterway for the barges and steamers than they have at the present time below London Bridge, and as I propose the river to be five feet deep at low water, this will greatly facilitate the transit of the steamers and barges.

In order at all hours of the day to gain greater facility for the public to travel backwards and forwards between the City and the suburbs, and to relieve the Strand and Fleet Street, &c. of the enormous traffic at present prevailing there, I propose forming a spacious carriage road, and four lines of tramway on the embankment of the north side of the river between London Bridge and Hammersmith.

I contemplate forming, for commercial purposes, timber and coal depôts.

I propose carrying out a jetty or pier near London Bridge, with hydraulic cranes for unloading vessels and barges into railway trucks to be conveyed to the different parts, as may be required. With these accommodations I apprehend that there will be a

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considerable reduction in the price of coals, and all other merchandise, materials, &c. &c.

In carrying out so necessary and important an improvement expense should be a secondary consideration, therefore I have made no precise estimate of the cost; but I have made an estimate how the value of five millions' worth of work might be executed without Parliament being called upon for a grant, as follows:—

	£
The proposed line of tramway, if sold to a company, I value at	500,000
Ditto railway	500,000
Sale of land for building upon	200,000
Value of coal and timber depôts	100,000
Ditto land for wharves	200,000
Proportion of coal duty for 10 years, at 100,000 <i>l.</i> per annum	1,000,000
	2,500,000
Saved by carrying out the work by sappers and miners	2,500,000
	£5,000,000

I propose the work should be done by 5,000 sappers and miners in 10 years.

This would afford a favourable opportunity for our sappers and miners acquiring a knowledge of practical artificers' works, which would make them all useful men for military purposes, without their being any extra cost to the country, and also save the cost of experimental work at military stations.

I consider the first six items would raise sufficient money for buying the materials. A great deal of the rough masons' and granite work might be prepared by the convicts at the Island of Portland and Dartmoor. The embankment is so designed that there would be great facilities for the Metropolitan Board of Works to construct a low level sewer under the carriage road. I should add, that, in my opinion, it would not do to construct an embankment on the north side of the river without also constructing one on the south side, as shown on my plan.

I have the honour to be,

Gentlemen,

Your obedient Servant,

Th. H. HARTLEY.

1424. (*Chairman.*) Are you a civil engineer?—My occupation is that of a marble merchant, but as far as regards this design and others that I have made I call myself a designer, that is, what I may call the amateur part of my occupation, but my business is that of a marble merchant, &c.

1425. Will you be kind enough to describe in general terms what is the system of your plan?—I have very little to say in reference to the plan. I have made everything as explicit as I can upon it. I propose such alterations in the waterway as would give great facility to barges and craft going up and down the river. On the Surrey side I propose an intermediate embankment thus (*describing the same*), starting from close by Alderman Humphery's wharves and running along up to Battersea Church. At each end I should form lock gates, which would convert that part of the river into a canal, so that barges at all times of the tide might have access into this lock, and be brought up this canal at any time during the day or night. When they got to Battersea Church if they wished to go up to Fulham, or farther up the river, they would go out at the upper lock gates.

1426. They can go up and down the river now?—Yes. In addition to these locks I propose to put a weir across the other part of the river.

1427. (*Mr. Thwaites.*) Why do you want to have these locks when there is nothing to secure?—My object in having these locks is to prevent the Surrey side of the river being inundated by the spring tides, and also to give greater facility for the craft to come up the river at all tides. By this embankment con-

tinuing along here I prevent the inundation which generally takes place at spring tides on the Surrey side.

1428. (*Capt. Galton.*) Do you then always keep it at low water at that part?—It is always to be two feet below Trinity high-water mark.

1429. When the tide rose in the river higher than that what would happen?—This embankment would prevent the tide rising any higher in the canal.

1430. How do you retain it at that level?—I have a lock gate at each end.

1431. A double lock gate?—Yes.

1432. (*Mr. Thwaites.*) Have you formed an estimate of the cost of your plan?—Yes; I consider that this canal would give great facility to barges, that it would reduce the price of coals and all building materials in the metropolis, because there would be such facility in coming through here at all times, that there would not be the expense of wear and tear of barges from the scour of the river, nor the expense of carrying coals so far out of the barges; they would be more easily taken ashore.

1433. (*Chairman.*) Our instructions do not quite embrace that; I will just read them. We are to report in writing, "which of the said plans of embankment will, in our opinion, conduce with the greatest efficiency and economy to the improvement, embellishment, and convenience of that part of the metropolis, will improve the navigation of the river, and will provide a public thoroughfare without stopping such trade as must be carried on upon the bank of the said river, and also to report on the cost and means of executing such plans." I think that your plan hardly embraces these points?—As regards the embellishment of the river, I propose on this embankment to have a space of 175 feet, on which could be erected large warehouses with handsome architectural fronts, which would hide all these factories on the south side from the north side.

1434. (*Mr. Thwaites.*) You would place them in the centre of the river?—They would be on the embankment, not exactly in the centre of the river. On this embankment I propose to have four lines of railway which would give great facility to the public.

1435. (*Chairman.*) There would be no public thoroughfare in the ordinary acceptance of the term?—There would be a great public thoroughfare running the whole distance down the north side for business purposes, as I have shown upon the plan.

1436-7. We have not that within the scope of our instructions?—There would also be the scour of the river. I propose by reducing the width of the river to throw a weir up at Battersea Church which would prevent the scour of the river, which is at present a great injury to the property, &c. on the river.

1438. (*Capt. Galton.*) You would stop the current altogether?—Yes, on the same principle as at Teddington.

1439. What do you say that the cost of your plan would be?—The cost of a large undertaking like that I think ought to be a secondary consideration.

1440. Have you any estimate of it?—Yes, there could be produced 2,500,000*l.* In the first place I begin with the four lines of tramway on the north side.

1441. On the north side the question is already settled, we are not entering into that at all?—I consider that that would be worth 500,000*l.* The railway on the intermediate embankment would be 500,000*l.* more; the sale of building land 200,000*l.*; coal and timber depôts 100,000*l.* The land which I should make for wharves would be of the value of 200,000*l.* I calculate that the works would take ten years to be executed, and I take 100,000*l.* per annum out of the coal duties, which would be 1,000,000*l.*; that would make 2,500,000*l.*, that is what could be produced out of this plan.

1442. What would be the cost of the plan?—I have not gone into it, but I have an idea that it will cost 5,000,000*l.* Then in carrying out the labour for a large system like this the present system of contracting would not do, as it could not be depended upon,

and I propose that it should be done by sappers and miners. 5,000 sappers and miners trained to a work like that would be a great benefit to the country from their experience afterwards; and when the work was completed I consider that we should have a river worth having.

1443. (*Chairman.*) You would only have half a river?—At the present time with the great alteration which is taking place we do not want what we have.

1444. (*Capt. Galton.*) Is not the river so crowded as it was?—No, it is not.

1445. Where is your wharf?—I have not one. I can do without a wharf. I have the marble, of which I import a great deal, carted and delivered at my premises in Earl Street, Westminster. In consequence of the alterations of Saint Katherine's Dock I can have it carted more cheaply.

1446. Do you reside far from the river?—Close to the river.

1447. And you think that it is not so crowded as it used to be?—No, excepting that the steamboat traffic has increased. But the tramways which I propose to be worked at all times would be a great advantage to the metropolis, in taking the traffic morning and night to and from the suburbs.

1448. (*Chairman.*) Passenger traffic?—Yes. We have nothing of the kind now. It would bring them down close to London Bridge; and they could be taken to Hammersmith by this tramway for about 2d. or 3d. a head, which would be a great advantage to the public. This railway could be made to communicate with the London and North-western Line, and also with the Great Western Line. And I propose to

The witness withdrew.

THOMAS MORRIS, Esq., examined.

1454. (*Chairman.*) Are you a civil engineer?—I am an architect.

1455. Will you read the paper which you have transmitted to the Commission containing a general description of your design?

The Witness read the same as follows:

Carlton Chambers, 12, Regent Street, S.W.,
January 11, 1862.

Gentlemen,

I have the honour to lay before you a plan for the treatment of the south bank of the Thames.

I propose to construct a causeway from the Lower Surrey Road at Nine Elms, in a regulated curved direction to Bankside, Southwark, with a short street of communication to the new great thoroughfare in course of construction by the Metropolitan Board of Works. It will be seen by the plan that this causeway consists of a 60 feet road, falling generally within, but sometimes beyond, the original boundary of the stream. From its commencement at Nine Elms it rises to Vauxhall Bridge, which it crosses at a level, then gradually descends, and after passing the Gate-house at Lambeth Palace rises to Westminster Bridge, with which it also forms a level communication. It then again declines, and passing under the Charing Cross Railway, Waterloo and Blackfriars Bridges, joins the shore at Bankside, and so continues to the new street before mentioned.

It is proposed to construct the causeway, where within the water's edge, upon cylindrical piers of brickwork formed at first with a rim of no great thickness, so as to admit the process of excavation and sinking to be carried on within them. After being lowered to the necessary depth for a sure foundation they would be rendered solid, protected by occasional zones of iron, and capped with granite. Upon these piers rolled iron beams would be laid, with bearings of about 100 feet, upon a principle combining the properties of the lintel and cantilever, a plan I venture to submit as most consonant with the nature of the material and the most economical form of its application.

This design, while it would afford that regularity of appearance which is desirable, would not render

put hydraulic cranes on the wharves, which could unload the contents of barges into railway trucks, which would also be a great advantage to the public; and I consider that the price of coals would come down 2s. a ton by this plan, if carried out.

1449. (*Mr. Thwaites.*) By spending 5,000,000 of money?—If it is not undertaken before long, we shall be driven to it ultimately; there is no question of it, as the scour of the river is now going on at such a rate that it tears every thing to pieces. In fact, the River Thames is a perfect hospital for engineers; they are always at work.

1450. (*Chairman.*) Where is it tearing everything to pieces?—At Waterloo Bridge.

1451. But Waterloo Bridge stands pretty well?—But they are frightened of it. And then there is Blackfriars Bridge; and the money laid out upon Old Westminster Bridge was all thrown away.

1452. I am afraid that you go beyond our views and instructions in some points, and that in others you fall short of them?—I have been on the Continent, and I see that our river is a long way behind Continental rivers. It appears as if we were not in a civilized country, when I look at the River Thames, and compare it with other rivers, such as the river at Florence and the River Seine at Paris.

1453. Our river has been neglected, no doubt?—On the Continent they give more land accommodation on the banks. It is the land accommodation which we want, so as to relieve Fleet Street and the City, and there is no other way of doing it than by bringing the traffic alongside the river.

The witness withdrew.

THOMAS MORRIS, Esq., examined.

necessary any great interference with the valuable wharves on the line, but would admit of ready and convenient access to them during the greater part of each tide.

I have considered the approximate cost of carrying this plan into effect, and believe that it might be accomplished for 500,000l.

I have the honour to be,

Gentlemen,

Your most obedient servant,

THOS. MORRIS.

The Thames Embankment Commission.

1456. Your plan is called a causeway; what sort of traffic would it be adapted for?—It would be adapted for the same traffic as an ordinary road would be. It would be formed of large cylindrical piers, so as to cause no unnecessary displacement of the river, because I believe that it will be found to be of very great importance that the area, not as is sometimes said the mere sectional area, but the positive surface area, should be maintained to as large an extent as possible, and as near as it can be in its present extent. The rush of water, the nature of the stream, and the right angle which the river takes at Waterloo Bridge, are known of course to everybody accustomed to the map of London. Blackfriars Bridge and Westminster Bridge form an exact right angle, and therefore the turn of the river at Waterloo Bridge is very sharp indeed, and the lunge of the tide in the one direction and in the other causes that extreme action at the northern side of Waterloo Bridge which causes it to be the deepest part of the river near that spot, while the rising of the banks about Hungerford allows of the sluggish motion of the river, and the accumulation of mud there; therefore it appears that no mere dredging, no mere deepening of the river, will have any action upon the tidal capacity of the river, because if you dredge the river as deeply as you like, you simply make a hole which you fill with quiescent water, which never flows out again.

1457. That is, below low-water mark?—Below low-water mark, and therefore any dredging of course would have no influence upon the tidal capacity of

T. H. Hartley,
Esq.

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T. Morris, Esq.

T. Morris, Esq.

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the stream; and it appears to me most desirable that the area of the stream should be maintained. Therefore I propose to construct a roadway; a roadway I believe to be essential there, especially between Westminster and Nine Elms, and perhaps more essential than in any other part of the metropolis. Those who now wish to travel from the Surrey extremity of Westminster Bridge to the Surrey extremity of Vauxhall, or to Nine Elms, have to go an immense distance round; I think they call it Kennington Lane, or some place, making a very great distance. Now, I do not think that there is any part of London with which I am acquainted, in which a direct thoroughfare is more called for than on the banks of the Thames, from Nine Elms to Westminster Bridge.

1458. But that is a small proportional part of your scheme?—Quite so. As far as Lambeth is concerned, and the embankment of that side of the river, that is a very important point, and I propose to divert the road at one part from the bank of the river, and continue it so as to form a proper communication with the suburbs. Then it becomes a question whether the traffic upon that line would not find that more convenient than to diverge, and go on to the old road. It appears to me that it would effect the great object of a thoroughfare, and bringing the form of the river into a regulated and agreeable shape, and without any interruption to the wharves, or with the least possible interruption, because during the greater part of the tide, not merely for an hour or two before or after high water, but during the greater part of the tide, these wharves would all be accessible.

1459. Perhaps you are aware that very great inconvenience and damage is occasioned by the overflowing of the water over the present wharves into the cellars and places in Lambeth, your scheme would not affect that?—That certainly does not form an essential part of my scheme; my scheme is to do that which concerns the public as to the general treatment of the river and the navigation of the river. It would allow of dredging the river to a proper depth for navigation; it would allow these barge beds and the other arrangements which private parties have made for their own convenience to remain wholly undisturbed, and then if it were necessary to build anything for the protection of the surrounding neighbourhood from inundation, that I think would be a separate part of the work, but it would be unnecessary to disturb anything. If a man, for instance, liked the surface of his wharf to be laid under water for an hour or two every high tide, or for a day or two it would be his own fault, if not, he could of course take means to prevent it, but the great object was to carry out in a simple way the requisitions put before the public by the Commission.

1460. It appears to me that your scheme aims principally at working this communication from one end to the other. Are you aware that though you do not appear directly to interfere with the interests of these wharfingers you would certainly interfere very much with the coal trade and the timber trade, from the very small space which you leave between parts of your causeway and the present wharves?—I think that if the plan is perfectly understood it would be found that I interfere with very small spaces. At distances of 100 feet I put piers of about 10 or 11 feet diameter. It is very important that you should master that part of the subject, because these would be cylinders rising out of the water just in the same way as it may be said, I believe, of the piers of the Charing Cross Railway Bridge which is being constructed. There would be three piers at each place, and then there would be an opening of 100 feet before there was any other obstruction; then there would be another series of three of those piers. From one set of piers to the other the iron beams would come, and it is upon the construction of the iron beams also that I have laid some little stress in that short report which I have just had

the pleasure of reading to you, but the obstruction to the river would be very little indeed.

1461. It is not the obstruction to the river, but it is the obstruction to the convenience of the wharfingers and others carrying on their trades. You must have seen very large spaces occupied by timber and very large spaces occupied by barges in front of these wharves?—Yes.

1462. These piers would very much interfere with those places, would they not?—I should say not at all; in a very much less degree than anything in any other possible mode like an embankment which could be made. No stick of timber is 100 feet long; no barge is more than 100 feet long; everything could pass in and out. I have heard 35 feet talked of as being the entrance to the docks. There would be no docks upon my plan; there would be no subsiding basins of water; the whole thing would be open.

1463. Then you would contemplate that the trade would go on under the roadway, and that barges could lie there?—Nearly at all times; the access to some of the wharves would be wholly unobstructed at all times.

1464. (*Capt. Galton.*) What height above high water do you propose?—I think four feet above high water would be quite sufficient for the general traffic.

1465. Then how would the barges get underneath?—At low water.

1466. How could they get in at low water, there would be no water?—There is a rise I believe of 18 feet in the tide; there is the whole of that to deal with. Whatever depth people like to have, they have that 18 feet at command, and six feet more if they like, because six feet more would be the depth to which I should recommend the general bed of the river to be lowered outside. Therefore if it were necessary, you would always have a depth of six feet.

1467. You say that you would make your roadway four feet above high water, and that you would not interfere in any way with the existing barge beds. If the barges could only pass under at low water, considering that the existing barge beds are all uncovered at low water, how would the barges get up to the wharves?—They are not obliged to maintain the exact level; but there would be nothing to interfere with them. As they get on now so they could get on then. The only thing would be, that they would have to pass under the roadway.

1468. A barge with masts cannot pass under with less than 15 or 16 feet?—Then they must go in at low water. I think that masts of every description pass on the opposite side. At Pimlico there is an example which did Mr. Cubitt very great credit. I do not think that that is four feet above high water, and billy buoys, as they call them, pass in and out there with the greatest possible facility.

1469. That has now been bought by the War Department, has it not?—No; it is a broad embankment which runs up from Vauxhall Bridge to Chelsea Bridge; there is a fine roadway.

1470. But there is only one place in it, I think, where there is a dock into which barges go?—Whatever the people have desired there has been done, and therefore I do not see any reason why whatever the people desire in this part should not also be done.

1471. (*Chairman.*) For a considerable space above and below Southwark Bridge you touch the wharves; your road comes along the front of the wharves?—The present road at Bankside comes along the river. Where there are no wharves of course it does not matter at what level you fall into the road. So at Lambeth, between Westminster Bridge and Lambeth Palace, and the new suspension bridge at Hungerford, there are not many wharves.

1472. There are 15?—Yes. At Westminster Bridge I am on a level with the bridge itself, and therefore any vessel which could go under Westminster Bridge could go to those wharves, and I should gradually descend until I got down to about the palace.

1473. (*Capt. Galton.*) You state the cost of this work to be 500,000*l.*?—Yes.

1474. Does that include the cost up to Nine Elms?
—Yes; it is mere road there.

1475. At one part you cut off a projecting point in the river?—That might be left in the river for those people who have their warehouses there; it is quite optional.

1476. Does the 500,000*l.* include the cost of purchasing this property for the purpose of making a road at that part near Princes Street and Fore Street, Lambeth?—That part of Lambeth is all in a state of transition, and I believe that it is only necessary to mark any particular line; it is all in a state of the utmost decay and dilapidation.

1477. No doubt the works which are carried on in those manufactories are disagreeable trades; but still I believe that they let at a very high value?—I mean that the buildings are all in a ruinous condition; the property is in a very bad state there.

1478. You would go right through a certain number of manufactories by this plan?—There is a street, and it is in a state of transition; the old buildings are taken down, or being pulled down, and the new ones are not set up, and, therefore, it is a favourable opportunity.

1479. You have not included that compensation, I suppose?—I think that the whole thing might be done for what I have put down. Of course, in a statement of this sort, it is a general and inclusive statement of expense.

1480. You think that that sum would cover it?—I do. In the first place, the mode of construction is not very expensive, and a great part of it is mere roadway.

1481. It is a series of bridges, is it not?—It would be one continuous beam bridge.

1482. Of 100 feet span?—Of 100 feet span.

1483. (*Chairman.*) And 30 feet wide?—No; the roadway is 60 feet wide. The manner in which I propose to construct that roadway is this; you would build a cylinder, for instance, of 10 feet 6 diameter.

1484. Of brickwork?—Yes; and when you had built up a certain height, it would be banded with zones of iron, and not built very thick at first. Within that you would excavate the whole of the soil from underneath, and this cylinder would gradually subside.

1485. In the same way that an iron cylinder does?—Yes; in fact, it is the same as sinking a well in a gentleman's mansion. I had a large tank sunk a few years ago in the same way; it is a very simple and economical mode, and it obstructs nothing; it is all done inside. There would be three of those cylinders, and that would form the pier.

1486. That is the transverse pier?—Yes; at 100 feet off there would be another of those piers. They would make altogether about 60 feet in width of roadway, therefore there would be a 60 feet road going all the way along, built upon these piers at 100 feet apart. I certainly think that it would be the most economical and simple method in which a roadway could be constructed, and it could be done at different levels; it could be kept higher if it were necessary. At some of the bridges it rises to the level of the bridges. There is one thing which I consider of great importance and that is the obstruction to any improvement of this kind which is being suffered to come into the town by the introduction of railways. Now when you come to a bridge in a thing of this kind you can connect the bridges, and it might have been desirable if it had been practicable to form one causeway connecting the whole of the bridges on the south side; it would have been a very handsome thing and I think a very useful thing. But that is no longer practicable, therefore you are obliged to dip and to undulate the road, and a most important question as regards the future of London is created by the introduction of those unmanageable iron lines of railway, that you cannot cross them on a level. I think that a level causeway connecting the whole of the bridges would have been a feature of great importance and beauty in the management of the metropolis, but it is no longer practicable, and this plan so far as it concerns a practicable thing, I think is really deserving the attention of a body of gentlemen met as yourselves to consider the treatment of that part of the metropolis.

1487. As you do not contemplate interfering with the wharves I suppose you have not taken into consideration any question of compensation?—Not to the wharfingers, I do not think that they would be prejudicially affected at all, everything that would be done would be rather an advantage than otherwise.

The witness withdrew.

Adjourned to Thursday the 27th instant at 12 o'clock.

Thursday, 27th February 1862.

PRESENT :

Major Gen. Sir JOSHUA JEBB, K.C.B.
JOHN THWAITES, Esq.
Captain DOUGLAS GALTON, R.E.

Captain BURSTAL, R.N.
HENRY ARTHUR HUNT, Esq.

CAPTAIN DOUGLAS GALTON IN THE CHAIR.

WILLIAM ALEXANDER BROOKS, Esq., examined.

1488. (*Chairman.*) You are a civil engineer, I believe?—Yes.

1489. Will you have the goodness to explain to the Commissioners the plan which you propose for embanking the south side of the river Thames?—My object is to improve the navigation as much as possible, which I consider is to be done by the construction of quays. I propose several quays for the south side of the river; one above Westminster Bridge, which is marked Number 1 on the plan. The first embankment is 3,000 feet long, and is to cost 51,000*l.*

1490. Where does the first embankment above Westminster Bridge, which you say is to be 3,000 feet long, and the estimate for which is 51,000*l.*, commence?—It commences a little above Church Street, south of Church Street, and above where the new bridge is to be built.

1491. You mean Church Street, Lambeth?—Church Street, Lambeth.

1492. And proceeds to Westminster Bridge?—Yes.

1493. What is the description of the embankment which you propose?—The entire embankments are founded upon piling, the front row being driven close together.

1494. Solid?—Solid, so as to have the effect of sheet piling to the level of low-water mark; and upon that there will be a solid wall of masonry carried up to four feet above high-water mark.

1495. Would you propose to place a road upon that?—A simple road on that. No docks or any thing of the kind.

1496. How would you accommodate or deal with the wharves near Westminster Bridge?—The parties would have the right of making use of the quays. I

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propose to have a public road in front of their wharves, and give them the wharves in lieu of compensation, but maintaining a broad road throughout. And that plan I adopt through all the different wharves.

1497. What is to be the width of that road?—Of course that must depend very much upon the extent of the enclosure of the foreshore.

1498. But you have laid down your line have you not?—There is no line of road laid down at present; that, of course, would be a matter of negotiation.

1499. What is the amount of encroachment upon the river?—The width of the road would be left open to the public. Of course that would be a matter to be settled between the parties. But I should say that the road should not be less than 60 feet wide, from that to 100 feet. Then the next quay is from Westminster Bridge, extending to opposite Queenhithe.

1500. (*Mr. Thwaites.*) Do you intend to enclose any portion of the foreshore except what you will occupy for the road?—There is a line laid down, and, of course, it would have to be enclosed within the line laid down upon that plan. It would be all formed into solid land; I leave no docks behind.

1501. Do you propose to encroach upon the foreshore of the river beyond the extent which you require for the roadway?—Not beyond that, because the roadway would, of course, be kept outside.

1502. (*Chairman.*) Before you go on will you explain the extent of the encroachment you propose at Westminster Bridge?—At Westminster Bridge itself there is very little encroachment; it is just close to the abutments.

1503. It would go flush with the abutment of Westminster Bridge?—Close to it; it is a separate quay, in point of fact, there.

1504. Will you explain the second embankment?—A second embankment commences at Westminster Bridge, and goes to very near Southwark Bridge, to opposite Queenhithe Dock; the total length is 7,260 feet, and the estimate 116,492*l*.

1505. Would that be a solid embankment in front of the wharves?—Yes.

1506. Have you allowed, in your estimate, for any compensation to be paid to the wharf proprietors?—Nothing at all in the shape of compensation.

1507. Do you anticipate that any compensation would be required?—I do not think there would be; I think they would get such an advantage generally in the increased area of their wharves as would fully compensate them.

1508. What do you think would be the advantages they would gain to compensate them for having a road placed in front of their wharves?—They would have larger quays, larger wharves, and there is not that great traffic on the south side that would much interfere with their business.

1509. (*Mr. Thwaites.*) I do not quite understand the extent of the roadway in front; you do not propose that the wharfingers should occupy the roadway?—No.

1510. If you do not propose that they should occupy the roadway, will you explain what is the additional quay room they will gain?—It varies with the extension of the line into the river, in some places it is very considerable, it goes into the river as much as 150 feet.

1511. You state, that in your judgment no compensation would be required, by reason of the fact, that they would have additional quay room?—Yes.

1512. I understood you to state, that you proposed to form a roadway, and a roadway only, in front?—Yes.

1513. Then where is the additional quay room?—The additional quay room would arise in this way: in some places the extension would be of considerable depth, in some parts 150 feet; and 60 feet for roadway would leave 90 feet for quay room.

1514. Then you would propose to give up to the wharfingers all that not utilised for the roadway?—Yes; but that would be more for the judgment of the Commissioners, I think.

1515. But we are examining your plan, not the Commissioners' plan. Where you would have a separate roadway in front of these wharves, without any additional ground, how would you deal with them?—In that case you would have to give compensation, of course.

1516. You have not calculated for compensation in your estimate?—No, I have not.

1517. This 116,000*l*. is simply the structural cost?—Simply the structural cost, quite clear of compensation. That would of course, in some cases, have to be gone into; but it was impossible for me to do that.

1518. (*Chairman.*) You terminate at Bankside with that embankment?—Yes, opposite Queenhithe Dock; we call that Bankside. Then the third quay is at Bermondsey, where the navigation requires to be improved, for the shore is very irregular, and I think an enclosure might be made there.

1519. (*Mr. Thwaites.*) Will you be kind enough to state the exact point in Bermondsey to which you refer?—It is between George Stairs and Horslydown Stairs, and extends to Cherry Garden Stairs. The length is 2,640 feet, and the estimate for it is 44,880*l*.

1520. (*Chairman.*) Would you have a road upon that embankment?—There would be a road as well.

1521. Where would that road commence?—I rather look upon that as a public quay for promenade than for any other purpose. I do not think a road is required there. I do not think that there are really any new streets required upon the south side; there are streets parallel to it, and at so short a distance, that I do not think a new street is required at all there.

1522. Where is the fourth embankment?—The fourth embankment commences at Church Stairs, a little on the west side of the Thames Tunnel, and extends eastward for the length of 2,860 feet. The estimate is 48,620*l*; that is at about the rate of 15*l*. a foot. I have made a great many similar works that only cost 5*l*. a foot, and I know these works could be executed easily at the rate I have named; so that it is quite possible to effect this large improvement in the navigation and in the beauty of both shores of the river by laying out 500,000*l*., and no more, including the quays, which I propose on the north side, that would be for a length of about 16,000 feet of quays.

1523. That is the total expense, exclusive of any compensation to be paid?—Exclusive of any compensation.

1524. (*Capt. Burstal.*) How far off from the present line of wall at the Bishop's Walk, Lambeth, do you propose to have your embankment line?—It would be about from 50 to 60 feet.

1525. At what point do you propose to start with your embankment below Westminster Bridge?—It is at a quay of about 150 feet from the bridge.

1526. Is it at the corner of the flour mill?—I believe it is by the corner of the flour mill, but it does not interfere with it.

1527. Following that line from the flour mill down to Waterloo Bridge, you do not trench very far upon the river?—No, I do not.

1528. Then your roadway would occupy very nearly the whole of the space embanked?—It would very nearly. It is not meant for a road, for a public carriage way; it is not wanted there.

1529. That road is to be on a level of four feet above high-water mark?—Four feet above high-water mark at spring tides.

1530. Then all the business transactions of the wharfingers would have to be carried on upon the level of that road to their premises?—Yes; that is to say, unless they made roads over at a higher level upon stages where the enclosure is very small, and the trade carried on is of a nature to specially require it.

1531. Then your road would terminate at Bankside?—Terminate at Bankside.

1532. How would you deal with the river opposite St. Saviour's Dock in Bermondsey? Would you

have a solid embankment from Horselydown Stairs to Cherry Garden Stairs?—A solid embankment.

1533. What would you do with the waterside premises and the rights of the wharfingers on both sides of St. Saviour's Dock?—In that case I think you would have to give them a right of way over the ground which you reclaimed.

1534. Of what use would the ground reclaimed be to people who had waterside business in St. Saviour's Dock on both sides?—There must be, of course, a proper dock entrance made.

1535. You still propose to have a dock then?—I do not propose to shut out St. Saviour's Dock, that is not in my estimate.

1536. It would appear from the drawing that you have made a solid embankment wall in front of it?—That merely shows the quay line which is to be

formed for the navigation embankment line. I have not entered into all these details on the plan.

1537. Then the public wharf would extend between Horselydown Stairs and Cherry Garden Stairs?—It would.

1538. Then the public would have no river side walk, or footpath until you got to the Tunnel?—No.

1539. Then from the Tunnel down to King and Queen stairs there would be another public wharf?—Yes.

1540. There are some dock entrances there. Do you propose to have bridges across those?—That would be quite necessary.

1541. And in that case all the shipping would lie alongside of the wharves and discharge their cargoes into wagons which would wheel them across into the warehouses, I suppose?—Yes.

The witness withdrew.

Mr. T. E. WELLER examined.

1542. (Chairman.) Are you a civil engineer?—I am an iron engineer, not a civil engineer. I have brought a description of the plan which I propose, and perhaps the simplest way will be to read it. My plan aims to accomplish that which seems to be the chief object, namely, to keep out the contemplated inundation on the southern side and to do that at the least expense consistently with the accomplishment of that object. This is the statement which I have prepared. There being no necessity for a roadway on the south embankment, between Westminster and Blackfriars, inasmuch as there is now a direct and shorter road between the two bridges via York Road and Stamford Street, and a communication from the Belvedere and the Commercial Roads with the wharves in that district, also shorter than a new road could be, it would seem that nothing more need be done than,—First, to construct a new river wall in a line to be decided by Her Majesty's Commissioners but which should not take in more than one arch of Waterloo Bridge (as on the north side of the river), so that uniformity may be preserved to that noble structure. Secondly, to fill in solid all the space between this new wall and the present wharves except where it may be desirable to preserve existing draw docks or leave openings in front of warehouses which at present have crane lifts direct from the water. The open quays which constitute the main portion of this shore to be simply extended further out upon the newly filled-in ground to the new river wall. The material for filling in would be obtainable to a large extent from the dredging in front of the new wall, and therefore at a comparatively cheap rate; and as the wharf property would be increased in size and benefited by always having water alongside, it would be but fair that the expense of filling in and perhaps the building of the wall should be borne by the owners of the said property. With respect to the portion of the Surrey shore which lies between Westminster and Vauxhall Bridges, if that forms part of the present inquiry; it would be highly desirable here to make a new road between those points. This could be accomplished by widening Stangate and cutting off the projecting corner of the Archbishop's grounds at Bishop's Walk, forming a new river wall from thence to Vauxhall of proper height above high water, and continuing the road immediately upon it or a little inland by widening Fore Street and Princes Street, whichever might be deemed best by Her Majesty's Commissioners and the Metropolitan Board of Works, to whom the execution of this improvement would seem chiefly to belong. All the embankment that I should think necessary or that should be allowed in this part of the river is a strip in front of Bishop's Walk. There is a small outer garden on one side of Bishop's Walk next the water, a kind of corner projecting 40 or 50 feet, which might be continued so as to terminate at the foot of the new bridge. There would then be ample space for a road without interfering with the Bishop's ground except just at

the corner of New Palace Road where a little projecting bit might be cut off.

1543. If I understand your plan right it is for the Commissioners to build a wall in front of the wharves extending to a certain distance into the river and for all the filling in to be done by the present owners of the wharves and the whole of the property to be owned by them?—Yes, on condition of their making it.

1544. Then the object you have is to obtain a wall of sufficient height to prevent the water flowing over it?—That is it.

1545. Would not your object be attained equally well by compelling the present owners to raise the walls?—No, because I apprehend the foundations of those walls are not of sufficient depth to admit of there being any dredging in front.

1546. Is there any dredging required in front?—You would want to provide a certain area of water space taken from the river by the northern embankment.

1547. Would not the dredging interfere to some extent with the barge beds which at present exist there?—No, the dredging might be done further out and simply to provide for the space which is lost on the north side; there need be but little encroachment on the barge beds.

1548. Is it not the case that the barge beds are very much wanted on the south side?—You might still preserve the barge beds if you like, but I think it would be much better if the barges were afloat, because then they would be moveable at all times. It is better to have facility to move a barge at all times than to let it lie on the mud.

1549. Then you would propose to have a depth against the wall of 6 feet at low water?—Yes, sufficient to float a barge, so that owners would always have their barges floating; they would take up no more space in the river than they do now, and if they were afloat it would be more beneficial for the owners of the barges.

1550. What is the estimate of cost?—The river wall might be built, according to the material, for from 30,000*l.* to 50,000*l.* The cost of the wall would of course depend upon the material of which it was built; if it was built of iron it would cost much less, and if built of granite the expense would be much greater.

1551. Have you formed any estimate in detail?—No, it is more the principle of the thing that I have dealt with than with the way of carrying it out.

1552. Do you know the smallest depth of water that will float a barge?—I suppose four or five feet. An important object would be to have a regular sweep to the river wall from Westminster to Blackfriars, and if you take in but one arch of Waterloo Bridge on the Surrey side the greatest extension into the river would never be more than about 130 feet.

1553. Are you well acquainted with that side of the water?—Very much so.

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1554. You do not consider that a road is at all wanted between the points which you have sketched?—Not only not wanted, but I think it would be a very great injury.

1555. A great injury to wharfingers?—Yes, because the shortest route is the greatest advantage. Every wharf has a communication with the water-side and a road in front would only be a nuisance, I do not see any object in it, except for a promenade, which would be hardly worth while.

1556. (Mr. Thwaites.) You propose, as I understand, a solid embankment?—Yes.

1557. (Mr. Hunt.) The ground that you would reclaim by building that embankment wall would be thrown into the wharves that abut upon it now?—Yes, they would be so much larger by that extension into the water, and for that advantage they ought to make it themselves.

1558. You think that they ought to build it themselves?—Yes.

1559. You, as a commercial man, think that it would be worth their while to do so?—Yes, I should be very glad to do so if I had a wharf there, because I should gain a new piece of ground in the middle of London, which certainly is worth the making; and as to the wall itself, it is a very small matter, as it could be done for 50,000*l.* the wall alone, because if it is filled in behind it need not be very thick. You would merely have a facing wall; it is not as if you had to make a wall on both sides.

1560. A continuous wall?—Yes; except where you had a draw-dock to preserve, or where, as in the case of Mr. Dowson, the timber merchant, who uses a piece of ground in front. He may say I wish to preserve this piece of ground as a mud bank. Then let him have it; and give him a small breach in the wall in order to bring his timber in and out. But to stipulate that he build the wall of his present wharf high enough to keep out the water.

1561. Your suggestion for embanking that part of the river is to improve the navigation?—Yes, and to keep the flood water from overflowing, which is the main object. Of course you could do that better by a continuous wall than by walling up the old wharves.

1562. That would not only increase the value of the wharves themselves, but increase the value of the property in the immediate neighbourhood?—It would be in every way beneficial. Wharf owners would have water always alongside, which would increase the value of their frontage.

1563. And the house property would be increased in value by this work?—Yes, everything would be improved by it.

1564. (Capt. Burstal.) You seem to think that any additional road on the south side of the river is

not required?—I do not see the object of it, it appears to me to be absurd.

1565. With respect to the timber and coal wharves, if the proprietors were desirous of retaining a niche in the embankment for the purpose of a bed for their barges, what sort of bed would you make there?—A bed of mud as it is now; all that would be necessary would be to let them have the present ground that that they occupy in front, where the timber lies, and which would be inside the new wall; the ground to remain just as it is, with an opening through the new wall for them to get their timber in.

1566. Would not that have the effect of making mud traps?—Mud inside but not outside; mud inside, which they like.

1567. But that appears to be one of the objectionable parts of the plan of the promoters of the southern embankment?—The small quantity of mud that would be accumulated in the timber docks would be of very little consequence to the river outside, it would not come out, it would remain there.

1568. That is so far as timber merchants are concerned. What provision would you make for coal merchants?—I do not think they require any provision more than they have now.

1569. Sufficient space for the barges to lie?—Yes, outside the new wall but afloat.

1570. Do you happen to know many instances of the water of the river overflowing the banks in that particular neighbourhood below Waterloo Bridge?—Yes, below Waterloo Bridge, but not below Blackfriars Bridge, the ground is higher there.

1571. You mean the water overflowing the wharves, but does it come up into the Commercial Road?—Very rarely; I have scarcely ever seen such a thing, it does not happen often, and may be more through the sewers than over the wharves; I do not think there is an actual overflow. There is an actual overflow at Lambeth, but if you make the new road to Vauxhall sufficiently high to act as an embankment that would render unnecessary any new river wall above the new bridge.

1572. However desirable you think it would be to make this uniform line of wharfing, do you think in practice you would ever get the owners of premises, supposing they could afford it, simultaneously to construct this embankment in front of their premises, supposing they got the land for nothing?—I suppose you cannot oblige a man to buy a thing or to do a thing, but you can oblige him to sell it. And if you were to have a clause in the Act of Parliament empowering you to say, if you will not do it we will purchase the ground and sell it to somebody who will, I think that would settle the matter. But I think to get a piece of land for nothing would be generally considered a good thing.

The witness withdrew.

A. Giles, Esq.

ALFRED GILES, Esq., examined.

1573. (Chairman.) You are a civil engineer?—I am.

1574. Will you state to the Commissioners some of the works on which you have been employed?—I am engineer of the docks at Southampton, and have been for upwards of 20 years. I have been engaged upon railways and in harbour works for the Danish Government at Copenhagen, and I have been in general engineering practice for many years. I must state, that I have not considered the question now under inquiry beyond the district lying between Vauxhall and London Bridge. My design is based upon the width of the river at Southwark Bridge; there you have the narrowest waterway which there is at any part of the river, and taking that as the datum I thought myself at liberty to encroach upon the river to a considerable extent, so long as I did not lessen the waterway below what you have at Southwark Bridge; in fact, the greater part of the river would be even wider than that at Southwark Bridge. I have also considered, in designing this

plan, that if you were to put a road between the wharf property and the water you would totally destroy the value of that wharf property; and it is quite impossible that you can destroy all the wharves on the south side of the river. And again, a road of communication with the bridges upon the south side of the river is a necessity which has long been felt. I begin at Vauxhall with a bank extending a little beyond the first pier of Vauxhall Bridge. I have not made that portion a road because it would end abruptly. There is a concentration of roads at this point (*pointing to the plan*), near Vauxhall Bridge; there are five roads coming in at that point, so that I propose to make a new road through this pottery district and wretched property of Lambeth, to come to the new Lambeth Bridge. There is another reason why I put the road here. Without raising the embankment to an unnecessary extent you cannot get over Lambeth Bridge, and you cannot get under it; besides, there is a good deal of valuable property here, and you have not got width enough to make a

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dock within the roadway, so that to make a roadway along the river bank you must destroy the whole of that property. I should perhaps say, that to carry out this line completely, it would be necessary to cut off that slice of the present foreshore, and to make the same width here, if a uniform line of embankment is to be carried out. It would also be necessary to continue this line to the Houses of Parliament, and to take off that corner opposite to the Penitentiary.

1575. You mean to cut off a portion of the existing embankment?—Yes, that would be necessary if you are to make the line of uniform width. You see the line is very much narrower there than it is here. I propose that that, being now a very extensively used draw-dock, should be set off as a dock with an entrance; this would be land useable for wharf purposes; this would be also an addition to the present wharves here, no road intervening between those wharves and the river. Here the new road would commence, which I propose should be 60 feet wide, to come down along Bishop's Walk. Then you come to very valuable water-side property at Stangate, where there is a slate yard and saw mills, and various premises, with convenient warehouses built upon the face of the wharves. I have not been bold enough to propose a plan which would destroy all that wharf property, because the compensation would be so enormous that it would prevent any such plan from being carried out. There is an inferior wharf property just above Westminster Bridge, used as boat builder's premises; this will be embanked, with a road outside, the level of which should be 7 feet above Trinity high-water mark. The wharf I propose should be only about 4 feet above Trinity high-water mark. I have drawn that so as effectually to shut out any tide that rises above Trinity. I believe the highest tide is something under 4 feet. Then, by dipping under the first arch of new Westminster Bridge, with an inclination of 1 in 60, I can get a headway of 13 feet 6 inches, and from that road I can also get up to the Westminster Bridge Road opposite Stangate with an incline of 1 in 35, so that any traffic coming over Westminster Bridge or coming along the Belvedere Road, and wanting to go that way, can go down to Vauxhall, or may turn under the arch and may go down here, so (*describing the same*). Travelling down the river from Westminster, I find that the whole is wharf side property, owned by coal merchants and timber merchants, and so on, which I do not think it would be possible to destroy, and having plenty of width in the river, I propose to put my embankment to that extent, and make the road outside of it, and to make entrances for the barges to go in and out. You see my object in making the embankment 7 feet above Trinity high-water mark is, that I may give fixed bridges over the dock entrances. If there is to be a large traffic on that road, it will be utterly impossible to have a swing bridge, but by keeping the top of the embankment 7 feet above Trinity high-water mark, I am enabled to get a bridge over the dock entrances, a fixed bridge, and to have the top of the gate above the highest known tide, that is 4 feet above Trinity high-water mark; and as I have made the sill of these entrances 14 feet below Trinity high-water, barges will be able to use these entrances as soon as there is water enough to float them over the mud. I think that for all practical purposes it will answer very well. I do not mean to say that the wharfingers might not object to come through the entrances, they having the full scope of the river now; there might be complaints, but it is the choice of two evils, and if you are to have a river bank you must either destroy the wharf property or give them the best accommodation you can. One great feature is to prevent the tide from rising over all this property, which is in many places below very high tides, and gets flooded sometimes, so that by these means, and by having self-acting gates, which shall shut when the tide rises up a certain height, you would prevent the flooding. I do not propose that they should always be left to themselves, but to prevent the

possibility of an accident in case of a high tide occurring in the night, when, of course, if the water came through these entrances, the land would be just as much flooded as it is now. I propose that there should be an apparatus that should close the gate as soon as the tide is at a certain height, by which you would prevent any chance of flooding at high water. Now, travelling down to Hungerford Bridge, I find that I have plenty of height to get under the new railway bridge at Hungerford without altering the level of the road, and I get a very good connexion along side of the new bridge into the Belvedere Road.

1576. Do you terminate that end of that embankment abruptly?—I do not consider it a complete scheme, because I am perfectly aware a good deal must be done above Vauxhall Bridge. I have not studied the question beyond Vauxhall Bridge, but the river is plenty wide enough above Vauxhall Bridge to carry the embankment further up, and it must come to that eventually.

1577. In fact you propose to keep the river throughout the same width as it is at Southwark Bridge?—No, not exactly that; I have taken care not to have anything less than that; it is generally wider. I have not been bold enough, as I said before, to destroy that which I consider the most valuable wharf property, property owned by timber and coal merchants; but having more than width enough, taking Southwark Bridge as a guide, to get a greater space than we have got there, I think we may very well get the road which I have proposed without damaging the course of the tide. I have shown a connexion from Hungerford Bridge into the Belvedere Road; there is one dock, as you see, between Hungerford Bridge and Waterloo Bridge with one entrance, and from Waterloo Bridge I have height enough and sufficient headway, to get an incline from that road to that point there at an inclination of, I think, 1 in 25.

1578. Into the Commercial Road?—No, that is the Waterloo Bridge Road. Then I propose, also, to make a junction where I can get a very good connexion, into Duke Street, and then get on into Stamford Street, which is all comparatively on a level. With Blackfriars Bridge I have been a little puzzled; the plan of it not being settled, I am not quite clear as to what the arrangement will be; but as far as I can learn, I shall have plenty of height under the new Blackfriars Bridge without lowering the level of the embankment. The railway bridge I shall have to pass under, and by taking the roadway from here up in this direction I get a very good connexion from my embankment road to the Blackfriars Road with an inclination of 1 in 40. Then we have another dock below Blackfriars Bridge, and here, where the present road at Bankside joins the river, without any wharf intervening, I finish my line; and as there is already a road between this and the river you may as well bank it up; and I have no doubt that eventually a good deal of it will be banked up. Then, at Southwark Bridge, in the original plan it terminated there, as you see; but I find that I can get under Southwark Bridge Road with a headway of about 15 feet, and you might, by that means, without interfering with any valuable property, get a complete communication with Wellington Street close to London Bridge. There is only one property which is of any consequence here, which is the Borough Market.

1579. You go straight through the Borough Market?—No, I just take off a little slice of it; there are no buildings upon that spot, that is an open space; there is a large distillery here, which I just miss; beyond that, there is nothing here of any great value. You might just as easily get that road as not, and without interfering with this wharf property at all, and by making no part of that road less than 4 feet above Trinity high-water mark, you effectually make a dam against any inundation from the river there. To get that road 4 feet, you would only have to raise

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Park Street 2 feet, and Stone Street about $1\frac{1}{2}$ feet; all the rest is high enough to be safe from inundation.

1580. (*Mr. Thwaites.*) Are you aware that the Metropolitan Board of Works are at present constructing a street from very near the point where your scheme commences to Stamford Street?—I was not aware of that.

1581. Would that alter your views as to the desirability of making this street which you propose?—Of course, you do not want two wide thoroughfares. If the Board are going to make a good thoroughfare from here to Stamford Street, then, I think, you would scarcely want that piece of road.

1582. You do not apprehend any inconvenience to the river from the encroachment into it to the extent you have shown?—It would limit the water space for barges travelling up and down the river to a certain extent.

1583. Would not that be a very material limitation?—This is the line of the northern embankment, and if you carry out both embankments, of course, you limit the area of the river very considerably; but at the same time, you have got so much more width there now than you have below, that I do not think the trade would ultimately feel any ill effect from it. If you look at the low-water line in the plan, you will see that a very little of the proposed embankment comes beyond the low-water line. Here is the low-water line, and there it is on this side (*pointing out the same*). You have much more width now from there to there, supposing the two embankments were carried out, than you have here; and the higher you get up the river, of course, the less barge traffic there is.

1584. (*Chairman.*) Have you made an estimate of the probable cost?—I have; but of course, it is only a general estimate. For the works, exclusive of any question of compensation for property, the sum would be 400,000*l*.

1585. Exclusive of all compensation?—Yes, that is, including those two roads; but it is exclusive of all purchase of property or damage to property.

1586. That is for building an embankment with a wall on each side?—A wall on each side on piles.

1587. And forming the road where the shore is to be reclaimed, I presume?—Exactly,

1588. What sort of wall do you propose to build?—A wall of masonry on piles, about 10 feet thick at the bottom; on three rows of piles with wales and planking, with a good handsome coping on the top of the outside wall, and a stone parapet. The wall to be of rubble or Kentish rag; the inner wall to be of the same nature, without the parapet and expensive coping. The whole of the bank, in fact, the roadway, and the two walls, exclusive of anything else, would cost about 25*l*. a foot; when you got into deeper water, there you would have to add something for a coffer dam, of course.

1589. You have examined the property, I presume, on that side of the river?—I have.

1590. And you consider a road as very desirable?—Do you mean the connecting road?

1591. The road which you have shown upon the plan.—I think it is very desirable to get a connexion along the river side if you can get it without a great sacrifice of property; but if you have to do it with a sacrifice of the whole of that wharf property, I think it is utterly impossible that you can carry it out. Look at the people holding premises here. Look at Humphrey's wharf, for instance, at London Bridge. You can never shut up such a dock as this, or put any road in front of property like this; it would be utterly impossible, you would destroy the property altogether. Of course, although property is not quite so valuable as you come up here, yet you have got iron stores, and coal stores, and manufactories of every description, and gasworks.

1592. Then I understand you to say that the water would flow in and out of the docks at every tide?—Yes.

1593. Do you apprehend any inconvenience from the mud that would be accumulated in the docks?—No. I have purposely put into these entrances two pairs of gates. That is, one to keep the tide out, and the other to keep it in if necessary; so that if they get any accumulation of mud, and they choose to shut the gate, and leave a little water in the dock, and stir it up, and then let it out, they may clear their docks at any time. They would of course, get a little deposit of mud, for the Thames mud will accumulate, but they may either keep these docks full at high tide, or they may let them run empty.

1594. (*Mr. Thwaites.*) Have you examined the ground near to London Bridge for the roadway?—I have been over here (*pointing to the plan*).

1595. Did you see new works going on there?—No. I did not go down below York Street.

1596. Did you not observe that they were actually paving the new street there?—I did not. I went through the back slums here, to see what property a road running in that direction would take, but I did not see that there was a new street making.

1597. Are you aware that by your proposed road you would interfere with Messrs. Barclay's brewery?—No, it would not touch it.

1598. Are you quite sure of that?—I think so.

1599. Is not the brewery on both sides of Park Street?—I think so, on both sides. They have hop warehouses on one side. This is the distillery, and this corner I particularly remarked. Vickers' distillery comes to that line. At that portion there are some new ale stores, and I think that is the only new building in the line of that new road that would be affected. I think there is an old house here at present unoccupied; and I think the rest of this ground is pretty much open or occupied by sheds and stables, and things of that sort.

1600. I think I understood you to state that your proposed docks would be self-cleansing?—They could hardly be self-cleansing, you may clean them by mudding them, by leaving a little water in, and putting men in to rake the bottom, and then letting out the liquid mud. They will not clean themselves, but they might be emptied by means of that sort.

1601. Do you propose to give them a concrete bottom?—No, I put nothing at all. I should leave the gravel just as it is. I have simply put a lock here, which would form a dam to keep the tide in if it is wished to be kept in. If the people wished to float their barges at every tide, instead of letting them lie in the mud bank as they do now, they would have the power of shutting the tide in.

1602. Supposing you made out to your own satisfaction that a roadway was not necessary in front of the Thames, how would you deal with that part of the river?—If a roadway is not necessary, then I do not think I should make any docks at all. I should simply extend the Thames to a uniform line.

1603. By an independent wall?—Yes, I think so, by a bank as far out as is necessary. Of course the value of land so gained would go in compensation for the damage done to wharf property, and you would find that the wharfingers would only be too glad to avail themselves of that additional land; but I question whether the value of the land so created would not be more than eaten up by the compensation you would have to pay in some cases. Of course where the wharf is at present unoccupied by buildings there would be no additional expense, and it would be a great gain to the wharfinger; but where he has got his warehouse on the present edge of the wharf, if you push his wharf further out into the river, you compel him to remove his warehouse, for which you must give him compensation.

1604. And give him the ground too?—Yes, at a price; take Humphrey's wharf, for instance, which extends for a 100 feet, the ground gained in front of that 100 feet would not compensate Humphrey's for pushing his wharf further out.

1605. (*Mr. Hunt.*) Take the case of Goding's brewery, opposite Hungerford Market, what would

be the effect upon that?—I should think to that brewery the increased land would be of much more value than any loss Mr. Goding would sustain by the operation.

1606. His brewery stands upon the edge of the wall at present; would it be an advantage or disadvantage to Mr. Goding to have 130 feet of land in front of his building?—I should think it would be a decided advantage.

1607. Would you, as an engineer and a man of business, think that it would be worth Mr. Goding's while to build an embankment wall of 130 feet in the river if he could have the land reclaimed added to his own freehold?—I should think it would; and I should think he would be glad to do it; but at the same time I think, as a general rule, you would never get one uniform bank made if you left it to the individual owners to do.

1608. I ask you, as a practical engineer and a man of business, whether, commercially speaking, it is not the fact that parties would embank the river at their own expense, if they could have the land so reclaimed in return for their outlay?—Yes, some of them would, if you do not put a road between them and the river.

1609. Then why do you suggest that road?—Because I think the communication is very much wanted.

1610. But there is a communication now being made from Southwark into the Blackfriars Road, opposite Stamford Street?—Yes.

1611. Stamford Street is a wide street, and continues right into the Westminster Bridge Road, as you observe?—Yes.

1612. Is not that a much shorter distance to traverse than your road would be?—Yes, as the chord of the arc, but not from all points of the river.

1613. Are not these roads all of a sufficient width to take almost any amount of traffic which might be expected on that side of the water?—Yes.

1614. Then what occasion is there to make a roadway along the bank of the river?—If the road is being carried out from Stamford Street to Southwark, the necessity for this new road along the river side will not be so great; but it would still be a useful means of communication from the wharves against the flooding of the low ground behind it. When you get up to Westminster Bridge, you must have a road from there to up to Vauxhall.

1615. That is another question. That would diminish your estimate very considerably, would it not?—The estimate for this road is only about 15,000*l*.

1616. If the whole road from Southwark to Westminster according to your plan were omitted, would not that very much reduce your expenditure?—I think if you do not want any communication of that sort, you perhaps would not make docks there; the docks are a necessity created by making the road.

1617. (*Chairman.*) Do I understand you that the road which you show on that plan between Southwark Bridge and London Bridge would be made for 15,000*l*?—Yes, exclusive of all property; there is nothing to do but to pave it.

1618. (*Mr. Thwaites.*) That is supposing that the property is purchased and the land cleared?—Yes; I have nothing to do with the value of the property or the compensation; my estimate when I speak of 400,000*l*. is simply for works.

1619. I understand your estimate of 400,000*l*. is only for the structural works; you have not ventured to face the question of compensation at all?—Not at all; my estimate is merely for structural works. The value of property and compensation are questions with which I have not attempted to deal.

1620. (*Capt. Burstal.*) You are in hopes, I presume, that the embankment formed in the way that you propose, will in no measure interfere with the mode of carrying on the business and traffic of the river in barges and so on?—I do not think it could. I do not think the traffic upon the river is thick

enough to be impeded by the abstraction of as much area as is proposed by my plan.

1621. You think the dock entrances you propose to make would be fairly available for all the ingress and egress that would be necessary?—Yes, I do.

1622. Have you any knowledge of the velocity of the stream at present at Southwark Bridge, which you take as your datum, as compared with other parts of the river?—It is swifter at Southwark Bridge of course, that being a narrow gorge.

1623. By bringing out this embankment as you propose, you would expect, and it would be the case, that the stream at the upper part would be assimilated somewhat in velocity to the stream at Southwark?—Not altogether, because if you take away a certain portion of the area of the river by a high embankment, you would not have so large a body of water coming in and out at every tide. I must tell you that the whole area abstracted from the river by this proposed line of mine is 51 acres, whereas in round numbers the whole area of the river between Southwark Bridge and Vauxhall is 325 acres, measured between the high-water marks.

1624. You think that a five feet headway above Trinity mark would answer all the ordinary purposes for barges to pass under?—Yes.

1625. (*Mr. Thwaites.*) I understand you that the area of the river between Southwark and Vauxhall now is 325 acres?—Between Vauxhall and Southwark Bridge.

1626. Have you had regard to the line laid down for the northern embankment in giving those figures?—No; I take the river as it is.

1627. (*Capt. Burstal.*) Would you oblige the present owners of wharves at Lambeth to raise them where they are so low now?—That plan of mine raises it for them, except where I cut off the foreshore.

1628. You propose no dock there?—No, and I do not propose any road in front of the wharves from Lambeth Bridge to Vauxhall.

1629. How would the waterside business at Bankside below this dock, where that land is shown as enclosed, be carried on?—It would be destroyed, of course.

1630. Could it be landed at the embanked road and carried over to the warehouses?—I think not; if you have a road with a large traffic over it, you cannot use it for wharf purposes.

1631. You are of opinion that a roadway with wharf traffic across it is practically impossible?—It is practically impossible to carry on a large trade from the wharves by running across a wide and much frequented road.

1632. When this muddy water is sluiced out from the docks into the river, as you propose, do you apprehend that the silt and stuff held in suspension will be deposited along the banks by the side of the embankment wall, and thus form a new muddy foreshore?—I do not think it would be in sufficient quantity.

1633. You think the stream will be sufficient to carry it away?—Yes; and besides that, I do not think that the owners of property in those docks would allow it to accumulate in sufficient quantity for that before they carried it away.

1634. You would stir it about with rakes, something like they stir about the harbour at Ramsgate?—Yes.

1635. Do you think that the headway that you propose of five feet above Trinity mark at those dock entrances would be sufficient for the ordinary purposes of these barges?—For ordinary purposes it would; but there are some purposes for which it would not; for instance, there are some masted vessels which come alongside of those wharves, and Thames luggers. I do not think five feet would be sufficient for them.

1636. But for the ordinary Thames dumb barge without any masts?—Five feet would be plenty of space for them; the ordinary coal barge is not above six feet high.

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1637. When she is light?—When she is light.

1638. But when she is deep?—Then she draws about five feet. She would then rise about a foot; but she would have an opportunity of coming in at all times, because there would be five feet above Trinity high-water mark; it is not very often that you get Trinity high-water mark. She would have ample headway at all times, except at Trinity high water.

1639. (Sir J. Jebb.) What width of river do you secure by your plan?—688 feet is the waterway at Southwark Bridge.

1640. Then the general width between the north and south embankment would be about the same?—About the same in the narrowest part.

1641. Would not such a contraction of the river as that give it more the appearance of a large canal than a river?—No, I do not think so; it would be a great deal wider than the Seine at Paris, which is banked up like that.

1642. Would it conduce to the ornament of the metropolis?—I think it would decidedly, to take away those mud banks. Of course, a narrow river is not so handsome as a wide one; if you could make it as wide as it is now, and keep it always full of water, with ornamental lines of quays, of course it would be much handsomer than it is now.

1643. In your plan you have got the same distance opposite the Houses of Parliament that you have in other parts of the river. Now, suppose it were intended to take a road outside the present terrace of the Houses of Parliament, your scheme would very much interfere with that, would it not?—You would have a narrower river to that extent of course; but I look upon the line of quay of the Houses of Parliament as a fixed line.

1644. That was the line which guided the line of the northern embankment; but looking at the future, it is possible that it might be desirable to carry a road forward along the front of the Houses of Parliament to Pimlico?—If you are to have the river a certain width, you must not expect to get a road on both sides of the river. You must, of course, limit your width of waterway.

The witness withdrew.

Mr. J. Lightfoot.

Mr. JOHN LIGHTFOOT examined.

1651. (Chairman.) Are you a civil engineer?—No; I am an architect and surveyor by profession, but not in practice for myself.

1652. Will you have the goodness to describe your plan to the Commissioners?—I may perhaps first of all say, that it is more in the form of a general idea than of a detailed plan to be carried out, because I have not had sufficient time to study it as it should be studied; but if I first read the statement which I have prepared, giving a general outline of what I should propose, it will not take very long, and may in the end save your time.

1653. Will you have the goodness to read it?—“To the Honourable the Commissioners of the Thames Embankment. My Lord and Gentlemen, It is with very great regret I am unable to submit for your consideration more finished and comprehensive drawings than those I have ventured to lay before you, but guided by an impulsive feeling to make known the ideas which sprang up in my mind at a time when a complaint of the foul gases arising from the river was loud and earnest, and a steadfast impression that those ideas, worked out, would undoubtedly remove and prevent the recurrence of such complaints, has led me to lay before you such crude and unfinished and incomplete data for forming an opinion, that if they should be considered to be well conceived, they might be provided with the attention to make them thoroughly complete as a scheme for a Thames Embankment. My duties have entirely prevented me from doing more, and I trust that as I have used my utmost exertions in doing it, that they, with the accompanying details of

1645. Would that materially interfere with your plan of reducing the width of the river?—It would throw the road a little further back; but I must mention that if a road is desirable on the river side, you cannot have the road and the docks within unless you get a good space, as you will see. The reason for not making a dock here and at one or two other points is, that you really have not got width enough to make the docks of much use. If you do not make the docks of something like 150 feet width, so that the barges can turn in them, the docks will not be of much use to the wharfingers.

1646. The point to which I refer would be nearly opposite to that which you propose to make solid, namely, just above Westminster Bridge?—To get under Westminster Bridge, I go 60 feet outside the abutment. I cannot rise by an embankment over the bridge, so that I am forced to go out that distance to get the road under the bridge.

1647. There is another question strikes me, namely, that you take two arches and a half of Waterloo Bridge; that would be the destruction of Waterloo Bridge, would it not, so far as the appearance of it is concerned?—If you had the river in its original state to deal with, you perhaps would not adopt a plan like that; but you have bridges and wharf property and new roadways to consider, so that any plan must be a compromise between one thing and the other. You must get past the bridges if you are to have a road there, but at the same time you must not destroy the wharf property.

1648. If you did not take two arches and a half, you would have space enough for the docks inside the road, I presume?—I might bring my road to the second pier, but to do this I must either have the pier outside the line of embankment, or I must make a twist in the road by putting it inside the pier (pointing to the plan).

1649. Then you would not have space for your dock?—I should there. I have got plenty of room there; this being such a very wide part of the river, I can afford to lose that space.

1650. (Chairman.) Have you anything further to add?—No.

the plan forwarded on the 13th proximo, may not be laid aside by reason of the length of time that has elapsed since that period. Not to unnecessarily occupy your valuable time more than is really needful, I will endeavour in as clear and as concise a manner as I am able, to describe the improvements and intentions proposed to be effected in my design. Firstly, to provide a suitable embankment; secondly, to improve the land traffic; thirdly, to improve the waterway traffic; fourthly, to purify the river; fifthly, to improve the wharves; sixthly, that the works should be executed without any special taxation; seventhly, that such an income should be obtained, as would liquidate the debts, and provide funds for further improvements at a future period. Firstly, with respect to the embankment, I propose that as it has now been determined that the river shall be embanked, that while providing for the proper carrying out of such works of really public utility as the importance of the subject requires, the opportunity of redeeming the character of London, from being one of the ugliest cities in the world should not be lost. To accomplish this end, I propose to construct the embankments shown in the plans, the same to be extended hereafter as far as the progressive spirit of the age may render it requisite and necessary. The construction would be of brickwork faced with granite or stone, and raised to a level of 6 feet above high-water mark. Upon this embankment the structures shown in the detail drawings would be erected to a general level approximating as near as possible with the various bridges, and extending on the north side from the Tower to Westminster, and on the south

side from Princes Street, Rotherhithe, to Westminster Bridge. The portion from the Tower to London Bridge would be carried on columns, at any rate, immediately opposite the Custom House, the other, together with the portion extending on the north side, to near Blackfriars Bridge, and also returning from thence on the south side to Princes Street, would be used for warehouse purposes, the remaining portion, excepting where fronting any public or other building which might be considered of sufficient architectural merit or importance to leave open to the river, would be devoted for the purposes of retail trade, with warehouses in the rear abutting upon the docks. Immediately opposite the Temple I propose to erect a building, as shown in the detail drawings, to serve for the purposes of a hall and club, with the necessary offices to be presented to the Benchers and members of the Inns of the Temple as a compensation for any injury they might be supposed to suffer in consequence of the embankment. To break the monotony of the sky-line, the buildings shown at the extremities of the wing and in the centre are proposed to be erected, which being surmounted by sculpture would present an agreeable appearance. In the centre I propose should be an arch dedicated to Justice, and flanked by lesser buildings used respectively as a clock tower and police observatory. The appearance of the building from the garden would be similar to that from the river, excepting there would be a colonnade of a convenient width to permit of promenade to be taken during the wet weather. The shops would also be protected by a similar colonnade, and would be fitted with every modern convenience. The warehouses would likewise be protected by a covered way, where the width of the embankment would permit such to be done, for loading and unloading; the smoke would be conveyed as is herein-after described. I further propose that other police stations and observatories shall be erected at convenient distances along the entire route of the embankment, and connected by telegraphic wires with every station throughout London. And also to provide for the inhabitants of the low districts bordering the south side of the river, such institutions as may be of an improving and beneficial character, namely, libraries, reading rooms, baths, wash-houses, and places for public worship. Owing to its enormous population, and the great extent of land which it covers, London, with all its parks, does not provide for many thousands of its people such healthy promenades as the Boulevards at Paris offer to the inhabitants of that city; I therefore propose to create a waterside promenade, as shown on the plan, which, if thought desirable, might in places be planted with shrubs and trees, with fountains at short intervals; but the object in view is more to provide a space of sufficient length and breadth to permit of the full enjoyment of what would, undoubtedly, become a favourite place of public resort. The surface would be covered with either fine shells or gravel, it not being proposed that vehicles or horses should be permitted thereon. The roadway in the rear to the warehouses would have a tramway of iron, and be paved in the usual way. It is also suggested that inasmuch as preaching in the open air is so much practised, structures termed crosses should be erected for the convenience of the preachers. Secondly to improve the land traffic,—The roadway would extend on the north side from the Tower to Westminster Bridge, forming a direct line and connecting the two extremities (east and west) of London on the north side of the river, and would be approached from the various bridges, and also from some of the adjacent streets. In connexion herewith it is also further proposed to form a new line of street directly opposite Saint Paul's Cathedral which would form a direct communication with Islington and its neighbourhood, and also a continuation of New Earl Street, Cannon Street, extending on one side to the Mansion House, and on the other to the embankment. The portion tinted red on the land is considered to be necessary to render the

roadway effectual in relieving the streets of some portion of the traffic, as unless the access thereto is made convenient it would be an useless improvement. On the south side the roadway would extend from Princes Street to Westminster Bridge, and would be approached similarly to the north side by the bridges and streets leading thereto. Stairs would be formed at convenient intervals leading to the promenade and wharf roads. It is proposed to continue the roadway to Princes Street, which if the park proposed to be formed in that quarter is carried out would form a good carriage-way thereto, and on looking at the maps it will be observed to be much required. Thirdly, to improve the waterway traffic.—It is proposed to form docks extending nearly along the entire line of embankment. The river immediately in front of the locks would be dredged out sufficient to permit of the entrance of vessels at all times of the tide. The occasional flow of water from the locks between the tides when low would tend much to keep the channel clear, which in carrying out a scheme of this nature would perhaps be all that was necessary, it being supposed that the water would not be disturbed so much by reason of there being fewer steam boats as the land communication would doubtless effectually compete with and drive off the greater number, at least those which plied between London and Westminster Bridges. The interference with the present wharves, the underpinning of the river walls, the probable rebuilding of many, and the compensation to the owners has been stated to be a great reason for not undertaking a general system of embankment. It is therefore proposed not to interfere with them in any way, excepting as herein-after stated, and when absolutely necessary for communicating with the land, and as they are easily approached at certain times of the tide, at present it would be rendered unnecessary by the confinement of the water within the embankment. The gates of the different locks would be worked by steam power, which would also render aid to vessels in their entering. Note.—I believe that in consequence of the proposed construction of the sewer in connexion with the embankment the entrance of vessels could not take place until a certain time of the tide. Fourthly, to purify the river.—It is proposed to construct in the embankment, as shown in the sections, receptacles into which the sewage would be conveyed by extending the present sewers (or in such other way as would present itself as being the best) in the following way:—The receptacle nearest the dock wall would first receive the sewage, which, when it had obtained a certain height, would allow the liquid to drain off into the other receiver; this receiver would be divided at one end by open cast-iron partitions, between which would be placed, in vertical layers, pebbles, coarse gravel, and charcoal; from this portion it would (having become somewhat clear) be pumped into the docks for the purpose of creating a current. To prevent the water in the docks becoming stagnant, channels would be formed through the embankment, or the locks opened, so as to permit of a change of water taking place. The receiver would be constructed with outlets near the top as a precaution against violent storms, and which would be above high-water mark. These receivers would be ventilated by means of a channel which would be connected with the chimney shaft of engine. The first receptacle of the sewage would also have a partition, but of brickwork, with an opening at the bottom permitting the influx of the semisolid sewage for the purpose of being pumped into vessels constructed for that especial purpose (with air-tight holds) for conveying it away. The vessels would likewise be fitted with pumps and steam power, which would also assist in their propulsion and navigation. By adopting these means it is expected that the sewers in the lower districts might be kept constantly clear, and would be entirely shut off from the action of the tide. This becomes necessary, inasmuch as the formation of docks will entirely destroy the drainage of

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the low district. The sewers being continually full of water, the solid matter would not be carried away; and again, as it is stated that many of the houses are below high-water mark, they would be kept in a continual damp and unwholesome state. It therefore becomes imperative to contrive some means of preventing such an evil attending so important an improvement. The chimney shaft would be treated in an ornamental style, or rather, monumental character, and would be connected with the furnace of steam-engine by an underground shaft. The smoke from the various buildings would be conveyed into a larger flue, as shown in the sections, and, together with the ventilation flue of sewage receiver, would be brought directly under the furnace; and by means of pipes the smoke and gases would be conveyed into the furnace and there burnt. In proposing the foregoing scheme for the collection of the sewage, it has been considered as a matter of the greatest importance that it should, if possible, be returned to the land. That it might be done is indisputable; it therefore becomes a question with the public whether it shall be done. That the sewage is valuable as a fertilizer has been a recognized fact for years, and it therefore resolves itself into a question of the cost of producing an article that would be so valuable to agriculturalists. The accompanying comparative statement shows the opinion of some of the most eminent chemists and agriculturalists of the day as to the value of the sewage. Professor Liebig states, the price of nitrogen only produced by 100,000 persons is 12,000*l.* per annum, which reckoning the population of London at 3,000,000, would produce the sum of 360,000*l.* per annum. Mr. Edwin Chadwick estimates the value of the sewage at 1*l.* 17*s.* 0*d.* per head, which would produce 5,500,000*l.* per annum. Professor Johnson states the value to be, for every 100,000 of the population, 223,000*l.*, which would amount to 6,690,000*l.* per annum. Mr. Lawes estimates the value of the dry only at 6*s.* per head, which would be 900,000*l.* per annum. It therefore appears to be a subject demanding the greatest consideration, whether it cannot be made to contribute towards the cost of the embankment. Fifthly, with regard to the improvement of the wharves,—I would suggest that they should be placed under the surveillance of a Commission (entirely distinct from the Metropolitan Board of Works), aided by professional gentlemen, and that an Act of Parliament should be framed to regulate their construction, with power to condemn when in a bad or dangerous state, and also to grant monetary assistance for the purpose of effecting improvements to be returned in the form of rent chargeable upon the premises. I would suggest that the works should be carried out under the direction of a special Commission appointed by the Government, the money to be borrowed for the purpose, and repaid from the profits arising from the rental of the buildings and the sale of the sewage. Sixthly, with regard to the execution of the works,—I would propose, for the purpose of expediting as much as possible their execution, they should be carried out in sections by different contractors, under the direction of a Commission appointed for that particular purpose. And, seventhly, the Government to provide the money; and the profits arising from the rentals of the various buildings, and the produce of the sale of the sewage, after a sum had been set aside therefrom every year as a sinking fund towards the liquidation of the debt, should be devoted to further improvement of the banks of the Thames. And for the greater convenience of the traffic, a system should be determined upon for the regulation of those vessels entering and laying at anchor in the river way. No vessel to be allowed to come into the pool or above unless about immediately to discharge or take in a cargo. The wharf from London bridge to the Tower to be devoted to the sea-going vessels, that now load and discharge from there.

ESTIMATE OF COST.

	£	£
Estimating the total of cost at 200 <i>l.</i> per lineal foot, the portions extending from London Bridge to Westminster Bridge would amount to the sum of	—	5,200,000
For the purchase of Southwark and Waterloo Bridges	—	900,000
The rentals of buildings averaging 100 <i>l.</i> each day, which would amount to the sum of	136,800	—
Estimating the net value of the sewage at	351,200	—
Being 8 per cent upon the gross outlay	488,000	6,100,000

"In conclusion, I would add that the object in the design has been not to injure any class for the benefit of another; and I think that by providing the commodious docks extending nearly the whole frontage of the river, the wharfingers, as the parties most directly interested, have had their interests studied, and would have their conveniences vastly improved for the purposes of commerce. The inhabitants of the south-side would be relieved from the nuisance of tide-locked sewers and occasional floodings, and would have given to them delightful recreation ground and beneficial institutions. The crowded thoroughfares of the city would be relieved, and the sewage, so great a source of complaint, effectually prevented from any longer contaminating our noble river and turned to the only proper and good purpose, namely, returning to the earth from whence it came. The river would present an appearance that could not be equalled by any other city in the world, and portions might be of such a character that the favoured cities of Italy could not surpass." Those are all the remarks I have written, and I shall be happy to answer any questions which the Commissioners may think proper to put.

1654. (*Capt. Burstal.*) I think you propose to have a road and embankment below London Bridge, occupying the space of the present tier down to the Tower?—Yes.

1655. How do you provide for the business of the river there?—I propose that there should be a dock, as shown, there for the admission of small craft, but the large steam-boats and sea-going vessels should lie alongside, though not in such numbers as they do at present, because they would come very nearly to the middle of the river.

1656. You would necessarily restrict the number of ships that could make use of that part of the river Thames below London Bridge?—Yes.

1657. And that do make use of it now?—Yes. I noticed six large steamers there yesterday morning, and they stretched out a very long way.

1658. Are you aware that there has been a demand for more accommodation for large steam vessels, more particularly this year, in consequence of the Great Exhibition?—Probably; and as there would be an embankment on the other side, that would provide accommodation for some of them; but there are various docks here, the Victoria Docks, and so on.

1659. Have you communicated to the Steam Navigation Company your views?—No, I have not; but what I did do was to call the attention of the South-eastern Railway Company to this portion extending from here to here; if that was built as an embankment, as shown upon one of these sections, there might be a railway constructed directly to that point, which meeting the curve there would go in that direction (*describing the same on the plan*).

1660. On the south side below London Bridge you would have an embankment and roadway in front of the wharves?—Yes.

1661. How would you carry on the business of those wharves?—The railway would be above the ground level; that is, at almost the same level as the railway is at present. My plan was more to show what might be done as a remunerative scheme for the embanking and beautifying the shores of the Thames at London.

The witness then withdrew.

Mr. WILLIAM AUSTIN further examined.

Mr. W. Austin.

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1662. (*Chairman.*) Do you wish to add anything to the evidence which you gave upon a former occasion?—I had the honour of submitting before your Honourable Board on the 6th May last all that was requisite or desirable to submit, and I have nothing further to offer in connexion with my plan; but I can give the details of the plan upon which I was then examined, if you desire it.

1663. Then you have nothing new to offer with respect to the southern embankment?—My plans embraced the north and south both; it is detailed in the former plan, but I should be very happy to answer any further question upon the subject. What I simply want now is to show the *modus operandi* of carrying out my principle of masonry; I believe it to be a new feature of bonding. I have received from some of the first engineers of the kingdom approbation of my plan, "that it is novel, and that it is wanted for great public works;" and if the Commissioners will allow me, I shall have great pleasure in explaining it.

1664. What we have to consider now are the principles of an embankment to be carried on the South side of the Thames, and where that embankment should be placed. We do not wish to go into any details of construction?—In repeating my evidence, I should be only giving that which is already detailed in the Book of Report; I think five minutes explanation will be sufficient, and it may be only for the want of that explanation that my plan may not be chosen.

1665. Will you explain what you wish to state in as few words as you can?—This is one of my plans for dovetailing walls together either in large or small masses; but it applies more particularly to such works as vertical or horizontal shafts, which, when placed once in position, can never get away from each other,—they are immovable. The ideas are original, and my own. I was engaged for 17 years with Sir Morton Peto, and I have been altogether 32 years engaged on some of the largest works in the kingdom, and it is from that experience that I have matured my ideas as a practical working engineer.

1665a. Have those things, the models of which you have produced, been adopted on any works?—I have not had an opportunity of introducing them for want of capital. I have had my employer's business to attend to, and that has taken my entire attention. I propose using them in connexion with vertical shafts, and horizontal tunnels. This iron-ring cutter forms the first sinking curve, on which the next piece or ring of masonry throats and tongues. Each of these models are represented in ring or circle series. This shows a complete vertical ring; they slip into each other either up or down, and it becomes fixed and immovable masonry.

1666. What are those circular holes?—Those holes are for the convenience of lowering into the work, and making the blocks stronger by having two arcs or orifices in them; and they form bond, if ties are considered necessary, for vertical work, or for driving a heading. Thus we have the advantage of introducing the dowell tie or key. This dowell goes in the form of a key from one end to the other. It is novel in masonry. This is the material of which I propose making them (*exhibiting the same*). It is a recent introduction of Mr. Ransome of Ipswich, a gentleman well known in the scientific world. The

material could be produced in blocks of any size that would be required; and they would form vertical shafts, or horizontal shafts, or culverts, or tunnels, of any size or calibre.

1667. (*Capt. Burstal.*) Have you patented this invention?—Yes, but unfortunately, I have not had capital sufficient to hold on; I was obliged to let it drop. This is the application in another form (*exhibiting models of the same*). I had the honour of showing this to the honourable Chairman, the Lord Mayor, when I was last here, and I call your particular attention to this mode of getting out masonry blocks, by forming a groove in the bed or joint faces of each, and then tonguing them together, either for embankment work or for docks, or for forming breakwaters, or river or sea walls where an immense pressure comes on either side.

1668. (*Mr. Hunt.*) Available also for graving docks?—Yes, for graving docks, or more especially for river walls. The bond forms one complete lock; if you turn it round it forms as you see a staircase, for landing from the sea or river side.

1669. It is rather expensive, is it not?—No; the whole would be worked out by a machine cutting the grooves in the blocks in the quarry. It might have emanated from a child as to its design for simplicity, but for strength I fearlessly challenge it. I was complimented the last time I was in this room by the Lord Mayor, who said "it was one of the best things he had seen for years." His Lordship's opinion was voluntarily given. I consider the embankment walls should be constructed on both sides of the Thames, and carried throughout so as to be a great national work, and that it would pay itself most handsomely. The minimum I calculate that the embankment would pay, would be at least 10 per cent clear profit.

1670. (*Capt. Burstal.*) Do you propose that the material of which the embankment is to be composed should be this Ransome's Patent Stone?—Yes. It is made principally from chalk and sand; it is very beautiful as a building material, and very strong, and it has been tested against Portland, and has borne three times the strain and weight that Portland stone will bear. I do not exaggerate, as Mr. Ransome's assertion and written statement confirms it. It is for the object of securing a good article deserving patronage that I have been pausing in my project. These blocks are cast in iron moulds, and when once put together they are inseparable and indestructible. I do not believe that sewage will ever destroy them; it will destroy brickwork and ironwork. Mr. Hunt must have seen in his great experience the immense destruction of iron pipes by action of the sewage; I am not speaking out of prejudice, but only asserting (as a practical man) "that iron pipes will never do for sewage, nor will ordinary bricks ever do for sewage for permanent conduits or discharge tunnels."

1671. (*Chairman.*) We are much obliged to you for your explanations.

Mr. Austin concluded by saying, I am endeavouring to get this plan introduced for a double shaft to mines and coal-pits, so as to prevent those horrible accidents in collieries, &c. I would undertake to go two or three miles deep with them with perfect safety of construction and working of machinery, &c.

The witness then withdrew.

Adjourned.

Thursday, 6th March 1862.

PRESENT :

The Right Hon. the LORD MAYOR.
Major-General Sir JOSHUA JEBB, K.C.B.
JOHN THWAITES, Esquire.

Captain D. GALTON, R.E.
Captain BURSTALL, R.N.

The Right Hon. the LORD MAYOR in the Chair.

Mr. H. Turner.

Mr. HENRY TURNER, examined.

6 Mar. 1862.

1672. (*Witness.*) I should have been better pleased if the Commissioners had not thought it necessary to go into the question of the embankment again; it has obliged those who take an interest in it to go twice over the same ground; but as it is so, I wish to impress upon them the re-consideration of the lines of embankment, which, so far as I can see by your plan of last year, are not likely to be laid down in the best direction.

1673. (*Chairman.*) Do you wish us to revise the last year's work?—No, my lord; but from your fixing last year a certain line on the north side, I imagine you must have considered also the south side to a certain extent. The principal point that I look at is the embankment. I am aware that the great consideration with many is the street communication, and that the navigation of the river is rather to be looked upon as a secondary matter. If any one takes the trouble to look to the history of the metropolis, they cannot come to any other conclusion than that the river is the great source of its wealth; and although by the proceedings of past generations many acts have been committed not at all beneficial to the navigation of the river, it does not follow that future generations are to take the same course; so that, perhaps against hope, I again appear to press upon you a consideration of other lines.

1674. You have presented us with a plan showing your notion of what a south embankment ought to be?—Yes.

1675. Perhaps you will be so obliging as to describe it to us by word of mouth. You have no manuscript, or letter press, I believe?—No; I think I can explain it from memory. I have no copy of the plan.

1676. On looking at the plan which lies here, it seems that you begin your embankment a little way above the new Lambeth Bridge. Yes. Of course that river line of mine cannot agree with yours. I have laid down a line on the north side that regulates, at the part of the river which is most material, the contour of the south side; but, taking the south side, you will find it is one continuous line from the point you mentioned, near Lambeth Bridge, nearly parallel to the terrace of the Houses of Parliament to Westminster Bridge, at the point where the new arch on the south side ends.

1677. Bringing the width of the river down to 800 feet?—I think it is more; it is a similar width to what is suggested at Waterloo and Blackfriars Bridges, or thereabouts; my object is to get not an uniform width, but as near that as the circumstances of the river will allow without a great sacrifice of property.

1678. Does your line on the Middlesex side correspond with the line recommended by us last year?—No, not the outer line.

1679. You go further into the river?—I think, if you take the back of what I propose as docks, you will find it very near your line.

1680. Then you propose to carry out your embankment wall about 200 feet further to the river?—It is not as much as 200 feet I think; at any rate it is to the third pier of Waterloo Bridge.

1681. (*Sir Joshua Jebb.*) It is nearer 300 feet; it is three arches instead of one; we take the first arch, and you take the third?—I take the back of the third, the northern side of it.

1682. (*Chairman.*) Then supposing any revision of the scheme recommended last year, and which is now before Parliament, to be impossible, would you

still recommend doing what you have shown on the south side?—Decidedly. On this ground, that the probability is, or at least we may hope, that people will grow wiser, that the knowledge of the proper method of managing rivers will be more extended than it is at present; and then, if you carry your line on the south side so as to afford a means of alteration on the north, you can beyond your own present line obtain those outside docks which I think a great feature in the commercial employment of the river.

1683. Then we are to understand that in your opinion the scheme that we recommended and laid down last year may be superseded hereafter when people grow wiser?—Yes.

1684. May I ask you upon what that opinion is founded, is it upon your own experience as a nautical engineer?—Upon the principles that regulate the management of streams, which I have been in the habit of thinking of, and looking to for the last 30 years as an engineer.

1685. Have you ever been employed upon rivers?—I have not been employed upon any river works at all. I speak only theoretically.

1686. Then you come up here to set up your original genius and your notions against the experience of the Commissioners of last year?—I come here to express my opinions upon the points that the Commissioners have expressed theirs upon, and which differ from theirs.

1687. You have told us that you have no practical experience on tidal rivers. May I ask you, as a civil engineer, on what branch of the profession you have been chiefly employed?—I have not done any works that may be called engineering.

1688. Then I think you had better accept our thanks for coming here, and let us go on with another witness? If you will not receive my opinion upon the river, perhaps you will allow me to explain the streets. Although not living in London, for many years I have paid great attention to the means of communication. I am speaking from memory, but I think you will find a suggestion of lines of streets there which will afford relief to the traffic that is now so clogged in getting from Westminster to the middle of the City of London. Taking advantage of certain existing streets, there is a proposal of a line of street from the end of Southwark Bridge to pass in nearly a direct line to the end of Westminster Bridge.

1689. A diagonal line from Southwark Bridge to meet what you have written down here as the New Cut, and then a short bit cutting off an angle now formed by Bridge Street and the New Cut?—Yes.

1690. No doubt it is very desirable that it should be done if you will show us where the money is to come from to clear away existing property. It is very easy to lay down a new street, but there are conditions of a pecuniary nature?—You would not allow me last year to speak about where the money is to come from; I can only say that the same fund which is now proposed to be applied to the purpose would be sufficient to execute the whole of this scheme.

1691. (*Mr. Thwaites.*) Just show us how the existing fund would be sufficient for the purposes indicated upon that map?—There is a fund of somewhere about 130,000*l.* a year; am I not right in that? I am speaking altogether from the report that I have seen. By the purchase of Southwark Bridge toll you render that which is now comparatively unused a

main artery of communication. The properties that I have laid a new road through are properties of a much less value than those mentioned in your suggested alterations, and therefore I am keeping upon safe ground when I say that it is a feasible scheme.

1692. What is your estimate of the cost of the streets?—The streets I have not estimated for, because that is a work not of a day or a year. I have sketched out what would be a work for probably two generations. It seems to me that the fund now applied to the purposes of the improvement of streets is an ample fund for the purpose.

1693. You see you do not understand the fund evidently; you do not understand the pecuniary question; there is no fund applied for the purposes of forming streets.—There is a duty arising from coal.

1694. That is not applied to the formation of

The witness withdrew.

Mr. JOSEPH FAIRFAX examined.

1711. (*Chairman.*) What are your antecedents?—I am an engineer at present.

1712. A very young one?—Yes.

1713. How old are you?—19.

1714. Do you think you can tell the Commissioners anything that will be of any assistance to them? Perhaps you had better read your paper?—

"I propose to construct a solid embankment, with roadway, commencing at the end of Bankside, to be carried underneath Southwark Bridge, Blackfriars Bridge, Waterloo Bridge, and Hungerford Bridge, and to run into the Belvedere Road at Westminster Bridge; from there the traffic could proceed down Stangate, at the end of which the embankment would again begin, and proceeding in front of the existing wharves would terminate at the eastern side of the London Gas Works, near Vauxhall Bridge, where it could be led into Princes-street, by cutting a short street. The roadway could be led into Holland-street, and a communication made with the embankment on the other side of Blackfriars Road, thus avoiding the necessity of going under Blackfriars Bridge; but I prefer the former plan. And I also propose to raise the existing wharf walls the same height from Trinity high-water mark as the embankment, viz., 4 feet 6 inches from Vauxhall to the embankment of the Southwark waterworks at Battersea on the one hand, and from London Bridge to Rotherhithe on the other. The roadway is to be 50 feet wide, with footpaths 10 feet wide each, making the embankment 70 feet wide in general, though in some places it may rather exceed this, having at intervals, as many as should be required, jetties for landing goods."

The witness withdrew.

Mr. HENRY WYNDHAM SICH examined.

1726. (*Chairman.*) Will you please to tell us something of your antecedents?—I was a pupil of Mr. Tierney Clark, and was employed with him until his death; subsequently I have been in the Crimea as engineer to Prince Woronzoff.

1727. Will you be kind enough to describe your plan. You have no manuscript or letter-press description, I suppose, of your plan?—No; I thought it was unnecessary.

1728. Will you be good enough to describe it in your own way?—The kind of arrangement I propose extends, as I have indicated, only from Lambeth Bridge to Blackfriars; either above or below those points I think the river narrows so very much that it would be unsuitable. In the first place I propose an extension of the present wharves, so as to form a tolerably uniform line towards the river; that you will see indicated by this yellow tint; that would be bounded by a retaining wall, four feet above Trinity high-water mark. For the accommodation of barges and timber rafts I propose a barge bed, paved at a certain inclination; when I say paved, I mean merely

streets.—That I understand is to be applied to the improvement and embankment of the river, and the formation of new streets.

1695. It is tied up in the embankments of the river, and will not be sufficient.—But including those streets. As far as I understand, it includes the proposed new street from opposite the Bank to the end of Blackfriars Bridge shown upon your own plan. I am suggesting a line which saves that. Instead of going through the valuable property there, I am proposing that you go much lower down; but if the points are so far settled, I do not see any good that I can do here by going into it further.

1696-1710. (*Chairman.*) I quite agree with you.—My main reason for offering the plan was, that I might have an opportunity of appearing before the Committee of Parliament sitting upon the matter.

1715. (*Mr. Thwaites.*) Do you fill in solid embankments between your wall and the piers?—Yes.

1716. (*Captain Galton.*) You would have to purchase all the wharf property, would you not?—It would run into the river a great part of the way.

1717. How would you do with respect to the existing wharf property?—I do not think it would interfere with that much.

1718. Not if you made a footway in front?—No.

1719. Is it a footway or a roadway?—A roadway.

1720. Do you propose to make use of the roadway as a wharf as well as a road?—The jetties would answer for landing goods.

1721. Why do not you pass your roadway under Westminster Bridge?—I think the traffic would not require it there.

1722. You think there would be no traffic in that direction?—There would not be so very much to go under there; it would principally go over Westminster Bridge, I have no doubt.

1722a. You do not propose to carry any embankment, then, beyond the gas works?—No; but merely to raise wharf walls.

1723. (*Chairman.*) Are you associated with any engineer at the present time?—No; I am a mechanical engineer.

1724. Then you are not carrying on your profession with any person?—I am merely a mechanical engineer.

1725. How do you carry on your business?—I am employed by Mr. Simpson.

laid with hard material at a certain inclination towards the river, extending out as shown by the brown tint. It would be at the outer extremity four or five feet above low-water mark. For the accommodation of the public, I propose a viaduct on the suspension principle in spans of 200 feet each, running from Bishop's Walk to Blackfriars Bridge; you will see the levels indicated upon that section. I do not think they are very heavy. I adopted that arrangement principally from noticing the kind of accommodation that the large rafts of timber would require. I did not think that any system of docks would be suitable for them. I do not know that I have anything to explain further.

1729. Then you propose, for the sake of the river itself, I presume, to carry out the existing wharves so as to get an easy line, as shown there, with a retaining wall coming up four or five feet above Trinity high-water mark, or something of that sort?—Yes.

1730. And then at a lower level what you have properly described as a barge bed, in which the barges and the rafts of timber would lie, or anything

Mr. H. Turner.

6 Mar. 1862.

Mr. J. Fairfax.

Mr. H. W. Sich.

Mr. H. W. Sick.

6 Mar. 1862.

of that sort, the outer edges to be sustained by piling?

—Yes.

1731. Then that would be four feet above low water?—Yes.

1732. Then you have a carriageway and footways upon what might be considered a longitudinal suspension bridge?—Just so.

1733. A suspension bridge leading all the way along by the edge of the river, from Lambeth Bridge to Blackfriars Bridge?—Yes.

1734. With piers 200 feet apart; and then, according to your plan, you would offer no obstruction to the existing use of the wharves all the way along, except for 200 feet apart, where your piers come?—Just so.

1735. And the surface of your barge bed would be formed of hard material, which you expect would keep clean. I presume there would be no deposit of mud there?—To help the downward tendency of the mud.

1736. It would give, in some places, a considerable addition to the existing wharves?—It would.

1737. Have you gone at all into the question of expense?—Yes, 400,000*l.*

1738. Do you suppose that the wharfingers, or the owners of the wharves would contribute anything in consideration of their getting additional space?—I should think it would be fair to ask them to do so.

1739. Let me ask you what advantage would be derived to the public from this?—The advantage of a carriageway along the shores of the river; that I think is an essential advantage.

1740. Are you aware that it would be nearer to go by the existing streets than it would be to go by your new road?—Certainly, I am aware of that.

1741. Then what good would it be to the public?—I understood that was a point especially to be noticed by those who sent in plans.

1742. And it was more because you thought you were called upon to contrive a road than from any notion of its necessity?—Or its great utility. It was, as your lordship puts it, that I considered myself as being called upon to propose it.

1743. Rather more than for its great utility?—Certainly.

1744. How much do you narrow the river in the part where you extend the most into the river; how far do you go from the banks?—Where I extend most would be at this point at Hungerford Bridge; I can scarcely see the figure.

1745. I do not mean the bottom of the barge bed; I do not refer to the brown line, but the yellow line?—I do not think at any place it would extend more than fifty feet into the river.

1746. Then, in fact, you would add somewhere about fifty feet to the existing wharves?—At the broadest part.

1747. Then you would either make them a present of that, or you would think it fair to ask them to pay something towards it?—Yes.

1748. (*Sir Joshua Jebb.*) I observe that you go over several of the bridges at the level of the road?—Yes.

1749. Would not the traffic rather interfere with the bridges?—Yes, I am afraid that would be a blot upon it; but that is unavoidable in point of fact.

1750. (*Captain Galton.*) What height is your roadway above Trinity high-water mark?—It varies in different places, in order to get up to the levels of the bridges.

1751. At the lowest part, I mean?—The lowest part would be just by Mr. Goding's brewery.

1752. That is ten feet?—No; six feet six inches, at the under side.

1753. Then barges could only pass under it at that point when the water was low?—six feet six inches at high water.

1754. Barges with masts, for instance, could they pass?—I am afraid they will be stopped at that part of the river.

1755. Would there be space for barges to lie between the embankment and the roadway sufficient at all points?—At the point where that is taken it is fourteen feet above Trinity.

1756. Is the distance from the new line of wharf to the bridge shown upon the section the same distance throughout?—Very nearly so; I have made it as nearly as possible so.

1757. That distance is how much; you allow about twenty-eight feet, I think?—Twenty-eight to thirty feet I was going to say.

1758. Have you formed a separate estimate of the cost of the bridge and roadway, independently of the cost of embanking the land, or does your estimate of 400,000*l.* include the whole thing?—It includes the whole thing.

1759. Have you separated them?—Yes.

1760. Can you tell the Commissioners what the different items are?—The bridge would be 240,000*l.*

1761. From Lambeth Palace to Blackfriars Bridge?—Yes.

1762. Do you remember how many spans there are?—There would be thirty spans.

1763. Of two hundred feet each?—Yes.

1764. And you think 240,000*l.* would be sufficient?—I think so; I propose to use iron wire cables.

1765. (*Mr. Thwaites.*) What is the separate estimate for the river wall?—The retaining wall along the present wharf in front of the present wharves would be 25,615*l.*

1766. Of what length is that retaining wall?—It would be 7,600 feet.

1767. That would be the length of the bridge?—Longer than the bridge.

1768. How do you propose to construct it?—When I said that sum I meant for the brickwork alone. There is the backing of concrete behind it to increase its stability.

1769. There is a concrete foundation, I suppose?—A concrete foundation and concrete at the back, a counter-fort continuous.

1770. Do you propose to face that with iron?—No; with brickwork.

1771. Have you made an estimate of the cost of the retaining wall, including the concrete foundations and embanking?—32,979*l.*

1772. And the barge bed?—Do you wish to include the filling?

1773. Yes.—Behind the concrete?

1774. Yes.—That would be 10,450*l.* in addition.

1775. For the whole of the filling?—Yes; up to the retaining walls.

1776. Then that would be 42,000*l.*?—Yes; not including the barge bed.

1777. What would be the barge bed?—The filling to the barge bed would be 9,074*l.*

1778. The whole cost of the formation of the barge bed is what?—The whole cost would be 32,839*l.*

1779. The barge bed?—Yes, that includes the camp shedding in front.

1780. There are but three items of expenditure, namely, the bridge, the retaining wall, and the barge beds?—Yes.

1781. (*Captain Galton.*) Those sums do not make up 400,000*l.*; you have given us 240,000*l.*, 42,000*l.*, and 32,000*l.*—No; they make up 316,000*l.* Then I have allowed ten per cent. for contingencies; then I have put down a sum for the saddles upon the suspension bridge, and I have put in the estimate a lump sum for compensation, and so on, making an extra sum of 50,000*l.*

1782. Then the Suspension Bridge altogether will be what?—I can scarcely separate the sums at this instant—I may say about 270,000*l.*

1783. For the Suspension Bridge?—For the Suspension Bridge.

1784. That is complete?—That is complete.

1785. (*Mr. Thwaites.*) I suppose, taking your scheme as a whole, you are of opinion that the wharfingers would not be entitled to compensation?—Decidedly not.

1786. Do you think that you would improve their position by the scheme you propose?—I think so. I think the barges would lie in a much better position. They would have an extension of their present frontage, without being too far from the river, and I think

they might be called certainly to maintain the camp *Mr. H. W. Sick.* shedding in front.

1787. What camp shedding do you refer to?— *6 March 1862.* There (*pointing out the same*).

The witness withdrew.

Mr. WILLIAM PAICE examined.

Mr. W. Paice.

1788. (*Chairman.*) You, I believe, are one of the firm of Wilkins and Co., as I see by your evidence of last year?—I am.

1789. Are you a mechanical or civil engineer?—Mr. Wilkins was originally a civil engineer, but he has retired from the profession.

1790. Is he carrying on works somewhere?—He was, but he has retired now, in fact many years. I, through his assistance, got the plans out under the name of Wilkins, Paice, and Co.

1791. You are now carrying on business somewhere?—I am an architect. I have been practising in Temple Chambers, Fleet Street, for the last twelve months.

1792. Are you not now associated with any engineer?—No, I am not.

1793. Then is it as an architect that you have gone into this matter, or as an engineer?—Well, I cannot exactly explain that. I am an architect myself, but that is an engineering scheme. I have a short report here, and if you please I will explain it.

1794. You had better do so?—"The embankment for the south side of the Thames is proposed to extend from the north side of Westminster Bridge to the west side of Hibernia Wharf, and to be about seventy feet wide, enclosed by a river wall of brickwork, faced with granite, backed up with concrete as shown in section, carried not less than four feet above Trinity high-water mark; a solid embankment would be commenced at Westminster Bridge, and to which an approach can be obtained by the removal of and the formation of a road on the site of the seven houses situate between Westminster Bridge and Belvedere Road, the new road then to pass over the stairs, at the foot of the bridge, on to the embankment. It will then commence at four feet above Trinity high-water mark, and proceed with an incline of 1 in 400, until it has passed under Hungerford Bridge; it will then have reached a height of seven feet above Trinity high-water mark. The roadway would then run on wrought-iron plate girders, on granite piers about fifty feet apart, and raised to a height of about sixteen feet above Trinity high-water mark, to allow of the dock below, and to ascend and descend as the case may require, to and from, viz., Waterloo, Blackfriars, and Southwark Bridge, at the points of intersections, in order that the raised roadway may be brought on a level with the foot of each bridge. The embankment, on leaving Southwark Bridge, will have a fall of 1 in 60 to bring it to a level of four feet six inches above Trinity high-water mark, at which *datum* it will be continued, and with a gradual curve, and meet the new wall of Hibernia Wharf at London Bridge. By means of a raised roadway, a dock would be constructed beneath from midway between Waterloo and Hungerford Bridges, and terminate near Southwark Bridge, which would be of great advantage to the wharfingers, and which would materially increase the value of the waterside property. There would be eight openings in the embankment as entrances to the docks, viz., one at each end, and six intermediate ones with gates to retain the water. The docks would have a headway of about nine feet at high water, and the sill to and the bottom of the

“dock to be about five feet above Trinity low-water mark. As several entrances are intended to the docks, it is proposed to construct three cross walls through the docks at an equal distance from each other, in order that the gates may not have so large a body of water to retain, and also to enable the water to be retained in some compartments of dock where occasion may require. The space obtained between the river line of the embankment and the towing-path next the dock might, with great advantage and profit, be converted into offices, promenade, or model lodging-houses for the poor—a thing so much required in the neighbourhood—from Southwark to Hungerford, communications to the roadway above to be constructed about 300 yards apart. The three cross walls in dock will form a communication to the wharves, which if not found sufficient small iron space bridges might be thrown across. The shore of the river, from the foot of the embankment to low-water mark, to be dredged, in order to avoid the unsightly appearance that the Thames now presents at low water; the produce of the dredging will go far towards filling in the embankment. The east end approach to the embankment would be from the bottom of Wellington Street, as shown on block plan, coloured red, the intermediate main approaches would be from the point of intersections (viz., the foot of) Southwark, Blackfriars, and Waterloo Bridges, for the accommodation of the wharfingers between Westminster and Hungerford Bridges, and Southwark and London. Tidal basins might be constructed with great advantage at intervals, and to be made of sufficient width to admit a barge lengthways, and sufficiently deep for barges to float in and out at half tide. The road and footways over these basins can be carried on wrought-iron plate girders, leaving a space of 9 or 10 feet by the width of the basin, for the purpose of loading or unloading the barges thus brought alongside the wharves.”

1795. (*Captain Galton.*) Then you propose a long canal between Southwark and Hungerford?—Yes, it is a long canal.

1796. And you would do away with the existing shore between high and low water?—By dredging.

1797. You would dredge the whole down to a certain depth below low water?—Certainly.

1798. So that the barges would not bed as at present upon the shore?—No, there would be no occasion for that when the dock was formed inside the embankment, and also the basins.

1799. Would the dock hold the same number of barges as now lie upon the shore?—More.

1800. I see it is forty-four feet wide?—Yes; it would hold more in point of fact. Now there is only one frontage, then they would have one frontage of the docks alongside the wharves, and the other one formed in the place I have described, for a promenade.

1801. On what you called the towing-path?—I have no doubt of it; in fact, the dock would have two frontages, whereas now the river only has one.

1802. But the towing-path would be scarcely available for moving the barges?—No; to a certain extent it would not, if used for the purpose of loading or unloading.

The witness withdrew.

Mr. J. F.
Smith.

6 March 1862.

Mr. JAMES FRANK SMITH examined.

1803. (Chairman.) will you tell us what your profession is?—I am in practice, on my own account, as an architect and civil engineer. I have been eleven years in the profession, and was with my uncle.

1804. What profession?—The same profession, architect and engineer, with Mr. Flint, well known in the midland counties.

1805. In carrying on your operations, have you had much to do with tidal rivers?—None with tidal rivers; but I have had with rivers and canals, considerable.

1806. Will you be good enough to read your paper?—I may as well say that in my plan I have considered that the north embankment has been settled, and in all my arrangements I have followed that up, to correspond with the line of the northern side. "It is proposed to embank the south side of the river Thames, by a wall of the height and thickness described on the drawings, the water-face of such wall being of masonry, and the filling in of good sound brickwork, in hot-beaten or ground mortar; the footings to be built on the solid ground, and clay puddle, well tempered, and trodden in in layers as the wall is built, and in no place less than two feet thick, to line the back of the wall and round the counterforts. This wall would form a quay wall, and it is proposed to leave a space for a quay along the whole extent of the embankment, twenty or thirty feet wide between the new road and the river;" (that is, from Westminster Bridge to Waterloo Bridge, and from Waterloo to Blackfriars;) "the new road to be eighty feet wide and elevated above the quay, as shown on the accompanying sections, and high enough to obtain tunnelled roads beneath, from the quay to the wharf; and it is proposed to lay a tramway along the quay and in the tunnels, so that trucks may be run from the quay to the wharves with the greatest facility. It is proposed to build stepways from the quay to the new road, for the convenience of pedestrians and persons landing on the quay; these stepways to be 150 feet apart. No carriage road to be formed on the water or quay side of the new road. The whole of the retaining walls for the new road and the stepways thereto to be of iron, excepting the foundations for the columns, which are to be of brick and stone, on the solid ground. The retaining walls to be supported by wrought iron girders, on cast iron columns, twenty feet apart, and the stepways to have like supports; the whole tied together with wrought iron rods. (See section.) The ornamental balustrade along either side the new road to be of cast iron, pierced, and the ends thereof finished with cast iron pedestals of an ornamental design. Iron is preferred to brick or masonry, in consequence of its comparative cheapness. It is assumed that the scheme thus proposed would cost less than one fourth any other in which brick or stone would be employed for a similar purpose. It is proposed to make the road of an uniform width of eighty feet throughout, and the levels to be as shown by the accompanying sections." It would pass from the foot of Westminster Bridge under Hungerford Suspension Bridge and rise again to Waterloo Bridge. "It is proposed to line the paving of the quay with tempered clay, eighteen inches thick, to prevent percolation, so that in case of a flood overflowing the quay wall, the tunnels beneath the road may be stopped by iron plates, fitted in grooves for the purpose, and thus the water prevented from flooding more than the quay, and percolation through the paving stopped by the clay. The new road to commence at the foot of Westminster Bridge, and, by an easy gradient, pass beneath the Suspension Bridge and on to the foot of Waterloo Bridge." I have prepared an estimate since I sent in those drawings, and have gone into the detail of the matter, and taken out the quantities, which, with your permission, I will read.

THAMES EMBANKMENT.—South Side.

Yds. ft.	In 1 yard lineal.	£ s. d.
1 0	Run Piling, a double row with clay puddle, &c.	1 0 0
1 0	" Stanking back mud for foundation of river wall	0 10 0
3 0	Cube digging and removing mud for ditto	0 3 0
1 1/2 0	Superficial rough slab footing to wall, &c.	0 6 0
32 6	" 9 in. reduced brickwork in river wall close joint in fine mortar, English bond	6 8 0
0 87	Cube coursed masonry, cleansed face, worked to a sweep, including beds and joints	15 0 0
0 6	" blocks for columns prepared for iron flanches	0 5 0
10 0	" Clay puddle, well tempered and trodden	2 10 0
0 20	Superficial 3 in. sheet piles driven close, iron rings and shoes	2 0 0
10 0	" random paving to quay	1 10 0
17 0	" do. to middle road of street	2 11 0
10 0	" granite jack paving to side causeways	1 15 0
2 0	Run granite chisselled kirk	0 8 0
350 0	Cube filling into quay and road	30 0 0
Cwt.		
2	Wrought iron in angles for bressumers, &c.	2 0 0
42	Do. in plates and sheets	37 2 0
5	Do. in T iron ribs, &c.	5 0 0
	Iron tie rods, &c.	1 0 0
6	Cast iron in columns, flanches, &c.	1 6 8
	Cast iron balustrade and plinth	3 0 0
	Per lineal yard	£ 113 14 8

Then the length:—

	Yards.
From Westminster to Waterloo Bridge	877
From Waterloo to Blackfriars	900
Total	1,777

General:—

1,777 yards at, say 115 <i>l</i> .	£204,355
Add for 35 step-ways from quay to new road at 50 <i>l</i> .	1,750
Two engines for pumping, say three years	1,000
	207,105
Add for contingencies, 10 per cent.	20,710
Total estimated outlay	£227,815

The above does not include the filling in and forming the ground for the wharves.

From the above amount deduct the value of wharfrage gained from the river, probably 40,000*l*.

JAS. FRANK SMITH.

Architect and Engineer,
March, 1862. Leicester.

1807. You have not consulted the wharfingers, I suppose?—No; the wharfingers would have a right of road from the present wharves to the quays in all cases.

1808. Take the coal wharves where they have barges, how would they be accommodated?—The barges would always be enabled, at low water, to unload the goods on to the quays.

1809. But at present they have their barges lying end on in two tiers, so that their barges lie covering a space, probably, of a couple of hundred feet, lying on the ground and close together?—Yes.

1810. What will become of those barges?—They must lie in the same position, I presume, along the quay wall.

1811. But if they were to go beyond the quay wall, and extend it 200 feet into the river, as they now extend 200 feet from the fronts of their wharves,

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would not that interfere with the traffic of the river? Yes; but the extent of quay wall would be so great, that it would not be necessary for them to lie alongside each other. They could be spread along the whole extent of wall, now they have only a certain frontage to occupy.

1812. But suppose a coal merchant has his own wharf with, we will say, 200 feet of river frontage, and he by practice has acquired a right of letting his barges lie 200 feet out into the river, what would be his condition after you had covered, with your embankment, the 200 feet which he now goes into the river?—If he has a right to cover that space of water, I should propose to allow him the same area.

1813. Where?—Along the quay wall.

1814. What would his neighbours say to that?—His neighbours would have ample room.

1815. Then you mean that you would allow him to go 200 feet further into the river than he does now?—No; the superficial area I refer to.

1816. But there is not a single yard of lineal ground all the way along that shore which is not occupied by people carrying on waterside business, all of whom require the use of that sloping shore either for barges, or for floating timber, or for something or other?—If you do away with the sloping ground, there must be some new law made to prevent their occupying so much space into the river; that might be left to the river police.

1817. In that case you would have to compensate the wharfingers for depriving them of that use which they now enjoy?—Assuming that they can maintain their right.

1818. If they could not maintain it, then you would take it away, and if they could you would have to compensate them. Where will you get the money in the latter case?—I presume you would get ample money from the value of the wharves on the other side; the additional space would compensate them for any loss of space in the river, because it would not be necessary then to keep the boats there so long—having so much additional wharf space, they could unload and take them away, whereas they have now to keep them there a long time.

1819. At all events this is your own opinion, unfortified by the concurrence of any wharfingers?—I have had no communication with any wharfingers, but I have considered all along that that would be the best scheme in my own opinion for their good. I have considered their welfare, and I think that would be of great advantage to them and to the district generally.

1820. I must say you have made very nice drawings, and no doubt this road and these footways would be a convenience, but to recommend that we should attempt the taking away of 200 feet of that accommodation which they now enjoy is more than we could undertake.—I assume that they would take so much away on the other side, that it would be necessary, in order to form a nice curve in the river, to take that; it is partly to accommodate the flow of the river.

1821. (*Sir Joshua Jebb*). At what distances are the communications between the quay and the wharves placed?—The width of the road; the tunnel passes beneath the road from the quay to the wharf.

1822. At what distances are those communications apart?—Wherever they are required to accommodate the wharfingers at their present wharves.

1823. Then those are the openings which are marked from the tramways to the wharves?—Yes.

1824. To each wharf?—To each wharf.

1825. (*Captain Galton*). To each wharf you would give a separate road?—Yes.

1826. An archway under the road?—Yes.

1827. Would you give to each wharfinger the wharf space which you create in front of his present wharf?—I think not.

1828. Suppose you did not, what would he do?—He would have to purchase it; you would give him the right of way to his old wharf.

1829. Suppose he refused to purchase it?—Then some one else would purchase it and use it.

1830. Would not he be entitled to compensation, for your having destroyed his right of wharfage upon the river?—He would still have the right of way to his wharf.

1831. At present he has property abutting upon the river, which is entirely in his own possession, but by your plan you propose to form some additional wharf property in front of it, which if he does not choose to buy, you would sell to somebody else?—Yes.

1832. How would you compensate him in that case?—If it is necessary to give him his frontage, I should propose to give him the same frontage which he has now, and sell the other part conditionally.

1833. What additional part would there be beyond what he has now? Have you calculated that?—I have not.

1834. A few feet might be gained, but not much?—There is a lot of private property not used as wharves along there.

1835. Have you been much along there?—Yes.

1836. What is the level of your quay above Trinity high water?—Two feet I think.

1837. That would be liable to flooding occasionally?—Yes.

1838. How would you guard against that?—By fitting in these tunnels with iron gates.

1839. Would you keep people there at high tides to watch when the tide was likely to rise above the level of the quay?—If it were necessary to do so.

1840. You have made no estimate of compensation to the wharfingers?—None at all. I have thought all along it would be an advantage to them; certainly I think the additional ground they would obtain for wharves would be ample compensation for their loss in the river.

1841. Is it only the loss in the river they would sustain; would not they also sustain some inconvenience in the mode of unloading their goods?—I believe not. I fancy they would rather be accommodated by being able at all times to bring the barges alongside the quay.

1842. In cases where they have warehouses adjacent which they load from, would they not be injured?—Then they would have to use the tramways of course, and waggons.

1843. (*Sir Joshua Jebb*). It would be inconvenient in loading and unloading the timber, would it not?—For timber, of course; large balks of timber would have to be unloaded opposite the tunnels, and carried, of course, in trucks.

1844. If there were a strong tide running, it would be an awkward thing, would not it?—Yes.

1845. (*Mr. Thwaites*). You spoke of the credit to be taken for the land which you proposed to sell, what land do you refer to?—The land obtained from the river coloured upon the plan.

1846. Do you mean in the front of the present wharves?—Yes.

1847. Then you have calculated, of course, the purchase of the interest of the wharfingers?—No, I have not.

1848. Supposing a wharfinger had a frontage of fifty feet, and you extend that into the river, he would still have the fifty feet, and the fifty feet only?—Yes.

1849. If you were to sell the fifty feet to A. how could B be in the enjoyment of his original rights? You would block him in unless you purchased his wharf?—You might sell a portion the frontage quay for an additional wharf.

1850. There are only fifty feet after the alteration?—You can sell as much of the reclaimed land as you please so as to give a right in the river.

1851. You can sell as much as there is beyond the fifty feet, which he has at present a right to do; he has a clear fifty feet now of river frontage?—I should propose that he has the same fifty feet along the river, with a right of way from the river quay to his wharf.

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1852. How would your road be wider than the present wharves?—It would not be wider.

1853. How then can you sell; it would encroach upon his neighbours each side?—He would have a right of way to his wharf.

1854. Supposing A, B, and C are wharfingers, and have respectively thirty, forty, and twenty feet frontage, and you extend those respective widths out into the river, and reclaim so much land, how could you sell any portion of A, or B, or C, without interfering with the width of frontage which each enjoyed prior to your works?—Each might still have the benefit of his river frontage, with a right of way to his wharf.

1855. He has now an undisturbed frontage of fifty feet?—So he would have in the other case.

1856. You say you propose to sell and alienate it from him?—Suppose that to be the line of river, and

that to be one road, and that another, and that is another, and these are the wharves.

1857. Then you mean in the outer curve you have a greater width than you have in the inner point at which you start?—Yes.

1858. Then taking your line straight you would simply have an angular piece?—No; you do not understand me. What I assume is, that he shall have a right of way through the ground you sell, and still have the same frontage along the quay as he had to his own wharf.

1859. You are there interfering with the unrestricted right which the party now possesses of his fifty feet frontage?—In so far as you alter the position of it.

1860. There is nothing in the question of 40,000*l.* which you refer to?—No.

The witness withdrew.

Adjourned to Saturday week, at twelve o'clock.

Saturday, 15th March 1862.

PRESENT :

The Right Hon. the LORD MAYOR,
JOHN THWAITES, Esq.
Captain D. GALTON, R.E.

Captain BURSTAL, R.N.
JAMES R. McLEAN, Esq.

THE RIGHT HON. THE LORD MAYOR IN THE CHAIR.

HAMILTON HENRY FULTON Esq. C.E., examined.

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Esq., C.E.

1861. (*Chairman.*) I presume that is your plan which is upon the wall?—It is.

1862. You are aware probably, that we are not now competent to go into the question of the left bank of the Thames?—Quite so.

1863. Our instructions are to consider the Surrey side, not the Middlesex side?—Quite so; the plan hanging on the wall refers exclusively to the southern side of the river.

1864. It seemed to me that you had a line also on the Middlesex side?—That is meant to represent the line which has been deposited, and upon which the present bill before Parliament is founded.

1865. Then you do not propose to say a word about that?—Not a word.

1866. Will you be pleased to tell us as briefly as you can, what your scheme is?—The plan upon the wall shows the river from the Victoria Bridge to Southwark Bridge.

1867. Is that Victoria Bridge the railway bridge?—The railway bridge leading to the Victoria Station; but from the information which I have received, I conceive that the Commissioners do not intend to investigate the matter at all above Westminster Bridge, and therefore, if your lordship thinks it right, I will confine myself to the portion of the river between Westminster Bridge and Southwark Bridge.

1868. I do not think that the Commissioners have so expressed themselves. I certainly may say that we are quite open to hear any suggestion with regard to any part on the Surrey side of the Thames?—Thank you, my lord. The proposal as shown upon this plan is to make a roadway, beginning from the present approach to Chelsea or Victoria Suspension Bridge, running along the margin of the river, sixty feet wide, down to Lambeth Bridge, and eighty feet wide from thence to Southwark Bridge. The portion of the roadway between Chelsea Bridge and Westminster Bridge is carried slightly above the level of high-water mark, generally speaking.

1869. Did you say Chelsea Bridge?—Yes, the suspension Bridge.

1870. Do you mean the one that is here, marked "Victoria"?—This, my lord (*pointing out the same*). I was under the impression that this bridge was

called the Victoria Bridge—the suspension bridge, I mean.

1871. Then you propose to make a roadway from that bridge upon the edge of the Thames as far down as Southwark Bridge?—As far as Southwark Bridge.

1872. A road sixty and eighty feet wide, projecting all that distance into the river, and in some places more than that?—Quite so; the outline of the roadway is so fixed as to make regular and parallel lines of waterway on the Northern and Southern sides of the river, measuring a width of from 600 to 700 feet, from Victoria Bridge to Southwark Bridge. Then there would be a deviation from the level of the roadway of four feet above Trinity high-water mark wherever it approaches the different bridges, such as Vauxhall, Lambeth (the new bridge which is now being built), and Westminster Bridge. Of course that would raise the elevation of the roadway somewhat above the level I first referred to. Then from Westminster the roadway goes on a level until it approaches Hungerford Bridge, where it drops at an inclination of 1 in 60, going underneath Hungerford Bridge with a proper headway; and from that point it would run, slightly varying in level, to Waterloo Bridge, which it would also pass under, with approaches on each side of Waterloo Bridge, so as to communicate from that roadway to the level of the Waterloo Road. Then from Waterloo Bridge the roadway would rise at an inclination of 1 in 60. I may say that 1 in 60 is the steepest gradient which I have adopted. The roadway would run nearly on a level there—in fact quite upon a level up to the junction of the altered level of the Blackfriars proposed bridge approach. Then between Westminster Bridge and Blackfriars Bridge in almost every instance the present frontage is accommodated with water-side frontage by the construction of docks. The total area proposed to be reclaimed from Westminster Bridge to Blackfriars Bridge would be 32 acres; of that quantity there would be 9½ acres of docks, 11½ of roads, and 10½ of unappropriated space.

1873. Solid?—Yes.

1874. That does not make up the whole quantity, does it?—I have given it you in round numbers; the

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precise quantity is 31 acres and 13 perches. The present amount of waterside frontage is 1,500 yards. The additional dock frontage would be 1,233 yards, and the additional frontage to the river wharfage would be 1,830 yards. Those lengths would all be available for waterside wharfage purposes; the roadway between Westminster Bridge and Blackfriars Bridge would be carried at a level of about 16 feet, ordinarily above the proposed wharf level, which is 4 feet above Trinity high-water mark, so that that would give free access underneath the roadway down to the riverside frontage, except that portion on the upper and lower side of the Charing Cross Railway Bridge, which would be, owing to the level of the railway there being necessarily at a depressed level; and there the present waterside frontage would be accommodated with docks, which of course, are included in the area to which I have referred. There is at present a line of tramway in operation underneath and concurrent with the Charing Cross Railway, and I am not quite sure whether that is to be made a permanent thing or not, but if it were so it would be very easy to connect all those docks with that tramway which I consider, (supposing it were connected with the South Eastern Station and also the Waterloo Station) would be a great advantage to all that frontage. In my plan, I propose that all this waterside property should have the accommodation of tramways to be laid throughout the whole length in the most convenient way. I consider that the depreciation of the waterside property has greatly arisen in this particular part from the fact of those wharves being all isolated, as it were, and cut off from any connexion with railways. I think there is only one other point I need refer to. I propose that there should be some new streets connecting the eighty feet roadway and the new space proposed to be reclaimed with the existing streets; for instance, an extension of the Cornwall Road Northwards, across the Commercial Road, and also a new street parallel to the Waterloo Road; also two approaches from the Belvedere Road parallel to the Charing Cross Railway. With those connexions I think that space would be sufficiently well accommodated with communications.

1874 a. Those streets would probably communicate with the new road also?—The new road would be too high a level to allow it.

1875. Is that new road solid from the foundation up to the top of the line, or is it on arches?—It is on arches, except at Waterloo Bridge, Charing Cross Railway Bridge, and the Cornwall Road; I have a cross section here which I think shows clearly what I mean. (*The same was handed in.*)

1876. Then the whole length of that road would be carried on a series of arches, with piers several feet apart, or something of that sort?—Thirty-four feet apart, I think they are.

1877. Then fair with the land side of the bridge the new embanked ground would come?—Yes, with the land side.

1878. The whole of the reclaimed space between, we will say, Blackfriars Bridge and Waterloo Bridge is occupied either by docks or by solid ground brought to the level of 4 feet above Trinity?—That is so.

1879. But the road itself has the water underneath, so that the barges may get in between the piers up to the new embankment wall, is that so?—No; that is not what I meant to convey. I first of all carry the embankment up 4 feet above the level of high-water mark, then upon that I construct a line of arches which would carry the roadway; as that embankment would, of course, be all upon made ground, I propose to carry the piers upon concrete.

1880. Then, in fact, the barges unloading would lie outside of the road?—They could do so as far as the river frontage on the outer side of the road is concerned.

1881. But if they were going into the docks?—

They would go through the different openings which would be left there for their passage.

1882. Then the edge of the reclaimed ground would everywhere be a little way beyond the line of the road?—There would be a roadway of 20 feet wide left between the higher roadway and the river wharf wall, which would be open throughout the whole length except where the entrances to the docks occur.

1883. Then between Blackfriars Bridge and Westminster Bridge there would be eight entrances to the docks?—Quite so.

1884. Would there be bridges over them?—Yes, there would.

1885. Swing bridges?—Swing bridges.

1886. So that the traffic over and along the road would only be free from interruption at a low state of the tide?—There would be no interruption to the traffic passing along the wharf roadway behind the arching, except when barges were going in and out.

1887. When you say "behind," do you mean the new lofty road and the existing shore, or between the new lofty road and the river. The road that I was asking about lies between the new lofty road and the river?—That would not be used for traffic, it would be used for wharfage purposes; the traffic would pass and re-pass behind on the land side of the high roadway, and on the same level as the dock and river wharfs.

1888. As it does now in the existing streets?—Not as it does now, because it would pass over the made ground,—the proposed reclaimed ground—it would be in the nature of a private road; it would pass along here (*pointing out the same*).

1889. In front of the wharves; but then it would have to go over the entrances to the docks?—The general traffic would have nothing to do with this reclaimed land at all; the traffic arising here would be arising from a trade carried on on the spot locally.

1890. What you mean by that traffic is the low-level traffic; the main traffic would be on the upper level?—I mean that the traffic that would arise from the trade carried on upon the proposed reclaimed ground would be carried on the land side of the proposed high-level roadway.

1891. But do you mean that a cart could go from Westminster Bridge to Blackfriars Bridge all the way along, or that it would only go from one dock entrance to another dock entrance? I am rather puzzled to know how, supposing the traffic to be there, it is to get over that entrance to the docks?—At that point as well I should propose swing bridges; there would be a swing bridge over each of these entrances, which, of course, would be closed except when the barges were passing in and out; that would keep up the communication.

1892. But as there are only eight entrances for the whole line between Blackfriars Bridge and Westminster Bridge, must there not be continual ingress and egress for barges, at least at the time of the tide, when they want to move?—There is nothing like that at this time; they can now only get alongside the quay at high water; if it is high water neap tide they cannot now get alongside; there is not sufficient water; it is just at the top of the spring tide that they can now come alongside the existing wharves.

1893. I am asking these questions in order that we may understand what your scheme really is in all its details?—Quite so. The level of the sills of these docks would be laid in such a way as to enable barges to enter and depart from these docks about an hour and a half, or an hour, before and after high water neap tides. I mean they would be able to get in and out of those docks during that time; of course they could come alongside the river wall outside the docks for a much longer time.

1894. Are those tidal docks, or with gates?—They would be with gates.

1895. Then it would, in fact, be a displacement of so much of the tidal water?—It would be a displacement;

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but then you would gain a very much better section of river; you would get a much deeper bed, and consequently you would increase the volume in that respect, which, practically, would be of far greater advantage to you than having the shallow water lying upon that flat shore in the form in which it lies at present.

1896. With regard to your 80 feet road which you have explained to us is carried along upon piers and arches, that would be at such a level above the wharves as would allow traffic to pass underneath; barges and so forth?—Yes.

1897. Would the barges lie outside?—There would be ample room alongside the river wall outside the docks.

1898. I think you said the higher road was to be 20 feet above Trinity high water?—No; 16 feet above the level of the wharf wall; it would be 20 feet above Trinity.

1899. Do you mean to the surface of the road or to the soffit of the arch?—To the soffit of the arch.

1900. Would it pass under the arches of the existing bridges?—There are two bridges that we should pass under, the one the Charing Cross Railway Bridge, and Waterloo Bridge. This shows the section (*pointing to the same*).

1901. You would diminish the water-holding capacity of the river between the points we have mentioned to the extent of 32 acres?—That is not a practical explanation, but the result ultimately would be, that you would deepen the river to a very great extent, and so compensate for the diminished area of surface of very shallow water.

1902. At all events you would diminish the extent of water-holding capacity?—That must be the case. I have a few sections here which show the general cross-section of the river at the point where I propose to carry out the embankment line to the extreme limit. The present section shows a very irregular bottom, and only a maximum depth at low water of about 8 feet. Now I have had other sections taken of parts of the river where the width and other circumstances are about the same that they would be when this proposed reclamation is made. I find that the depth of water in those instances, being originally 8 feet, is now 18 or 19 feet, an addition of 10 feet in depth, which I think is a far better demonstration than any theoretical opinion that one can arrive at in a question of this sort; it is a thoroughly practical one, and one that can be depended upon.

1903. Can you indicate the parts where you found that result?—I found that result between Southwark Bridge and London Bridge. I found that result opposite the Penitentiary. Wherever you take a portion of the river which has a decent plan, by which I mean has a decent width of water-way (and a decent width of water-way I call from 600 to 700 feet in width), you find an efficient navigable depth of water in every instance of from 18 to 20 feet.

1904. You have taken sections of the river at parts where you do not contemplate any narrowing; you have got two sections between London Bridge and Southwark Bridge?—Yes.

1905. Will you point them out; section A and section B?—That is section B (*pointing out the same*), which is, I consider, the fairest example you can take, because it is away from the bridges, and the bed of the river is unaffected by the irregular scour around their piers.

1906. This shows the actual state of the river?—This shows the actual state of the river; that is, opposite the Penitentiary, and there the river is 625 feet in width, and I believe that that is as near the proper thing as can be hit upon; because I might explain that I am quite satisfied, that with any greater width of water-way than that, you will find there will be a constant accumulation along the line of walls extending perhaps 150 feet upon each side, instead of having only perhaps a width of foreshore of 80 or 90 feet, as is shown by these sections.

1907. At this part, section C, you anticipate that the narrowing of the river to that extent would deepen the bed 10 feet perhaps; there being 8 feet now at low water you reckon that there would be 18 or 19 feet at low water?—I think if it was allowed to have its own way, it might be so; but in that particular locality I do not think it would be so, because there has been such precaution taken to protect the piers of the bridge, that the flow of the water there would not have fair play.

1908. Then if you were to sink the bed of the river anywhere above that, the water would not run out at a lower level than could be obtained at that bridge?—No; it would run out with less friction; run out with greater velocity if the water was deeper.

1909. Still there would not be the same quantity?—Of course you cannot draw water out of the basin.

1910. The object of my question is this: you are probably aware that those who are interested in the docks are uneasy and anxious as to any diminishing of the water-holding capacity anywhere where we are going to make an alteration. Now if you narrow the river from 1,400 feet to 600 or 700 feet, to my mind it seems that you will greatly diminish the water-holding capacity. Then your answer was, as I understood it, that you would compensate for that by giving the water liberty to excavate its bed?—Yes.

1911. But it cannot excavate its bed to any advantage if there is to be a bar across anywhere, which there would be at Waterloo Bridge?—I do not think there ought to be a bar.

1912. I understood you to say that by the precautions which had been taken in the foundations of those piers, the tide could not have the same action in scooping out the bed?—It would be part of my recommendations if I had anything to do with it, that those piers should be so altered as to give the water fair play.

1913. Do you happen to know what the difference of level is between the bed of the river at Waterloo Bridge and the bed of the river at Southwark Bridge?—It is a constantly varying level.

1914. Is there much difference between the level taken at Waterloo Bridge and at Southwark Bridge in the bed of the river?—The bed of the river longitudinally so varies in depth that I can hardly say.

1915. But still with reference to these two points, I want to know what the fact is?—Immediately under the bridge do you want to know?

1916. I mean anywhere thereabouts, because you propose to compensate for narrowing the river at Waterloo Bridge by letting the water lower the bed?—Yes.

1917. But would the water lower the bed there with any advantage, unless the bed at Southwark Bridge is low enough for the water to run out?—That is so, I should think.

1918. But do you know it as a fact?—I believe it is.

1919. You are of opinion that the bed of the river is low enough?—I can tell you as nearly as possible what it is from that section.

The witness referred to a section.

1920. What is it?—The bed of the river (of course I can only answer the question in a very general way), is I should say, about three feet lower below Southwark Bridge than it is above.

1921. The difference of level is somewhere about three feet between those two points?—Three or four feet; but where there is such a varying surface as there is in the longitudinal section of the bed of the river there, it is almost impossible to give an answer to that question.

1922. (*Mr. Thwaites.*) Have you formed any estimate of the cost of this?—Yes, I have, about 400,000*l.*

1923. What does that include?—That includes everything. I ought to explain that I have confined my estimate entirely to the portion between Westminster Bridge and Blackfriars.

1924. Does that include any compensation to wharfingers?—None whatever.

1925. Have you formed any estimate of the amount of compensation that would be due to them?—No, I have not.

1926. Do you think you would so improve the condition of their frontage that they would have no right to make application for compensation?—Of course every individual case would have to rest upon its own merits as to compensation; but as I am not a valuer, I can hardly give an opinion upon that point.

1927. It is rather a convenient item to get rid of no doubt, but still, after having as you have gone into the cost, I naturally supposed you would direct your attention to the ultimate cost of this plan?—I have confined myself entirely to the engineering.

1928. Simply the structural cost?—Quite so.

1929. Then I understand that from Westminster Bridge to Blackfriars Bridge, it would be the round sum of 400,000*l.*?—400,000*l.* For that I should have 1,830 yards additional river side frontage.

1930. (*Chairman.*) Yards superficial?—Lineal yards, and 1,233 lineal yards of dock frontage, in addition to 1,500 lineal yards of the existing wharfage.

1931. (*Mr. Thwaites.*) How would you obtain the increased frontage to the river?—According to my plan the existing frontage becomes dock frontage, and of course my outer wall forms a new wharf altogether—a river wall which would be available for wharfage purposes, so that I have the existing water-side frontage converted into dock frontage, and then an additional frontage to those docks on the opposite side of such docks.

1932. Then wherever you have the docks in the rear, you calculate that your frontage would be so much additional wharfage frontage?—Quite so; the intention of the plan is to give dock frontage wherever any existing frontage occurs, except just where the New Road approaches would come in.

1933. Have you taken any credit in your estimate of 400,000*l.* for the disposal of additional frontage?—I have not gone into the question of the valuation of land at all. I merely mention it as an object which would be effected if the plan were carried out.

1934. Do you propose to give to the wharfingers who should retain a certain frontage of your docks, the frontage which you secure from the other part of the river?—It would be entirely a matter of arrangement between the owners and the parties carrying this work into effect. If they found that it would be more economical to them to purchase those frontages, of course they would do so, and if they found it more economical that the present holders should retain them, they could do so; each individual case would have to rest entirely upon its own circumstances.

1935. Then so far as you are concerned in making your estimate you have taken no credit for anything of that sort?—I have taken no credit for that. I merely mention the circumstance that there would be this additional frontage as a sort of set off against the increased cost which would arise owing to the construction of a wall and arched roadway of that sort.

1936. Do I understand that you have formed an estimate of the cost of that roadway and the other works, and that the result is the amount of 400,000*l.* between Westminster Bridge and Blackfriars?—Quite so.

1937. Then I do not understand your last answer, that it would be a set off against the additional cost. I understand that you have left out altogether the value of the additional frontage you secure?—I have not taken that into consideration at all.

1938. Then how is it a set off against the cost of the construction?—I mean that there would be that advantage obtained by the construction of a plan of this sort, that there would be so much additional frontage; but I have put no value upon that additional frontage.

1939. Then whatever value it might have it would be in reduction of the 400,000*l.*?—Yes, that is what I intended to express.

1940. You said, in answer to the Lord Mayor's question, that apparent diminution of the water-holding capacity of the river would be compensated for by deepening the bed?—Yes.

1941. And you stated I think, that at Waterloo Bridge there was some interruption to the natural action by reason of the precautions taken to preserve the piers of that bridge, and that you propose to deal with those piers. Will you explain to the Commissioners how you propose to deal with those piers?—I should adopt such measures as would be necessary to protect the foundation of those piers. Of course, the precise plan I cannot determine off-hand.

1942. Would you underpin those piers?—I have not gone into the details of that question.

1943. But you deepen the river ten feet?—There are many ways by which it might be accomplished. Of course whatever plan might be adopted would be regulated by circumstances.

1944. As an engineer of some standing, we, of course, anticipated the advantage of some opinion from you upon that matter, especially when you state that you intend to deal with those piers. If you deepen the river ten feet at that point those piers would begin to show their teeth, would they not; the foundations upon which they are standing would be exposed?—I think if you were to go down there at low water of spring tides you would see their teeth, as you call them, exposed at present.

1945. Then of course, if you still further deepen it ten feet the evil would increase, and rather materially, would it not?—Well, if the navigation is to be made entirely subservient to the piers of Waterloo Bridge, it would put a stop to any further improvement in the deepening of the river.

1946. My anxiety, not being an engineer, is to know how you propose to deal with Waterloo Bridge. You have not given that your attention, have you?—I have not made up my mind as to the particular plan which I should adopt; but I have gone sufficiently into the thing to enable me to say that it is perfectly practicable. Of course, as to the precise plan which might be adopted, that would be a matter of a good deal of thought.

1947. It would be a difficulty that could be dealt with without taking down the bridge?—Oh yes, it could.

1948. Does it occur to you what public advantage would be derived by the formation of this roadway?—I think a great thoroughfare, a wide and convenient thoroughfare between Westminster Bridge and Blackfriars Bridge must be a great public convenience.

1949. If I rightly understand the plan it would be for through traffic only?—No.

1950. Taking its height you would not be able to get on to that roadway from the ordinary streets now in existence?—There would be a communication between the Waterloo roadway and the proposed roadway. If you will be kind enough to refer to the plan, there is a proposed approach from the roadway at Charing Cross Bridge up to the level of the Waterloo Bridge, and the same on the lower side of Waterloo Bridge, and also approaches afforded by an extension of the Cornwall Road, and by a street parallel to the Waterloo Road, and also other approaches parallel to the Charing Cross Railway. Then, of course, there would be a communication on a level with Blackfriars Bridge.

1951. How do you propose to cleanse the docks?—I propose that there should be a line of culverts running from one end of the line of docks to the other, by which the water might be held up in any one particular dock with a high tide, and drawn off three or four feet, and passed at low water through the adjoining dock; or, omitting one, you might draw it off from one particular dock through any other particular dock.

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1952. You would have, I suppose, a uniform bed?—It would be so.

1953. I speak of the dock itself; there would be a regular fall from the wharf wall down to the sill?—Yes; those docks would be nearly all on the same level, and would be a means by which the entrances to the docks would be kept open.

1954. (*Captain Galton.*) That plan is not quite strictly accurate. I see you have more docks here than you have at any other place?—That is a modification of the plan; but with regard to that portion near Blackfriars Bridge, I have proposed to have a continuous roadway to Southwark Bridge, passing underneath Blackfriars Bridge and also under the London, Chatham, and Dover Railway; but I have now confined myself entirely, as regards estimate, to between Westminster Bridge and Blackfriars Bridge, and the level of the roadway is proposed to join the level of the Blackfriars roadway without having that side street which is shown upon that plan.

1955. Do you propose to rebuild any of the walls of the existing docks or raise them in any way?—Wherever it is necessary.

1956. That you have included in your estimate?—I have.

1957. In some cases it appears that the wharves are occasionally flooded and the district injured?—There are only a few instances where the wharves are liable to be flooded. The lower parts of Lambeth are liable to be flooded because the water is liable to get into the drains from the imperfect outfalls; not being watertight the tide gets into the drains and rises up into the gratings and so floods the different lower portions. That has very little to do with the height of the existing wharves.

1958. You said that the waterside property between these points, I suppose that is between Westminster Bridge and Blackfriars Bridge, is depreciated; have you any facts showing that it is?—No; I have only a general idea that it is the fact.

1959. Then you do not know whether the rents have fallen at all?—From time to time I have seen several wharves to let, but I do not think that is so much the case within the last year or two. I speak now of three or four years ago. I believe that property there is improving again. I know that a wharf which I observed vacant for a very long time, near Waterloo Bridge, is now occupied by Sir Morton Peto.

1960. What is the minimum width that you give the river at Waterloo Bridge?—650 feet.

1961. And what is the width of Southwark Bridge at the present time, do you remember?—It is 660 feet.

1962. And yours would be 650?—Yes.

1963. You keep it very nearly the same?—I keep it very nearly the same, and I am quite satisfied that that is enough. I have known the Thames for the last 30 years since the building of London Bridge, and have looked at the thing in all its bearings, and I am quite satisfied that that is sufficient.

1964. What is the present maximum depth near Waterloo Bridge, do you happen to remember, upon section C?—The maximum depth there is 8 feet at low water spring tides.

1965. At the same time what would be the maximum depth opposite Millbank?—The maximum depth there is 14 feet. I think I must have made some mistake in giving you the depth there before; I think I stated it 18 feet.

1966. Then you expect to obtain a depth at section C equivalent to the present depth at Southwark Bridge?—There is not the least doubt about it, provided the water had a free flow at low water, if there was a uniform depth, or rather if the bed of the river longitudinally had a uniform inclination.

1967. Is the 650 feet which you mentioned exclusive of the piers at Waterloo Bridge, or does it include them?—It is exclusive; it is clear waterway. In order to bring the cross section of the river to its proper condition it is only necessary that the

bed of the river consequently and the low water line should be reduced to a uniform inclination, and that of course cannot be done without interference with some of the existing bridges.

1968. And you consider that it would be a benefit to the river traffic to alter the present arrangement, and not to have places for barges to lie in. The present arrangement is, that the barges lie upon the beach for a considerable time between each tide; there is a great space upon which the barges can lie. If that large portion was moved from the river and turned into an embankment the barges would not be able to lie as they do now in the river, I take it?—Yes, they would.

1969. Would not they interfere with the steamboat traffic on the river very much?—I should think that precautions would be taken to prevent them from lying so as to interfere with the navigation. That is the case where an enormous amount of traffic is carried on between Southwark Bridge and London Bridge, where the width of the water-way is precisely the same as that which I have put upon my plan, and there they lie without any impediment to the navigation.

1970. But a much larger number lie near Waterloo Bridge, do not they; between it and Blackfriars Bridge?—I should say not; more timber, perhaps, lies there; more timber rafts lie between Waterloo Bridge and Blackfriars than in the lower part of the river.

1971. What are these red portions shown upon your plan?—Those show that that might be made warehouses; warehouses are not included at all in the estimate, and therefore I have not alluded to them.

1972. That would be ground to let, I suppose, or saleable?—That would be ground available.

1973. (*Captain Burstal.*) How do you propose to accommodate the timber traffic upon the south shore between Westminster and Waterloo, and between Waterloo and Blackfriars?—A portion of the timber might be allowed to lie in the docks.

1974. And the coal traffic also?—And the coal traffic also.

1975. If the river was reduced to the width that you propose, 650 feet, I suppose you anticipate that the current would be increased to an equal velocity to what it is at Southwark Bridge now?—It would be about the same as exists between London Bridge and Southwark Bridge, that is to say, if it is allowed fair play; but if there are erections which would impede the flow of the current, of course it would not be so deep.

1976. It would result in leaving a uniform current, that is to say, the tide would be as strong where the river is now wide as it is where it is narrow?—Quite so; it would be a uniform velocity.

1977. The velocity is rather high at Southwark Bridge, is it not?—It would be equalized; instead of being great in one case and small in another, it would be equalized.

1978. Supposing the current, after that wall is built, to be equal to what it is now at Southwark, probably 4 miles an hour, do you think it would be practicable to get barges and rafts of timber into those dock entrances?—Yes. I do not mean to say that there would be a uniform velocity of 4 miles an hour all across the river; that is in the mid-channel that I mean.

1979–80. You do not anticipate any difficulty near the embankment with reference to docking and undocking the rafts?—I think not; but at the time that these entrances would be open for the ingress and egress of barges the tide would be considerably slackened.

1981. Near high water?—Near high water.

1982. In contracting the river like that, is your object to maintain a scour for the purpose of keeping the river deep?—That would be one of the objects; to keep it, I do not say deep, but to keep it a uniform depth.

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1983. Supposing the river was deepened by dredging with a uniform width of 650 feet from the northern embankment to a depth of 6 feet at low water from that embankment, do you think that the current that would run in the river, after this embankment was constructed, would maintain that depth?—I am quite sure it would not; not over the whole width.

1984. I do not mean the whole width of the river, I mean the whole width of 600 feet?—I am quite sure it would not. I am quite sure you would have a much greater depth in the mid-channel, say 14 feet, and a foreshore each side extending out at least 80 feet, or giving an inclination of 1 in 6; that is the result of my observation in these cases, that wherever the width of the river is reduced to a fair width, which I call 650 feet, you will always find that the foreshore exists at about 1 in 6 from, perhaps, 4 or 5 feet below high water mark of spring tides.

1985. With reference to the process of sluicing these docks, and the thick mud that would come out of the dock entrances, would it, when it came outside of the embankment at the time of tide when you would sluice those docks, meet with sufficient current along the embankment at that time of tide to carry that muddy water away?—I think so. First of all, I must say, that I do not think an accumulation would take place to any extent in the docks as is found to be the case in other London docks.

1986. You think there would not be much accumulation along the shore?—Within the docks, I think, there would be very little to wash out; it is a perfectly different thing in a dock to what it is where the water is allowed to ebb and flow every day. I

The witness withdrew.

JOSEPH GIBBS, Esq., examined.

J. Gibbs, Esq.

1993. (*Witness.*) I will preface any observations I have to make, respecting the embankment of the south side of the river, by stating that I propose merely to give evidence upon this question, because I communicated my views with regard to the north side of the river at the sitting of the last Commission; my object on the present occasion is merely to state to this honourable Commission that if an embankment is to be made at all on the south side, then there should be a conformity as regards hydraulic arrangement which shall harmonize with any system of embanking the south side; it was more with that object than to propound any particular plan as to carrying out the work. My reason for it is this, I have examined the question with some care, and I cannot see at the present moment any strong reason for commencing the work until the embankment upon the north side of the river is complete; by the time that is done, great experience will be obtained as to the hydraulic effect which will react upon the river bed, especially as regards the scour, the flow of water, and its velocity. Then again, I find great difficulty in coming to any conclusion as to where the funds could be drawn from for making the embankment, because, while it is imperatively required upon the north side of the river, and whilst there are but a few wharves to deal with, and large improvements likely to grow out of a work of that description, the reasons for embanking the south side of the river are much weaker, and the difficulty of dealing with existing interests is much increased. But I think it possible that a principle for embanking, if it is ever carried out, may be defined by this honourable Commission, and that principle may from time to time be acted upon hereafter in carrying out any part of an embankment which it might be desirable to effect; but to carry out the whole work at once, or to lay out a plan for the whole work at once, is a very difficult question, but, perhaps, more especially in a monetary sense, and in regard to the demand there is for this work. First, as to a road. A road along the river Thames, on the south side, obviously is not the most convenient road; if other improve-

ments are made on land, they will be shorter roads and much more convenient. Then again, the railway inter-communication which is about to take place will obviate, in a great measure, the necessity for making an embankment road; if an embankment is to be made, I think there should be a parallelism with the proposed embankment, which is to take place upon the north side; because, by maintaining that parallelism, a flow of water will be obtained. I do not think if the embankment was made, that is, made at a moderate distance, not contracting the river too greatly, upon an hydraulic view of the question, that any injury would arise with regard to the access to the present wharves; but if that embankment is carried out, I do not perceive that there is any means by which any part of the outlay would be repaid by the wharfingers, nor can the wharfingers' interest be bought up for any reasonable sum of money—and the reclaimed land would belong still to the frontages of the wharfingers—it would be their property, and therefore it can only be carried out as an act of necessity. If the embankment was made, I do not think the river would scour to any very great extent, that is, I do not think the velocity would be increased to an extent to remove the larger flints and pebbles forming the bed of the river; but of that I am not able to speak positively, because I have not made any calculation of the velocity as it will be after the embankment is made; if I had made estimates of the velocity of the river, which had reference to the size of the existing gravel, then I could come to a conclusion as to what amount of the existing gravel would be removed; but that I do not think necessary to be done at present; however, two honourable members of the Commission are able to speak upon that point, perhaps, more than any other engineer. Now I will refer to one particular portion of the embankment which I think might be made with great advantage, namely, the continuation from Battersea Park Bridge to Westminster Bridge, or some portions of it. The river at Lambeth is narrow—inconveniently narrow—and that embankment would straighten it at that point; and a

mean to say, where they empty themselves every tide.

1987. These docks would not run dry every tide?—No; there would be only water sufficient taken in to make up for the water lost by lockage.

1988. How would the wharfingers communicate with the river; under the road or across the road?—Under the road, which road would be constructed on arching.

1989. Does the road pass under the bridge?—In two cases, where it is physically impossible to do anything else without running to a very large expense, the roadway would pass underneath the Charing Cross Bridge, and underneath Waterloo Bridge, where this low level roadway occurs docks would be provided with entrances so placed as to afford sufficient headway.

1990. What is in your mind about the necessity of the public road following the curve of the river; is that merely for through traffic?—That question has been put to me already; this is not entirely a through line of roadway all the way; it would be a communication between Westminster Bridge and Waterloo Bridge, and also from Blackfriars Bridge, and also with the Belvidere Road, Cornwall Road, Waterloo Road, and Commercial Road.

1991. I meant merely as to the bearing of this upon the arc of the circle while the existing streets and intended new streets that may enter the chord of the arc?—The principal trade of this district is carried on at present along the Belvidere Road; it does not use Stamford Street and the York Road.

1992. And the Commercial Road below it?—And the Commercial Road below it.

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raised road on the embankment in that part is very much required; in fact, that part of the Lambeth district which projects into the river wants opening—wants ventilating—there are no wide streets, nor thoroughfares, except a very ancient one; and it is perhaps one of the most neglected parts of London, taken altogether, especially with regard to inter-communication. There, I think, something in the way of an embankment might be carried into effect with advantage, and it might be a portion of a great system which may be carried out hereafter; but, as I said before, I think the time has not arrived for an embankment upon the south side, extending all the way to Blackfriars Bridge or to Bankside. My object in giving this evidence is especially with regard to the necessity which I conceived there is of maintaining the parallelism of the two embankments, and maintaining the equal flow of the water, and showing the importance of making the improvement through the Lambeth district, between Vauxhall and Westminster Bridges. Beyond that I do not know that I have any other observations to make.

(*Chairman.*) I do not think I have any question to ask you. You have so clearly set forth your notions upon the matter, that there is nothing left to ask as far as I know.

1994. (*Mr. Thwaites.*) Then you are of opinion that it would be advantageous to the public and the river, and the general convenience, and for ventilating a district which is now locked up by inconvenient roads and other matters of that kind, to embark from Battersea Bridge to Westminster Bridge?—Yes, I am of that opinion.

1995. Would you propose to have a through roadway upon this embankment?—Yes; the projected embankment is for the purpose of making a convenient roadway where it is very much desired. For instance, there is a roadway without wharfage opposite Lambeth Palace; it would be a continuation of that roadway, and in fact it would be the finishing and perfecting of that side of the river. But there are no direct or convenient thoroughfares from Westminster Bridge to Vauxhall Bridge, and therefore I think that an embankment would be a very great public advantage to that part of London.

1996. I suppose in your opinion it is an important matter to get rid of the floodings in that district?—No doubt it is, especially in a monetary sense.

1997. I understand with reference to the other portion of the southern shore, that you do not speak with equal confidence as to the necessity of an embankment?—I do not perceive the present necessity until the other embankment is complete, and until experience is obtained as to the flow of water and the effect that the new embankment would produce. I

believe the effect would be a very beneficial one. When that work is complete, then I think the other part of the embankment would be undertaken with great advantage in the manner I have before explained.

1998. Then you do not express an opinion in the abstract that it is not expedient to embark the southern shore, but that you should wait the result and effect of the northern embankment upon that shore?—I would wait the result for two reasons: first, to get experience derived from what had been done, and next from the necessity of only at a future period drawing the sum of money requisite to carry that work into effect, and not to raise it at the present time when the necessity for it is not so pressing, and in fact not pressing at all as respects the most theoretical and costly part, parallel with the proposed embankment on the north side. Then again, it is a question whether it should not be deferred entirely on account of the great difficulty of dealing with the costly property on that side of the river, and which is constantly increasing in value.

1999. We rather look to you to give us engineering information; no doubt an engineer must direct his attention to the cost of any works that he may propose, but still your evidence refers to the effect (and I am sure I should value that evidence very greatly), upon the hydraulic effect that would be produced, and the mode of carrying out the various works; but setting aside the question as to how the money should be raised, I do not understand you to state that in your opinion there should be no embankment upon the south side, but that it is expedient before you determine that question to watch the action of the northern embankment upon that shore?—If you want a decided opinion upon that point, I will give it.

2000. Do I rightly interpret your meaning?—My opinion is, that it is not expedient to make an embankment except so far as from Westminster Bridge to Battersea Bridge, and as respects that work, the division through Lambeth should be commenced and finished first.

2001. You mean now?—I mean now.

2002. But still you reserve to yourself the right of judging the whole question so soon as you have ascertained what effect the northern embankment will have upon the southern shore?—Precisely so.

2003. I do not understand you to state positively that in your opinion it is not expedient to embark from Westminster Bridge to Southwark, or to any other point, but simply that it is not expedient to do it now?—Precisely; that is my opinion, having reference to what I before stated.

The witness withdrew.

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Mr. CHARLES HENMAN examined.

2004. (*Chairman.*) Are you an architect or an engineer?—An architect.

2005. Is the plan which you are about to submit to us for the south side only?—For the south side only now, but applicable to both sides.

2006. I ask that question because I believe that very beautiful picture against the wall is yours, is it not?—Yes.

2007. Does that show the portion on the south side?—That is for the northern side.

2008. Will you be kind enough to state in your own way the main features of your scheme, and then if you should leave anything for us that we do not quite understand, we will ask you any questions we think necessary?—Perhaps it will be convenient that I hand you in this; it is a photograph of the design at the end of the room.

2009. As we have already reported upon that side of the river, we cannot very well enter into it?—I have had the advantage of hearing the evidence which was given just now by Mr. Gibbs, and the other gentleman who was here, Mr. Fulton, I believe; and I

wish to say at the outset, that I agree with the former gentleman that the embankment on the southern side of the river should be parallel with the northern embankment, as a principle, and I had followed that principle out to a certain extent in the laying down of my line of embankment; but I do not altogether agree with Mr. Gibbs, although I dare say he is a much better authority than I am upon the subject; I think that owing to the curve in the river, allowance should be made upon that account, and that the southern line of embankment should not be altogether parallel with the northern line of embankment, but should be wider at the curve. If the river had been straight I should have agreed with Mr. Gibbs that the two lines of embankment should be entirely parallel. I may add that the line I have laid down I would rather should not be considered as an arbitrary fixed line, from which no deviation whatever should, in my judgment, be made, but as my line of embankment laid down on the principles enunciated above, but in its detail capable of more precise definition

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in regard to its encroachment on the river between the west side of Southwark Bridge and the east side of London Bridge, either by the Conservators of the Thames, or others who have had opportunities of studying that portion of the river at all times and at all seasons. If you will allow me I will now proceed to make a few remarks in reference to the designs I have prepared.

The advertisement put forth by the Commissioners requires plans for embanking the Surrey side of the river Thames within the metropolis, which will conduce with the greatest efficiency and economy to the improvement, embellishment, and convenience of that part of the metropolis, will improve the navigation of the river, and will provide a public thoroughfare without stopping such trade as must be carried on upon the river. The first point to be considered, therefore, is efficiency and economy combined, and this I consider, as regards the embankment, will be best attained by a solid embankment, substantially constructed with iron piles up to low-water mark, with iron panels between the piles, backed in with concrete, the upper portion being built of bricks faced with granite to a slight batter, and topped with a granite coping. The next point I would remark upon refers to the improvement of the navigation of the river which will be effected by the wall above mentioned, and by determining, as much as possible, the width of the river, having regard to the obstruction caused by the curve or natural bend of the river, and by dredging the bed of the river to a uniform section, so as to equalize the flow of water and consequent scour throughout the whole length of the embankment, and my line for the south side is laid out with this object in view, it being determined, in a measure, by the line already fixed upon by the Commissioners for embanking the north side of the Thames. The embellishment and convenience of this part of the metropolis is proposed to be provided for by a lower roadway four to five feet above Trinity high-water mark, and eighty feet wide, parallel with the wall of the embankment on the inner side of which I propose to erect an uniform range of arched fire-proof warehouses for the accommodation of the water-side trade, and having lateral communication at convenient distances with the Belvedere and Commercial Roads, and on the top of these warehouses I propose to form a road sixty feet wide, connecting Southwark, Blackfriars, Waterloo, and Westminster Bridges, at the level of the roadways of those bridges at the points of intersection respectively, to be flanked on the land side with a continuous range of handsome terraces, according to the drawing No. 2, which I now have the honour of submitting for your inspection; this drawing is a modification of the design No. 1 (*produced*), which I prepared in 1854, for an improved system of street architecture, having regard to the altered conditions of the modes of living of the present race of business men to that of their forefathers. It is the rule now, rather than the exception, for men of business to reside out of town with their families, and the fashion having set in, it is more likely to extend than decrease; it is, therefore, useless to provide further accommodation for them than what they require in their warehouses, shops, or offices. It was these considerations, coupled with the want of safe promenades in London for ladies and children, and the deficiency in house accommodation in central districts for the industrial population, which every new street improvement has a tendency to diminish rather than increase, which first led to my design No. 1, which was exhibited in London and at the Paris Exposition in 1855, and attracted some notice at the time. It will be seen, on reference to the design, that I propose to erect a glazed promenade, fifteen feet wide, along the course of my terraces, adjoining the shops; the principal story above the shops would be planned for offices in part, and the remaining part as dwellings on the Scotch principle, for respectable families, and it is proposed to form the upper stories, on the same principle, into

suitable dwellings for the industrial classes, the whole of the dwellings being built sound proof and fire proof, and each range or story to have its separate staircases and lifts. Returning now to the lower roadway, I desire to advert to a difficulty which exists in providing accommodation for the various coal and timber merchants along the line of the embankment, in regard to their cargoes and floats of timber. These I propose to provide for by shallow docks taken out of the interior of the embankment, of such lengths as may be found requisite in each case, and forty to forty-five feet in width, narrowing and raising the roadway at those points so as to admit of cargoes of coal stone or timber in barges, floating in or out at high tide through entrances thirty feet in width, spanned by iron bridges with a clear headway of, say, eight feet; the bottom of these docks to be laid with a sharp incline, and to be paved with concrete or stone paving, so as to clear themselves of mud through openings in the embankment at the level of low water. I think I have now sketched briefly the main points of my plan, to which I beg to refer, and it only remains for me to say a few words as to the ways and means which I propose for carrying it into execution. I have not deceived myself into the belief, nor will I disguise from the Commissioners the fact, that so radical a revolution on the banks of the river can be effected without a large outlay, or that any absolutely correct estimate can be given by a person situated like myself, who could hardly be expected to incur the loss of time and expense which the making of a detailed estimate would entail, even supposing that I was in possession of all the necessary data for doing so, which I am not. I have, however, made a general estimate for carrying out the work, providing compensation, &c., which amounts, in gross, inclusive of every expense, to 2,750,000*l.*; and I believe that this estimate, unlike estimates in general, if it errs at all, errs on the safe side; but any excess in that way can readily be balanced by adding to the magnificence of the design and perfection of the plan. The next question to be considered is, how this large sum of money can be raised. I apprehend it would be useless to ask the Government to advance it; impossible for the City to do so, and that the metropolis at large would be disinclined to tax itself for the purpose of raising it, considering its many other burthens. I propose, therefore, to enlist the speculative enterprise of the empire by the formation of a Tontine Association, uniting *certainly* with *speculation*. To do this with effect it will be necessary that the Government, the city, and the metropolis, through the Board of Works, or one or more of those bodies, should guarantee to the members of the proposed Tontine Association a minimum dividend equal to what consols produce, or rather perhaps, that the guaranteed minimum dividend should be a fixed 3 per cent. on the amount of capital, and that the price of the shares in the tontine should be the market price of consols, but this is matter of detail and does not affect the principle. The proposed guarantee could either be secured against any risk of loss whatever or such risk of loss could be confined within fixed and definite limits. For instance, supposing the plan carried out, it must be evident that a very valuable and improving property will be created, and I estimate its minimum net value at 80,000*l.* per annum, which would have to be divided among some 30,000 tontine shareholders or their nominees, requiring a deficiency of 10,000*l.* in the first year, to be provided by the guaranteeing powers. In the second year I think I may fairly assume that 5 per cent. of the nominees have deceased, and the deficiency in that year would be only 4,500*l.* In the third year, the same causes operating, there would be no deficiency whatever. Now, I think a loss of 14,500*l.*, spread over two years, extremely insignificant for either of the bodies I have named to incur in the prosecution of a design of metropolitan if not of national importance. And I imagine that each of those bodies, if they approve the plan, would readily concur in a scheme which limited their risk of

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liability to even twenty times that amount; but supposing it otherwise, and that no governmental or metropolitan guarantee could be obtained without a condition precedent that all monies advanced by virtue of the guarantee should be repaid before the shareholders or their nominees divided more than 3 per cent., I think that although such a condition would undoubtedly deteriorate from the value of the guarantee it would not altogether destroy the success of the scheme, as the main principles would remain the same, viz.: 1st, that no shareholder or his nominee should ever receive less interest than the same amount of capital in consols would produce him; and 2d, that the surviving shareholder, or his nominee in each class, will obtain a property in perpetuity, valued now at 1,000*l.* per annum, but which will probably double in value by efflux of time before it comes into possession. These two principles, I believe, would secure the success of the financial scheme if brought out under influential auspices, as there are many thousands of wealthy persons in the empire who would embrace such an opportunity and risk a small venture for portioning their children, relatives, or dependants. The same principles could also be applied to a similar construction on the north side of the River Thames, and in that case the coal duties now intended to be appropriated to the construction of the proposed embankment might form the guarantee fund, relieving all parties from any responsibility whatever in regard to that side of the Thames. In conclusion I trust that the Commissioners will not think I have taken up their time unnecessarily in entering upon these financial details, but I think the present so unique an opportunity for transforming the filthy banks and crazy sheds which now defile a noble river in the centre of the wealthiest and most populous city in the world, which has too long been a reproach to us amongst foreigners, into a scene of architectural magnificence and grandeur, conducing alike to the improvement, embellishment, and convenience of that part of the metropolis, besides providing remunerative employment for a large number of industrious mechanics, that I am most anxious it should not be lost for want of a due consideration of ways and means by which it might be effected, as this opportunity once lost can never be recovered. Let it be borne in mind that the present

affords an unusual opportunity of erecting one of the most magnificent and useful streets in the world, two miles or upwards in length, 1,000 feet in breadth, with a cleansed and purified tidal river running through its centre, and two commodious thoroughfares on either side, connected by noble bridges, the vista from either of which on a clear day would be superb; for let it not be supposed that the design I have the honour of submitting to you this day is a full exposition of what may be effected. It is, so to speak, but the germ of an idea which requires time and the warmth and fostering aid of patronage to be placed before you in its full development.

2010. (*Chairman.*) I think as far as I am concerned I can only compliment you upon the beautiful designs that you have prepared. You must have given a great deal of time to them, and a great amount of study and application. I do not think I have any questions to ask you. My colleagues all concur with me in saying that they are all very nice drawings indeed, and that they evince a great deal not only of time and application but a great deal of talent and inventive genius.

The witness withdrew.

7 Millman Street, W.C.,
March 17, 1862.

Thames Embankment, South Side.

SIR,

I OMITTED to state on Saturday, when I was before the Commissioners, that my plan for the lower roadway or embankment proper, which is tinted yellow on my plan, is complete in itself, and could be carried out to completion as a perfect work without the upper roadway or buildings, which might be done at a future time, as, under any circumstances, the lower roadway and embankment must first be formed.

My estimate for this portion of the work, which extends from London Bridge to Lambeth, and is about 12,100 feet in length, inclusive of docks and compensation for such buildings (generally of a poor class), as must come down for forming the lateral communications is 280,000*l.*

Requesting you will be good enough to lay this before the Commissioners at their next meeting,

I am, Sir,

Your obedient servant,

H. Kingscote, Esq.,

Thames Embankment Commission,
2 Victoria Street, Westminster.

CHARLES HENMAN.

Mr. E. E. Allen.

MR. EDWARD ELLIS ALLEN examined.

2011. (*Chairman.*) You are from Messrs. Allen I believe?—Yes.

2012. And you are one of the Messrs. Allen?—Yes.

2013. Are you an architect?—I am an engineer; my brother is an architect.

2014. You are aware we are only competent to deal with one side of the river?—Yes.

2015. I mention that, because I see your plan shows a dealing with both sides?—It did embrace that originally.

2016. Then probably in what you have to say, you will limit your description to what you propose on the south side?—This statement is very short, and although it refers to one or two places on the north side, I may as well read it through.

2017. Read it if you please?—"We beg to submit, for your consideration, the following suggestions for embanking the north and south sides of the Thames:—The plan coloured blue shows a proposed means of embankment in which both the north and south sides are so constructed as to be parallel to each other through their whole extent, from Westminster Bridge to London Bridge, in regular curves and straight lines; the width of the water-way to be 700 feet, thus leaving, as shown in the section, a depth of water at low-watermark, of three feet. The terrace on either side to be of one uniform width of 75 feet. The space thus gained from the present irregular form of the river banks will be available for building purposes and

for draw docks. It is suggested that the regular curves and straight lines of the proposed plan will add greatly to the beauty of the river and terraces; indeed the beauty of the ancient cities, as seen from the rivers on which they were built, seems to be owing chiefly to this plan of converting the natural irregularity of the watercourses into artificial lines and regular figures. The narrowing of the water-way would render the stream more rapid. The dotted lines on the plan show an opposite way of accomplishing this great work, viz., by leaving the water-way at each of the bridges of the full width of the bridges and piers, and connecting each bridge to the next by straight terraces, thus, on the average, keeping the water-way as it now is, and showing the bridges to the best advantage, each being seen from the river through its whole breadth of arches and piers. The lines on either plan show the width and direction of the terraces. The frontage towards the river would be reserved for the noblest class of buildings."

That is all that the paper states; it was merely a general view, that when the north side of the river is embanked, that the southern side should be either directly parallel to it, with perhaps the one exception pointed out by the gentleman who last spoke to you; viz.—that in the curve, it might be desirable to make it slightly wider, owing to the curve; or in taking the other alternative plan, showing the whole length of the bridges as they now appear, and joining the ends of those bridges by straight lines, thus keeping

the water-way, on an average, the same width as it is now, and yet making the embankment perfect, and the lines uniform. I have entered into no estimate of the cost of these things, nor have I gone into the matter of connecting the levels. Our view was, that in certain cases where large warehouses and cranes are erected, such as those at London Bridge, there could be no difficulty in making a receptacle for barges to come up alongside those wharves as at present, by letting them in at certain portions of the tide, under the roadway, if that roadway were constructed, by being built upon brick piers, but carried on iron girders, so as to make the footway as shallow as possible from the level of the road.

2018. (*Chairman.*) Then you contemplate a road from Westminster Bridge to London Bridge?—Yes.

2019. In front of the existing wharves?—In front of the existing buildings, and on such a level, not stating precisely what the level would be, but one, if possible, to accord with the level taken upon the north side, which would be the level of the Temple gardens, or thereabouts.

2020. You have done nothing more with regard to drawings than marking the lines?—No, nothing more.

2021. You have gone into no estimate?—I have gone into no estimates, because, I think it would be useless until you saw exactly the best mode of dealing with each special property, and that could not be done without knowing precisely how it was proposed to deal with them.

2022. (*Captain Galton.*) The plan with straight lines, I think, would involve a very considerable purchase of property?—Yes, it would, and would be more expensive than the other.

2023. And would not reclaim any land?—No; I think the reclaiming of land, by making the lines parallel, ought to cover all the expense of the work, and I have no doubt it would. I do not know the exact number of square yards it would reclaim; but a very considerable extent of land.

2024. At Southwark Bridge you would cut off a piece?—Yes.

2025. You do not propose to go beyond Westminster Bridge?—No, not with that plan.

2026. The straight lines were intended mainly for the purpose of beautifying the river?—Yes, because it would enable you to see the whole of the bridges as at present constructed, from one end to the other without blocking up any arches.

2027. (*Captain Burstal.*) You do not give any detailed account of the manner in which you propose to carry on the business on the wharves?—We propose in all those cases where warehouses are erected,

and are of any value such as those at London Bridge, or the Lion Brewery, or any cases of that kind, to make water ways for barges at the back of the new road.

2028. You seem to estimate the value of the premises by the elevation that they have now; you do not seem to attach any importance to premises that happen to look low and insignificant?—Because they are mostly places that could be very easily altered, and if they were pulled down altogether, it would not involve much labour or expense, the mere draw-docks there would be no difficulty about.

2029. Still if they are very unsightly, yet they are most important to the owner—such as Dowson's timber yard, Cory's large coal establishment, and other establishments of the same character?—Yes; those would remain just as they are, because there would be a water-way made for barges to go in behind the roadway.

2030. Is that to be a permanent dock?—It would be a permanent dock for their especial purposes, which they would have to keep clean themselves.

2031. You would inflict that expense upon the present holders of waterside premises?—I think there would be very little clearance necessary; but the little expense that would involve, would I think, very readily be paid by them, because they would get much more convenience than they have now.

2032. You think it would be more convenient?—I think so.

2033. In what way?—Because the line of wharves would be more regular.

2034. In what way would it be a convenience to the wharfingers?—You would add a great deal of landing wharf to a great many places by building them a wall up, making the wharves flat upon a given line.

2035. Would their vessels always lie alongside the wharves outside afloat?—They would lie outside their own walls, that is, so soon as the tide allowed them to go in.

2036. Do you make any provision for vessels with masts to go in alongside the present wharves?—No, I think that could not be done. The masts of large vessels are made to lower; there are very few that land goods, in which the masts do not lower.

2037. Would there be headway under the new road sufficient for a vessel to pass with a mast lowered?—With the mast lowered—not at high tide.

2038. There would not be water enough to go in except at high water?—The entrances of those places would be necessarily deepened, so as to give just sufficient room to go under.

The witness withdrew.

Adjourned to Thursday 27th instant at 12 o'clock.

Thursday, 27th March 1862.

PRESENT :

The Right. Hon. the LORD MAYOR.
Major General Sir JOSHUA JEBB, K.C.B.
JOHN THWAITES, Esq.
Captain D. GALTON, R.E.

Captain BURSTAL, R.N.
HENRY ARTHUR HUNT, Esq.
JOHN ROBINSON McCLEAN, Esq.

MAJOR GENERAL SIR JOSHUA JEBB IN THE CHAIR.

MR. HENRY ASTE EXAMINED.

The following statement forwarded to the Commissioners by the Witness was read.

2039. I am lessee of a wharf and granary in Upper Ground Street, having a frontage of 52 feet on the river, with a depth of 150 feet and 50 feet high; the buildings extend along the whole of the river front; there are two floors above ground floor, and capable of holding 12,000 quarters of grain in sacks. We land about 160,000 quarters per year; those which are

stowed in ground floor are carried by porters out of craft lying alongside; those to the upper floors are raised by jigger or winch direct from the barges lying immediately under (which is essential). We have usually about six or seven barges lying at one time on the foreshore, frequently requiring grain out of each at the same time. Any embankment would greatly impede our business, as we could not have the same conveniences as now; besides it would double the

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cost of landing by additional portage, and inflict on us a charge of 600*l.* to 800*l.* per year, besides being unable to have the same amount of work done, indeed if adopted must drive us to other premises, which would be a serious loss, we having recently expended a considerable amount on our premises. If a solid embankment with a roadway, our men in landing would be greatly hindered by the public traffic, and if the barges lay outside there would be serious delay and difficulty, especially at low water, when the height would be considerable from barge to top of embankment; indeed with flour and heavy grain it would be impossible to land except when the water is high; a public road on the river side would greatly expose our premises to depredations. Barges lying outside in deep water with a strong current would be at great risk and require constant watching.

If docks be adopted we could not have the same accommodation we now have; the craft could only pass in and out for a short period of the tide, but at the present time we bring craft up alongside as soon as there is sufficient water, and they remain to unload in the same manner; this is very important for the expedition of our business, which, if deprived of, would put us to a large increase of expense for additional craft; It would be difficult for lightermen to make to the dock entrance, there must be some place to bring up to; indeed without a clear waterway we could not carry on our business. We have also many country (masted) barges besides our own to unload and load at our granary, which are at least 70 feet in length.

If there were an inner water with an opening for more than one wharf there would be constant disputes as to the priority of entering in order to save the tides, and as to the duty of clearing from mud there would also be the expense of the gate keepers and repairs of gates; such a rate would be very objectionable.

If there were a tidal harbour barges would be subject to get aground and block the entrance.

We have many waggons and carts, and I believe that the street traffic (especially when the new street is opened to the borough) to be amply sufficient for the traffic on this side of the river.

Our wharf would not admit of a separate dock being formed in it, on account of its being of a small width.

Any extra space gained by an embankment would not be of any service to us.

The obstruction of our business during the works necessary for making an embankment would be very serious if we were to remain.

2040. (*Chairman.*) Your business appears to be carried on with very great convenience as the river now is?—Yes.

2041. And you state that it is essential to the carrying on of your business with convenience and without additional expense, that you should be able to hoist your sacks from the barges into the different floors of your warehouse?—Precisely.

2042. It would appear then that for any business requiring the same facilities for hoisting from the barges the additional space to be gained by embanking would be of no value to you?—Any additional space, or embankment there, would be of no value to our business.

2043. Do you think that the addition of tramways across the embankment would still lead you to incur extra expense in landing your goods?—Most certainly, there would be a double portage.

2044. Would you not gain an advantage by having the barges always lying afloat upon the outside of the embankment, supposing you had a depth of five or six feet at low water?—That would be of no use to us outside the embankment, and the danger would be extremely great to our barges outside the embankment.

2045. You consider that any road there would expose your premises to danger of depredation?—I consider that any embankment would greatly impede our business, as I stated in my evidence which you

have read, to such an extent that we could not carry it on. Our business is continuous from morning till night, and anything to impede it must injure our business very much.

2046. (*Capt. Galton.*) But would it not be more convenient if the barges could always lie afloat close to the wharf; assuming your wharf extended out into the river to a point to which the barges could always lie float at low water, would not that be more convenient to you than the present state of things?—It could not be more convenient. If we had the same accommodation as now, of course we could not complain, and the same facilities for getting the barges up and getting them away by a free waterway, or access for bringing the barges in and out; it is very desirable we should have free access for bringing the barges in and out at all times of the tide.

2047. (*Mr. Thwaites.*) Your objection appears to be to a roadway in front of the wharf?—That is one of my objections.

2048. Supposing the ground reclaimed from the river given to the wharfingers upon certain conditions, would not that give greater facilities, there being an undisturbed frontage; if the ground reclaimed from the fore-shore were given up to the wharfingers, would not that be a great benefit to the wharf?—Certainly not; it would be of no avail to us.

2049. You say that additional wharfage ground would be of no value to you?—Certainly not, for this very reason, that the barges then would have to lie outside the embankment, which would be at an immense risk, and there would not be the same facilities of getting to our granaries which we have now. For instance, how should we obtain easy access to our upper granaries—the upper floor of the granaries—the barges would be at such a long distance off.

2050. At the present time many of your barges are stranded upon the banks, and remain there, of course, at low water?—At low water they are stranded.

2051. At a distance from the wharf?—They lie one behind the other, so that you have access to the whole.

2052. You have a frontage, if I understand your statement right, of 150 feet?—No, the frontage is only 52 feet; the depth is 150 feet.

2053. What I want to call your attention to is that as you have only a frontage of 52 feet for your barges, it is perfectly clear that your frontage will only admit of one barge lying alongside the wharf?—We bring them up with their heads to the wharf.

2054. What may be the width of the heads?—About 16 to 18 feet; abreast we get about three barges.

2055. Two barges?—We get three barges in front.

2056. How do you get three eighTEENS in 52?—Three seventEEN are 51; of course we can use the foreshore of our neighbours if it is not in use.

2057. Then supposing in front of your wharf of 52 feet in width you were to have an extension of 30 or 40 feet out into the river, with the same freedom in the front of the river wall as you now possess in front of your wharf, would you with that additional accommodation be in a better position than you are now, or, if not, what are your reasons for concluding the contrary?—I do not quite comprehend your question.

2058. My question is this,—supposing this to be the front of your present wharf, 52 feet in width, you can bring three barges up at a pinch, with their heads presented to your wharf, out of which you can take your goods?—Yes.

2059. Supposing that the wharf were extended 30 or 40 feet out into the river, and you had the same facilities and freedom in front of the wharf wall, and you had that space given up to you, would you not then be in a better position than you are now with all that additional accommodation?—We should not have additional accommodation, because we use that portion which you are speaking of as being given up now at the

end of the other barges; we have not only three barges alongside, but we have barges drawn up to them, therefore we have more than that addition; many of them are large craft of 60 or 70 feet long; we have two craft out headways to the wharf.

2060. Suppose instead of having the craft out lying where they must remain during the low tide, you had a free access to the river wall at all times of the tide, where you could move one craft after emptying and substitute another, would not that give a greater facility for carrying on your business than now, when the barges may lie out a considerable distance where you cannot move them near the wharf, and must carry the corn on men's backs; the corn must be carried the length of two barges?—If you want the corn from the back craft of course you must carry it the entire length of one barge, and part of another.

2061. Supposing the wharf were brought out, and you could remove a barge when empty and bring in another, and then empty that by means of a crane, would there not be a saving of portage?—It could not be a saving of portage, because we always bring our craft requiring to be unloaded first close up to the wharf front; the others lie in readiness in case of an emergency of any particular parcel being required out of them; but it is not often that that occurs, as the barges we have are large, and it would always take a tide to unload one craft, and therefore no advantage could be derived from being able to move it in one tide; it takes a tide now.

2062. Are you subject to flooding at all in the district in which your wharf is situated?—We have at times a little up the grating, but it is very rarely to be seen beyond the gratings in the street; there is never any in our granaries.

2063. Then, according to your views, no system of embankment could possibly be carried out without destroying the whole of the trade on that side of the river?—It must positively destroy our trade. Other gentlemen who are now present will be better able to speak to the general fact; but my opinion is that it would be a very serious impediment to all the business close round my wharf.

2064. Did you sign the memorial which was presented to the Commissioners?—I did, or at least our firm signed it.

2065. I think you make a statement in that memorial that the several local authorities in the metropolis are vested with power to cause all banks, wharves, docks, and so on abutting on the river to be raised, so as to shut out the floods from their premises, in order to prevent the flooding of the locality?—That portion, I think, refers to a power given to the Board of Works where it is necessary. I think that your attention was called to that more particularly as to the flooding above Westminster Bridge.

2066. You are not aware that there is no such power resting with the Lambeth vestry as set out in this memorial?—I believe there is the power, if you refer to the Act of Parliament.

2067. I am bound to tell you there is no such power to call upon the wharfingers to raise the walls.—Mr. Meymott was our authority for that. It is a legal point.

2068. (*Mr. Hunt.*) How long have you been carrying on business at this wharf?—At this wharf we have carried on business for about five years. We removed from Queenhithe when the premises were taken down.

2069. Is that leasehold?—Leasehold.

2070. With a long term?—With a long term.

2071. You have erected new buildings upon it, have you not?—We have increased it.

2072. I suppose I may take it that yours is an increasing and flourishing business?—Ours is a very old firm. It is a prosperous business, I am happy to say.

2073. Suppose you wanted to extend your premises, to extend your warehouses, so as to meet the requirements of your increasing trade, have you the facilities now of doing it?—We have not the facility

beyond raising our granary. We could do that if we required more room, but have sufficient room for our business.

2074. But supposing your business increased, have you facilities in your present wharf of 150 feet by 52 feet of enlarging your premises so as to meet the requirements of your trade?—Very considerably, by putting two floors above.

2075. Suppose you had the facility of extending your warehouses towards the river, instead of raising them, and so bringing the front of that extended warehouse on to the new embankment wall that would be made, would not that afford a great facility to your business in preference to raising the existing building?—The only objection to that would be the danger to the craft that lie in the river.

2076. Then in other respects it would be an advantage?—In any additional room, as a matter of course, cost would have to be considered; and I need not tell you that going into the river to construct a foundation is a very serious item.

2077. But if you are going to raise two stories upon the building at present, the question is whether the foundations are strong enough to carry them?—We are not likely to require that addition.

2078. But I am looking now at the improvement of your property, and I want to know whether 30 or 40 feet in front of your present wharf wall would not facilitate the erection of any increased buildings you might require for your trade?—It would give more room.

2079. It would afford facilities so far as your premises are concerned?—Gentlemen knowing the river Thames must know that the further you get out into the Thames the greater the risk.

2080. What is the foundation of your wharf wall?—Brick.

2081. And what is the level of it above Trinity high-water mark—the top of it?—The top of the ground floor?

2082. No, the top of the wharf wall. Is it above the level of high-water spring tides?—Yes.

2083. What rights do you possess as to the barges being moored off or lying off your present wharf; are you limited to number?—Not any.

2084. You do it by sort of privilege from the conservators of the river, or what?—We do it as every other wharfing.

2085. Suppose you were to put 50 there, do you think you would be interfered with by anybody?—I am not aware; but it is not likely we should do so.

2086. But you do not think there is any limit as to the number of barges?—We never had a question about it.

2087. (*Captain Burstal.*) Do your premises rise directly from the river?—Yes.

2088. There is a crane up-stairs?—A jigger, or winch.

2089. For the purpose of unloading barges?—Yes.

2090. You unload goods from the barges on to the ground floor by means of men with sacks upon their backs?—Yes.

2091. And you unload barges to the upper stories by means of this crane or winch?—We do.

2092. Then you really have no wharf at all?—No wharf beyond the premises.

2093. Does the river water at high tide come into your ground floor?—No, I have never known such a thing since I have been there.

2094. It is sufficiently high to prevent it?—Yes.

2095. Why do you apprehend danger to barges? You say you have six or seven barges at once unloading; why do you apprehend danger to barges if they were lying alongside the embankment, if that embankment should be further out into the river, and there should be five or six feet of water always alongside that embankment, and those barges consequently always afloat?—At the present time we are in a sort of eddy, out of the way of the stream entirely. The further we were out the nearer we should be to the

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steam vessels; and if we were more into the stream there would be greater risk.

2096. You think that your premises retiring more to the southward you get shelter there—is that it?—Much greater protection.

2097. You say that your barges would require constant watching?—Outside the embankment you would be more liable, I think, to things running against you.

2098. Are those barges you have at your premises masted barges or open barges?—Our own barges are open craft, but we have other barges come up masted.

2099. It is not the custom to keep any person on board those barges during the night?—No.

2100. Do you feel perfectly safe with respect to those barges as to the property as well as to the barges themselves?—We do.

2101. Do the barges strain by resting upon the ground at all?—No, I do not find that.

2102. Supposing an embankment to be constructed in front of your premises, having a roadway over it, and then over that embankment a series of tramways were made so that you could hoist your goods out by means of hydraulic cranes, and turn them into trucks and from thence into your premises, would there be any serious loss of time and expense attending that?—There might be; there would be the double lifting and besides the double expense.

2103. There would not be double lifting as far as the ground floor is concerned?—On the men's backs there would be; of course they must first be lifted into the waggons, and run into the warehouse, and then lifted again on the men's backs which would be double portage.

2104. You conclude that in that scheme there would be a deterioration of your business?—I am sure it would be a serious deterioration.

2105. Those objections would not hold good if there was a dock between your premises and the proposed embankment?—Barges could come in a tidal dock only at certain times.

2106. Either a tidal dock or a floating dock?—The difficulty of a tidal dock is mentioned in my evidence, or indeed either dock.

2107. Do you find with respect to the traffic from your house of business, that the street in the rear of your premises is sufficient; is it the Commercial Road, or the Belvedere Road?—The Commercial Road.

2108. Do you find that that street is sufficiently commodious for the transit of all your corn both east and west?—Decidedly.

2109. You have never felt any inconvenience whatever from the want of accommodation or through traffic?—Certainly not, and when the new street is opened there will be room for a large increase to the present traffic.

2110. The new street from the Borough?—Yes.

2111. Have you ever had an opportunity of observing the state of the ground at the back of your premises after high floods; have you found that the water from the river has percolated through that ground and soaked the district. I do not mean by the floods, but I mean by percolation?—I have not.

The witness withdrew.

Mr. JOHN BENNETT examined.

The following statement forwarded to the Commissioners by the Witness was read.

2122. We are lessees of a wharf in the Belvedere Road, close to the Hungerford Bridge, having a frontage to the river of 78 feet. Our premises consist of a drawing-dock and warehouses on each side of it. We land hay and straw in the draw-dock (when the water is out) from barges direct into carts, and when the water is up it is landed on men's backs, half a hundredweight to each. Truss machinery would be useless for landing goods of this kind; they are too bulky; they come in country sailing barges, which are usually about 70 feet long and 20 feet wide, and

2112. You have not observed it one way or the other?—I have not.

2113. You are not able to give any evidence upon that?—No.

2114. (Mr. Thwaites.) There is one point in answer to a question of Capt. Burstal's that I do not quite understand. Supposing the river wall to be carried out 50 feet, something after that style, (exhibiting a diagram,) supposing this to be the frontage of your present wharf, and you were to be extended out 50 feet, with a crane by means of which you would raise your corn from the barge on to a tramway here, and wheel it back either into your basement story or stopping it at this point, raise it to any one of the stories you have described, in that case would there be a very great increase of cost?—There would be the increase of cost I mentioned, certainly double portage.

2115. You spoke of the men having to remove it on their backs; there would be no removing it on the backs of the men at all in that case?—It must be drawn from the barge and put into the trucks first, and then from the trucks it must be lifted again upon their backs to the part of the premises required.

2116. Supposing a small waggon or carriage of any description convenient for your particular business, namely, that of corn, were placed at this point, and you raised that corn by means of a crane from the barges, and put it into this carriage, and wheeled it back on the tramway either inside the premises upon the basement story, or stopping at that point lifted it to the upper story, it would not be taken by the men at all?—The whole of the upper floors would be extra, the extra portage would be to bring it to the wharf, and raise it on the winches; there would be the first portage, then would come the second portage to raise it up to the floors above; with regard to the second floors there would be the lifting, increasing the portage.

2117. The only additional labour would be in simply wheeling this carriage, containing two or more sacks of corn, from that point to this; you have now to lift it from that point to the warehouse?—We should have first to raise it from the craft into the carriage adapted for the purpose, and when we had done that we should have to bring it alongside of the wharf under the jigger, and raise it to the upper floor; the first portion of the work must be all additional.

2118. Only that which refers to the distance from that point to this?—There are two liftings.

2119. You have that lifting still because here you would have to draw it to that point from your barge?—The difference of unhooking and rehooking again, and see the extent of time it would take to do it.

2120. Then I am not able to persuade you that the addition of 50 or 60 feet to your wharf would be of any value?—I see none.

2121. (Mr. McClean.) Supposing a system of docks made as shown upon this plan between Blackfriars Bridge and Westminster Bridge, could the traffic be carried on as conveniently as upon the present foreshore?—If they had the same amount of room, the difficulty of entering the docks would then be great.

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If there were a public road in front of our wharf, the rapid transit of our goods across it must impede the traffic, or else be stopped by it, and such a road would be of no advantage to us; indeed, in order to admit our barges, it must be at such a level as to be useless for the heavy traffic of wharf goods. If there were an inner dock or canal we should not only have the contention and difficulty arising about first getting in and out, and the expense of men to attend the gates, and the heavy cost of clearing from mud, but we and the other forage salesmen on this shore would have this further disadvantage, that our barges must come up with the early tide, and there would be no convenient place for them to lie in till the gates were opened shortly before high water. Now they gradually float up with the tide on to the foreshore, which they can do, as we have slack water (being in a bight). They could not do this in a strong current. We have usually three or four barges up daily, but sometimes as many as 10 and 12 when they are kept back by strong winds. Any detention of the craft is of great importance, for we have Government contracts, and the forage must be supplied every day, so that we are obliged to have plenty of barges to depend upon, and we could not carry out our contracts with the uncertainty of our barges not getting in; and we require several kinds of forage in different vessels to be working at the same time, so that the detention of any one barge or more outside would be a very serious inconvenience. We can now work six barges at a time. Our draw-dock is most essential to us, and a solid embankment or a floating dock would of course destroy it. We have many carts constantly about, and I believe there is no need of any additional roadways, especially such a circuitous one as an embankment would give. The injury to our business during the works necessary for an embankment would be very great. We believe that any kind of embankment would injure our business more or less, as the same amount could not be done as at present.

2123. (*Chairman.*) What is your frontage?—The roadway on the river frontage?

2124. The frontage towards the river?—78 feet.

2125. You do not think that any kind of embankment with a certain amount of reclaimed land in front of your wharf would assist your business?—Of course, extra space is always an advantage, but we should have the great difficulty of getting at the barges; the barges are of a peculiar nature, the size is very great.

2126. Supposing the barges lay in 6 feet water at low water, and always were able to get up to the front of the wharf, and that you had tramways or other means of carrying off the hay and forage on to your new premises, would not that be a facility?—Should we have an equivalent in the extra room? What should we have to give up for it? We can now lay several barges. We should then be able only, perhaps, to lay two or three.

2127. That advantage you now possess is the result of your having plenty of room?—Yes.

2128. How many barges can you work now?—We can work six.

2129. With your frontage of 78 feet, supposing you were confined to that, how many should you be able to work then?—Three at the outside.

2130. Would they be able to lie end on to the wharf or alongside?—They must lie at right angles, of course.

2131. And no roadway along the front would be of any convenience to you?—No.

2132. An interference rather, perhaps?—Certainly.

2133. And it seems also that you object to interior docks from the circumstance that the barges would not be able to get into the openings?—The barges are so large; the barges themselves are very large, and then the stack of hay or straw makes them very large indeed.

2134. What headway do they require?—About 10 feet.

2135. (*Captain Galton.*) What width does a straw barge require with the straw loaded on it?—Twenty feet width and 4 feet more over.

2136. Do you unload your barges now from a draw-dock?—Principally.

2137. You have a draw-dock?—We have a draw-dock.

2138. Where do the barges lie?—On the foreshore.

2139. And you load them by means of carts?—By means of carts alongside.

2140. I do not quite understand why you said you could not unload a barge by machinery because of the bulky nature of the goods?—The trusses are so large that the machinery used would be hardly applicable to them; it is not as if they were in a very small compass. The trusses are of immense size, and were you to put many of those trusses it would be a very slow process, because, without knowing any definite plan of the machinery that would be employed, my impression is that the size of the trusses being great you would not be able to manage it.

2141. In the case of anything that is bulky and heavy, is it not more easy to unload by machinery than by hand?—Though they are a great size they are not very heavy.

2142. How is it done by hand now; do the men load the trusses on to the carts?—They are simply carried out on the men's backs for about an hour before high water and an hour afterwards.

2143. Then if your barge could lie alongside of the wharf, and if you had machinery which was adapted to raising the trusses of hay and straw rapidly, you think that would not be more advantageous to you than loading from the barges into the carts?—I have no idea of any machinery that would be applicable to the purpose.

2144. (*Mr. Hunt.*) Where is your wharf?—In the Belvidere Road, next to Goding's brewery, near the Hungerford Suspension Bridge.

2145. Have you a long lease of that?—Yes.

2146. It is the Archbishop's property, is it not?—I believe so.

2147. Do you know the wharf that was Mr. Henry Lee's, that the Council for India have taken?—I do know the wharf.

2148. Do you know Mr. Langton's wharf?—I do.

2149. Do you know that the Council for India, as well as Mr. Langton, have made an application to embank the river, and bring out their wharf 30 or 40 feet into the river?—I do not know that.

2150. It would be a great convenience, I suppose, to get additional accommodation upon your wharf?—Space is always, of course, an advantage.

2151. The only objection you have to this embankment is that it may possibly interfere with the safety of your barges?—I do not think the same amount of business could be carried on, because the barges could not possibly lie in the same number. If we reduce them from six to two or three, of course we cannot carry on the same amount of business.

2152. But your barges have to lie empty sometimes, have they not, because they cannot get away on account of the tide?—Only till the tide reaches them.

2153. They would be able to get away at all times of the tide if it were embanked; would that not reduce the necessity of having so many barges at a time in front of your wharf?—They are influenced so much by the wind; if there is a very severe wind blowing down the river they cannot come along, so that we frequently have a large number there together, and sometimes we have a small number.

2154. (*Captain Burstal.*) If a solid embankment were made in front of your premises, and your barges were unloaded upon the outer part of that solid embankment, I presume the trusses of hay would be placed in waggons or carts, would they not?—If

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Mr. J. Bennett. there were a roadway on the extreme edge of the embankment.

27 March 1862. 2155. Supposing the space between your present river frontage and the new river frontage were to be a roadway, or given entirely to yourself, you would then have to unload into waggons. Supposing it were a public road there would be only the difficulty of crossing that road to store this hay?—Provided we always have access to that road, and it was not interrupted too much by the traffic, the injury would not be so great.

2156. That is done in very many places. Vessels are unloaded near the water-side on to waggons. A certain space is devoted entirely to water-side traffic, perhaps 30 feet, and as soon as the carts are loaded it is merely to take an opportunity to cross the road and go to the wharfinger's premises; there does not seem to be anything objectionable in that?—There is the extra labour.

2157. It would be extra labour to the extent of the difference in the width of the road; you do not unload directly into your premises now?—We unload principally into carts, because, being a draw-dock, the carts are able to go alongside the barge, which saves expense.

2158. Where does the material go in the carts after it leaves the barge?—To the purchaser.

2159. If that is the case there is only the difference of 30 or 40 feet. Whatever it may be in the distance, the cart has to go to the purchaser, you do not store the hay?—We do store in some cases; sometimes we store and sometimes not, depending upon circumstances.

2160. When you do store the hay there would be a slight inconvenience, but when you do not store the hay, but cart it direct to the purchaser, there would be no inconvenience?—There would be an extra expense beyond that.

2161. How an extra expense?—Because you would have to carry it from the barges into the carts; you must bring it from the barges into the carts.

The witness withdrew.

Mr. THOMAS BERRIDGE examined.

Mr. T. Berridge.

The following Statement, forwarded to the Commissioners by the Witness, was read.

2170. "I have been a lighterman and acquainted with the navigation of the Thames for 40 years. I have considered the probable effect of an embankment on the south side, whether as a solid embankment or an embanked roadway with an inner waterway and openings. In the case of a solid embankment, with deep water at low tide, the current of the river must be considerably increased. It now flows at spring tides near four miles an hour in the narrow parts. I think we may estimate that it would increase to five miles an hour. In bringing barges up the river to different wharfs we should lose the advantage we now have of the foreshore, there being no difficulty in getting barges upon it. The lighterman calculates the distance at which to begin rowing his barge to the side, and when it will get into the eddy, which is in front of nearly all the wharfs on the south side, and he shoots his barge round to meet the eddy, which runs in an opposite direction to the tide, and enables him to bring up the barge; and if he overshoots it there is no difficulty in making fast to the piles or barges at the next wharf. In the case of an embankment there must be dummy barges outside or timber-heads on the embankment, to which a warp must be thrown for the barge to bring up to before approaching the opening. It would never do to shoot for the opening, for the head of the barge would most probably be broken against the further pier. These dummies or timber-heads would require men to be in attendance to fasten the warps to be thrown out. Many barges would have to bring up in this way, waiting to get in. The hay and straw barges would be a long time, because they can come through the bridges only with the early tide. Those that could

2162. But it is brought at present from the barges into the carts?—No, it is thrown into them alongside; we should have to employ extra hands.

2163. Supposing you had a hand crane to sling every truss?—It would never do; only look at the time that slinging every truss would occupy.

2164. There is this set-off against it, that at present you can only unload a barge from one hour before high water until one hour after?—That is, we can put carts alongside the barges with the exception of that time.

2165. What I am to understand is this, that when the tide is low you have to raise the truss of straw or hay, you have a longer distance to hoist it, and that increases your expense, is that it?—When the tide is low the cart goes alongside the barge, and the truss is thrown into it.

2166. Is that a public draw-dock you speak of, or a private one?—Private.

2167. Why do you say that the time of slack water is desirable for moving barges?—These barges being large are obliged to come up at the early tide on account of the bridges, and of course they start as soon as possible with the turn of the tide, and come up by degrees.

2168. But supposing they stop below your wharf, and the flood tide was running, the tide would rather facilitate their going to your wharf, particularly if the wind was against the tide?—They are obliged to come up by the early tide, on account of the high stacks coming through the different bridges; but, of course, I do not pretend to understand thoroughly the navigating a barge myself.

2169. But you have thought of the subject of docks with reference to your business. You say in your evidence here that dock openings are not practicable; is that from the force of the wind acting upon the hay stacks?—Exactly so; that is one reason; there is so great a difficulty in getting in.

not get near enough to the opening must lie alongside and make fast to the others, and the tier would probably extend a considerable distance into the river. There would be great danger in all this; for with such a current, and especially with a wind in the same direction, the strain on the ropes, especially of the outer barges, would be very great, and if the inner ones gave way several would be carried up the river together, and with broken warps they could not bring up at the next opening; and the rush of steamers passing would add very largely to the strain. They would also be exposed to the danger of knocks from the steamers and from other barges. It may be said that much of this inconvenience would be avoided by the lighterman using anchors (kedges); but this would require a second man in the barge, and in such a situation as above supposed, of a strong current, &c., they might not hold, and then the barge would lose the tide. I anticipate very great difficulty in the construction of gates, which would allow any length of time for them to be opened, unless they have locks; but the time occupied in passing the locks would render this impracticable. Without locks, I think the gates would have to be closed very soon after high water, and consequently could not be opened much before the next high water. I believe the accumulation of mud would be very great in a tidal harbour; there would be nothing to stir it, and barges not unfrequently stick fast in the mud and will not rise. The openings must allow 20 feet above spring tides for the hay and straw barges to come in. The effect of having always deep water in the river from shore to shore at all times of the tide would be very serious in case of accidents. Barges are continually meeting with accidents in shooting the bridges, and the new Westminster Bridge is the

most dangerous of all in consequence of the form of buttresses. They are also subject to accidents by being struck by the steamers and other barges, and when struck we can now generally make them safe by getting them ashore; but in deep water they must sink if leaking much, and of course the increase of current would increase the damage in being struck, and the diminished river way would of course increase the probability of such accidents. It frequently happens now that a barge is somewhat leaky, but the lighterman can manage to navigate her, knowing that she is going to the shore on the river side, and that, while lying there, there will be no leakage; but if there were deep water everywhere he could not do this. If barges sink they will sometimes roll over, and be dangerous to vessels passing above them. Such accidents would of course be much increased if there were always deep water."

2171. (*Chairman*.)—You state that you want 20 feet headway above high water?—Supposing there is a bridge over the locks, I think so. I think at least for straw barges.

2172. In your former evidence you said 10 feet headway?—It would be easily calculated. I should think a truss of straw is three feet thick, and there are generally three or four above the deck; and then the masts do not come down low in a straw barge.

2173. How much is the straw above the gunwale?—Very often four or five trusses.

2174. That would not run up to 20 feet?—Then there is the mast. That does not go down.

2175. (*Captain Burstal*.) Probably 20 feet would be the extreme height?—They never can lower their masts. I know that they prefer to stop below bridge.

2176. You seem to have a knowledge of the velocity of the stream of the river. You say it is four miles, and sometimes five miles an hour?—I say four miles an hour.

2177. Where do you find the stream to run about four miles an hour?—Can you measure the distance from the West India Dock to Blackfriars Bridge? It is about that. I know that I have many times come within the hour to my own wharf from there.

2178. You have come from the West India Dock to where?—Near Blackfriars Bridge.

2179. Within the hour?—Within the hour.

2180. And you estimate that to be four miles?—I think so. I have come out of the dock and gone out into the stream and made my barge fast at the wharf in that time.

2181. You anticipate then an embankment brought out a considerable distance from the Surrey shore would cause the stream to be so strong that for the general purposes of navigating barges it would not be convenient to bring them up?—It is impossible to bring them up without we have timber heads or dummies, or something placed there.

2182. Something permanent, floating in the river?—Made fast; not floating.

2183. Floating in the river to take a turn to?—Yes.

2184. In fact, you can scarcely ever bring a barge up in a strong tide without having something to take a turn to?—We always calculate upon that, unless we are shooting into an eddy.

2185. Is the fore-shore of the river ever used now by craft to run upon when they spring a leak or come into collision?—Undoubtedly; unfortunately I have had to put my own on.

2186. You have experienced it yourself?—Yes.

2187. If an embankment were to be constructed of such a character on both sides of the river as that there should be never less than six feet of water and no fore-shore at all, do you think that for the purposes I have just explained, there would be any deterioration to the interests of the bargemen and barge owners by their not being able to run upon that fore-shore?—Greatly so. Supposing you wanted to bring up a barge on account of a leak. You must be

aware that we sometimes strike a bridge, or a steamer runs into us, and many things, and we cannot bring her to her destination, and we are glad to run her on shore.

2188. You run her on shore at once?—Yes. But if there were always six feet of water we could not do it.

2189. You said something about striking bridges?—Yes.

2190. And you said something about the dangerous mode of structure of Westminster Bridge; will you explain to the Commissioners in what way you consider Westminster Bridge is dangerous?—From the piers, which strike us under water instead of above. Westminster Bridge is the most dangerous bridge to strike among all of them.

2191. The piers strike you under water?—Under water, instead of striking the part which is strongest. It is a very fine bridge, and I am not speaking against the bridge; only in case we have the misfortune to strike it, then it is a most dangerous bridge.

2192. Are there any other objections which occur to you in reference to that bridge?—No.

2193. The new Westminster Bridge you mean?—Yes. We are talking of striking the bridge; it is most dangerous in that respect.

2194. (*Mr. Hunt*.) You have no other objection to the new bridge?—No. We strike under water instead of above water, where there is less danger.

2195. (*Captain Burstal*.) You seem to have very great experience as a lighterman; I suppose, from the fact of your coming to represent the interests of the gentlemen upon the Surrey shore, that you have had a good deal of lightering upon the Surrey shore?—Yes, and I have now.

2196. That leads one to put a practical question with reference to the Surrey shore. I have heard it stated in a number of instances in other places that the Surrey shore, particularly below Westminster Bridge, is resorted to as an anchorage for barges in bad weather, to get out of the main traffic, is that the case?—Your practical knowledge must tell you that, for instance, there is a curve in the river there, and the tide runs away to the north shore.

2197. The main current of the river trends towards the north shore?—Yes.

2198. Have you ever experienced in navigating craft any want of accommodation, or any injury, or any impediment, or obstruction to the navigation by virtue of the number of barges that are now, and have been for years, lying outside the present wharves upon the Surrey shore?—No. Because, if we are going up the river, we should never go in there. There is always an eddy; we keep in the stream.

2199. In navigating up the river you avoid the Surrey shore because it is not in the main body of the stream?—Yes.

2200. But irrespective of the requirements of the wharves, there are sometimes probably as many as 20 barges moored outside a man's premises?—Yes.

2201. Do you believe that 20 or 30 barges moored outside a man's premises at present obstruct the navigation of the river?—No, not at all.

2202. There is plenty of space between the outer side of those barges and the north shore?—I always found it so.

2203. Supposing an embankment were to be constructed projecting something like the one you see depicted in the drawing against the wall, and there were 20 or 30 barges outside a man's premises upon the Surrey shore, do you consider that the navigation of the river would be inconveniently obstructed by those barges?—I do not understand your question.

2204. Supposing an embankment were constructed according to that plan, projecting in some instances 200 feet into the river?—You do not intend for us to come with our barges inside that embankment do you, are you proposing it in that way?

2205. No, what I mean is this,—supposing it to be a solid embankment and there were no floating docks inside, and you still required to have 20 or 30 barges

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outside that solid embankment, do you consider that those 20 or 30 barges would form an impediment to the navigation?—If it was only one outside it must.

2206. And therefore an embankment projecting a long way into the river would necessarily require to have docks inside of it, in order to prevent any unnecessary obstruction to the navigation?—I do not care whether you have the embankment solid or otherwise, any embankment in my opinion must impede the navigation of the river.

2207. I ask you the question as a practical man?—Yes, and I give you my practical experience, speaking what I really think; any embankment must impede the navigation.

2208. Supposing it was only an embankment that finished off the line of the wharves and filled up the small recesses and made the line of a uniform character instead of being in some instances as it is at present jagged, that would not affect the navigation, would it?—The more you contract the stream the harder it would run.

2209. But it would be so small a contraction as to be little appreciable?—I remember years back, before Deptford and Greenwich were embanked, that directly the tide flowed over the bank it checked its current, it did not run so hard; we could feel it immediately in our barges, and wherever the most narrow part of the river is, we find the stream run more swift, we can tell in a moment.

2210. (Mr. Hunt.) You cannot suggest any improvement at all to the navigation?—No, I think any embankment must obstruct the navigation. If there is an embankment where are the barges to be put?

2211. (Captain Burstal.) With regard to the statement you made that any embankment would be objectionable will you have the kindness to state between what points?—I do not go to points, I am

The witness withdrew.

Mr. R. Cory.

Mr. RICHARD CORY examined.

The following Statement forwarded to the Commissioners by the Witness was read.

2220. We hold our coal wharf by lease from the Duchy of Cornwall, for a term ending 1909, and the lease expressly demises (besides the wharf) "All the low ground next the River Thames in front of the said wharf to low-water mark;" so that we hold our barge-bed on the foreshore virtually by grant of the Crown as part of the wharf; and therefore the promoters of any public undertaking who would take the one must also purchase the other—our trade with it. The other wharves, from here to Waterloo Bridge are held in the same way. Before the Conservancy Act we declined to make a payment annually to the Thames Conservators, and it was not pressed. Our river frontage is 106 feet, and 8 barges with coals, which leaves two berths for barges under repair, can be worked at the same time, four lying lengthways, "end on," and four beyond them, extending to low-water mark. They lie there nearly in still water, for there is the eddy, the water being in a bight of the river. We land about 35,000 tons of coals per annum. Each barge contains 50 tons. It is necessary to work at the same time several barges, having different kinds of coal; such as house coals, steam coals, &c. Sometimes several barge loads of the same sort are landed in the same day. All coals are landed in sacks on men's backs, and carried by men to their places in the waggons. No ordinary machinery could supersede this. Each sack would be too light for machinery to be useful; and it has been found that no machinery can be profitably employed for light weights; and this is of great importance, because the actual value of the coal is so little in comparison with the labour bestowed on it. The use of machinery also would involve another shifting of the coals, and every movement deteriorates the quality by breaking the coal. The machinery at the Victoria Docks lifts 15 or 18 cwt. at a

practically, not theoretically, acquainted with all points; I know the river practically, and have been from the age of four or five years engaged upon it.

2212. Probably you mean where it is wide now, from Hungerford Bridge to Blackfriars Bridge?—Take Vauxhall Bridge to Chelsea, the tide runs harder now than it did before the embankment was thrown out, that will give you an illustration.

2213. It is not much brought out there?—It is not much brought out.

2214. That is no great detriment to a bargeman, because of course he goes so much the faster, it is only when you have to bring up that the difficulty occurs?—Supposing you met with an accident by happening to strike any thing, the harder the race of the tide the worse it is; you may do 400*l.* worth or 500*l.* worth of damage in a few minutes.

2215. I suppose four or five miles an hour would be a fair working stream?—Yes.

2216. And if it was increased much beyond that it would be hardly practicable to bring the barges up?—Exactly.

2217. (Mr. Hunt.) Have you considered what is to be done on the north side and do you think that will be an impediment?—I do, I think if you contract the river it must make it more dangerous to navigate and consequently more expensive.

2218. (Chairman.) Then I understand you attach considerable importance to having the mud banks on which you can run your barges on shore in case of accidents?—It is of considerable importance, it saved me 400*l.* or 500*l.* once, and I consider it of great importance. I had a barge strike Vauxhall Bridge loaded with malt and we ran her ashore and it saved me 400*l.* or 500*l.*; it was loaded with malt.

2219. (Mr. Hunt.) Bridges are an obstruction to the navigation, strictly speaking?—We do not mean that, but we like plenty of sea room.

time, and this is not applicable to landing from the barges and placing in the waggons; it merely supersedes the coal-whippers' work at the ship's side. A solid embankment with a roadway would destroy our business, because the coals could not be carried across a public road; the rapid passage of the men would either obstruct or be obstructed by the cross traffic; the top of an embankment, if four feet above Trinity high-water mark, must be 24 feet above low-water mark; and the difficulty of "backing" the coals up such a height would be very great, if not impracticable; and a raised road on a high level would be of no service for wharfingers' traffic, because of the incline from the level of the wharfs, which it would not be worth while for heavy waggons to undertake; and a roadway having inclines at various gradients would never be used for heavy traffic. The barges would have to be outside the embankment, and the wash of the steamers, increased by the contraction of the river and rebounding from the face of the embankment, would materially obstruct the landing of the coals. The men often could not stand with their load; the strong current (then increased) would make it unsafe for barges to lie there—the outer ones especially. They would get loose, and other barges would knock against them. We use part of the foreshore as a place for repairing barges; it is prepared with a hard bottom. This would be destroyed by a solid embankment. Such a plan is necessary for our extensive lighterage. We have 150 barges of our own, and sometimes 100 besides on hire. A stage, as has been proposed, would not be practicable. An increase of wharf room inwards would be of little use to us. We are interested in several wharfs on this shore, and the rent is reckoned according to the lineal feet frontage, and not according to the depth backwards. As regards the inner water-way, the embankment must be far enough out to allow our present use of 140 feet, and room enough beyond that

space to allow other barges to pass and turn round. There would be great inconvenience if more than one wharf owner has the use of the openings. Everybody would want to get in first. There must be a dock-master, and then disputes would arise about appointing and paying him, and about apportioning and recovering that expense, and the expenses of repairs, and the great expense of clearing the mud. A rate (which has been proposed for this purpose) would be a serious injury to the property. Our wharf is not wide enough to allow a separate dock to be made in it (as has been proposed), and this is the case with many wharves along this shore. We have now always barges lying in the roads, ready to come ashore whenever there is water enough to supply the place of each barge as it is emptied, and the latter goes off at once; this could not be done with an outer embankment. Some barges contain a coal which is little used, and sometimes lie at the wharf a long while unloading. If there were flood-gates there would not be time for all the craft required to come in and go out. If it is a tidal harbour the mud would fast accumulate, it would be expensive to remove it, and it might probably settle outside the openings and form another foreshore in time. In the Report of the Royal Commissioners reference is made to the increased facilities for distribution of coal by the new system of unshipping in the docks into railway carriages, and by various depôts on the railways; and Mr. Downey in his evidence speaks of the facilities for receiving large quantities rapidly into barges in the Victoria Dock. I understand Downey to say, that a reduced space for lying the barges above bridge will suffice, because there is room to keep the barges in Victoria. I reply, that unless the loaded barges are taken out of the dock, 36 hours work will block up the tidal basin when the colliers are discharged. And with regard to railway distribution, it is to be noticed, that no such facility as the North London Railway exists on the south side. And with respect to the distribution by this railway I would observe, that we lighter coals to any wharf as far as Chelsea at 1s. and more per ton, less than the price for which they can get them into trucks at the railway depôts. The railway distribution is chiefly of house coal, where the question of cost is not so important; but with the large quantities used in factories every increase of expense is very important. The factories are supplied chiefly from the river, and for the most part they lie near the river. Many factories consume 5,000 tons a year. Many of the largest factories are on the river, and coals do not go into the streets at all, and the railway depôts are too far off to make it worth the expense of carting coals from them. The increased cartage for bringing them, the increased distance from the railway, would also increase the throng of traffic through the streets. We have many carts and waggons, and I see no need of any further increase of thoroughfares on the south side. I believe the objections and difficulties above detailed will apply to the several other coal wharves along this shore. The obstruction of our business during the works necessary for forming an embankment would be very serious.

2221. (*Witness.*) There is one fact that I wish to add to that. I think that any embankment encroaching much upon the river would render necessary the doing away with the various moorings in the river usually called roads, and if it were so the owners of those roads would have to be compensated for taking those roads from them.

2222. (*Chairman.*) What is the nature of the tenure they have of those roads?—I do not know what the nature of the tenure is, but for many years past they have changed hands, and been bought without the tenure being very closely looked into, and I find in the Thames Conservancy Act the Conservators have taken power to purchase those roads and to compensate them for them. Thus it seems that so far there is some title to them, though I do not know exactly what it is. In the 90th clause it says "it

"shall be lawful for the Conservators from time to time to agree with any person being the owner of any private mooring chains for the purchase of such mooring chains, and to pay to such person such purchase money or compensation as may be agreed upon." And the 92nd clause again says, "it shall be lawful for the Conservators to remove any private mooring chain within the stream or tide-way of the River Thames, making compensation to the owners thereof for any loss or damage which they may sustain in consequence of such removal, such compensation to be ascertained in the manner provided for the taking of land by the Lands Clauses Consolidation Act, 1845." Those clauses seem to infer that there is a sort of title to those moorings, though I do not know what it is.

2223. (*Captain Burstal.*) There is no doubt that there are some few individuals upon the river who have had grants from the Corporation of London for accommodations of that sort. I may take the opportunity of remarking that most of those grants have been made during the pleasure of the then Conservators of the river. If, however, there should be any title to these moorings, there is no doubt but that the two clauses which you have just read in the Thames Conservancy Act fully provide for compensation to those persons who are entitled; it is quite likely that such cases exist?—The embankment, if extended much, would probably render it necessary to remove those moorings.

2224. I apprehend that if an embankment were constructed,—if it were deemed necessary to construct an embankment in the river,—the board in which is vested the conservancy of the river would use their discretion in laying down public moorings for the convenience of the public in such places as they might, from time to time, deem necessary, and, as you say, if that embankment enclosed those moorings to which any private individual may be entitled, that private individual would therefore be entitled to compensation from the board in which the embankment was vested?—Even if the embankment did not remove them it would take so much of the river that it would render it necessary to remove them.

2225. That is merely a question as to compensation for moorings; it is a matter of detail which does not bear much upon this question?—Only as it occurred to me, as increasing the expense of this embankment.

2226. (*Chairman.*) I glean from the statement you have made that though there exists greater facilities now for the distribution of coals in the docks below, you still consider it absolutely necessary to retain the facilities for discharging coals from above?—There is no facility for distributing coal by railway upon the south side of the river. The North London Railway carries a great quantity of coals that are delivered in London from the various depôts on the line, but if the south side as well as the north were to be supplied from there it would cause a great deal of additional cartage in the streets. At present, at any rate, there is no such facility on the south side at all.

2227. Your remarks refer to works on the south side chiefly, to factories and shops, and not to the distribution which the Commissioners allude to in their former report?—No; I look upon the supply to the factories as the more important, because I think the trifling addition to the price of house coal is not of so much importance; at any rate, it is a much smaller tax upon individuals.

2228. (*Captain Galton.*) Do not you think the railways which have been constructed upon the south side of the river would be available for the distribution of coal?—I do not know whether they will become available or not.

2229. There are a large number of railways being constructed?—There are a large number of railways being constructed—more than I am acquainted with, but what may follow in the course of years I am not prepared to say.

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2230. You said that machinery was not adapted to raising light weights?—I mean to say that it is more expensive than manual labour, when I say not adapted.

2231. Are you aware that in America they unload barrels of flour, which are very light, entirely by machinery, at a very small cost indeed?—But perhaps manual labour may be dearer there. I believe machinery is applied in America to much smaller matters than is found profitable here; for instance, I saw a machine the other day for peeling apples, and I am told it is very much used in America.

2232. (*Captain Burstal*.) Do you store coals to any extent upon your premises?—To a very small extent—that is, coal used for a special purpose that does not get damaged by removal; coking and smithy coals, nothing else.

2233. Then you carry most of the coal to its destination direct from the barges?—Yes.

2234. Under those circumstances the barges do the work of a store-house upon the foreshore, do not they?—To some extent on the foreshore, and upon those roads which I have mentioned.

2235. You have camp shedding in the front of your premises containing how many barges—12 barges?—Yes, there is room for 12, but we really only use it for 8, because we keep two berths for repairing.

2236. Do you think that the barges ground upon the camp shed without sustaining any injury?—Yes.

2237. It is flat, in fact?—Yes.

2238. Do you supply coals to any gas companies?—Yes.

2239. Of course it is not necessary to unload them into carts?—No.

2240. What do you do with those barges; do they hang on upon your roads until it is convenient to send them?—There is generally a small reserve at our roads, but mostly the barges go direct up to the gas works.

2241. What is the object, as a coal merchant, that you have in not having your barges unloaded and put into store, but merely kept for a short time in the barges?—Taking the coal out of the barges, which might be done by machinery and put into store, and then again loaded into waggon, would cause some additional expense for all coals, and for some coals the additional breakage would be a very serious matter.

2242. Would that be the case supposing barges were fitted with square boxes, and those boxes were filled from the coal ships, and were fitted with handles and then unloaded?—The additional breakage would be saved there; but it is rather rough work loading the coals into the barges, and it would require more nicety than is usual for putting it into the boxes, and that means more expense.

2243. Do you find that the roadway at the rear of your premises is sufficiently convenient for carting that immense amount of coals?—I have never seen a stoppage in the Commercial Road for any time at all; I have never seen even a momentary stoppage.

2244. Supposing a solid embankment were put in front almost as far out as the outer part of your camp shed, do you think it would be possible, with the system which I have just submitted to you, of the square boxes, to lift up by hydraulic cranes these coals, and truck them from there into the carts? Would that be attended with more expense?—It would be attended with more expense. It would not be impossible, certainly.

2245. There is a portion of mud on the fore shore of the river in that locality which extends out, generally speaking, as far as the outer part of your camp shed?—Yes.

2246. Is there mud outside that point, or is it gravel, or what?—It becomes harder, but there is a great deal of mud with the gravel.

2247. It does not bear the characteristic of mud?—No, it is dirty gravel—mud and gravel.

2248. In hot weather in summer have you felt any inconvenience from it?—Never; and with reference

to that, some two years ago there were two summers in succession when the river was very foul and we were almost driven out of our counting-house when the tide was up, though we did not feel any inconvenience at all when it was down, which showed that the smell came from the water, and not from the mud.

2249. At the next premises above you there are large quantities of timber stored. The outer part of those barks of timber ranges with the outer part of your camp shed?—A little further, if anything.

2250. Do you find any inconvenience in the approach to your premises by virtue of this timber lying there?—None at all.

2251. Why is that; is it because the timber is above you?—That would be a reason, but I do not think it would be any inconvenience if it was below us.

2252. If that amount of timber were to range with the outer part of your camp shed, upon the lower side, you do not think it would be objectionable?—No, it would not be objectionable.

2253. Is it a fair question to ask you whether you are aware of any impediment to the navigation having been made by virtue of those barges lying outside your premises?—No, I think not; and for this reason it is only barges that are going to bring up there, or thereabouts, that come to the south side of the river. All the barges going up keep in the stream.

2254. I think Mr. Gabriel's premises are just above you, are they not?—Yes.

2255. Is there any inconvenience in taking timber past your barges to his premises?—I believe none whatever. We have occasionally allowed our barges to drop right in front of Mr. Gabriel's wharf, and he has complained, and we have removed them immediately.

2256. Supposing an embankment formed with large capacious docks inside. You have thought of that question, I suppose?—Yes.

2257. Have you any views upon that subject?—If any of the space of the fore-shore was taken away about our part of the river it would be a great detriment, because it is all wanted, and it must necessarily take away a portion. In addition to that there would be the difficulty of getting in and out of these docks. That is rather a lighterman's question; but I conceive there would be inconvenience from it. I cannot explain how as well as a lighterman would do it.

2258. Have you ever experienced any inconvenience from not being able to get your craft alongside at all times of the tide; or is your store of coals of a sufficient amount to meet that?—Our store of coals is sufficient. It takes a tide pretty nearly to work a barge out, so that by the time the barge is out she is afloat again.

2259. (*Mr. McClean*.) Do the high tides injure your premises?—No; the highest tide I remember—and I remember some very high ones—has never overflowed our wharf.

2260. (*Chairman*.) Do you know how high it is above Trinity?—The camp shed of the wharf wall is about the height of Trinity high-water mark; it is about the ordinary spring tide. Then our wharf rises from the shore to the centre of the wharf, so that the centre of the wharf would be, I should think, about four feet at least higher than the camp shed. I have seen the water up on the wharf, but it never overflowed the wharf.

2261. (*Mr. McClean*.) Is there any percolation?—No; and with reference to that I may state one thing I have looked at for the purpose. We sunk a deep well about 40 feet from the river for draining a warehouse, and I observe that the tide does not raise the water in that warehouse well. It is not above 40 feet from the water, and I had it opened a few days since to see.

2262. (*Captain Burstal*.) You have actually looked at the sides of the well, and you did not observe any appearance of percolation?—I kept it open for several days, and did not observe any effect from the rise and fall of the river in it.

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2263. What sort of tide was it; was it spring tide?
—Spring tide; about the last spring tide.

2264. Is there water in the well?—The water in the well at the present time is considerably above low-water mark, and it does not drain out at low water; and it is considerably below high-water mark, and it does not rise at the top of the tide.

2265. (*Mr. Hunt.*) Is yours a timber camp shedding, or a brick wall?—Brick built with cement.

2266. (*Captain Galton.*) Did you build it yourself?—It is old; it was built by ourselves, but before my recollection.

2267. But by your firm?—Yes; it was built by my father.

2268. (*Chairman.*) Is it a fair question to ask

The witness withdrew.

Alderman THOMAS GABRIEL examined.

Alderman
T. Gabriel.

The following statement forwarded to the Commissioners by the witness was read.

2271. I am a partner in the firm of Thomas Gabriel and Sons; we are lessees of a wharf in Commercial Road, with a frontage to the river of about 135 feet; have bought the beneficial interest of lessees from the duchy of Cornwall. We carry on the trade of timber merchants, and land and ship over the wharf annually about 30,000 tons of timber and deals, the whole of which, with trifling exceptions, are brought up to the wharf by water. Any kind of embankment in front of the wharf must materially interfere with and impede the readiness of access to the wharf, and so be a serious injury to our trade and property, and greatly increase the cost of landing and shipping goods. With an embankment with an inner waterway there must be a multitude of entrances through the embankment, almost one to every wharf, or there would be great difficulty and confusion in getting the timber and barges to the wharves. If these entrances had dock gates the expense of construction would be enormous, and the perpetual charge of persons to attend upon them very great. If there were no gates to the openings, and they were left open to the tide, the object of an embankment would not be answered; and, in either case, the embankment would be useless as a roadway, from the incessant interruptions caused by barges passing through these openings. As the gates could not be opened till the water was as high outside as inside the basin, the barges and timber, as they arrive up, must all be moored outside the embankment, which would cause impediments in the navigation of the river, narrowed as is proposed and would, from the increased rapidity of the tide, cause great risk to the craft and timber moored there. A solid embankment would, in effect, do away with all waterside facilities, unless the portion of the embankment opposite each wharf is allotted to the exclusive use of that wharf, and then the mooring of craft and timber outside the embankment in the river would be so interfered with that it could hardly be adopted. The landing of timber and deals across the embankment would be a very costly operation, and would be so continually going on, that the embankment would be quite useless for the traffic of the public generally. If the business now carried on at the wharves is to be driven away, and be carried on further down the river, no wharves can be procured nearer than Rotherhithe or Deptford or at the docks; the extra cost of cartage into the yards of the consumers will be enormous, at least 3s. or 3s. 6d. per ton; and to pass all this amount of heavy slow traffic through the streets would be an impossibility. No embankment roadway is needed for the streets running east to west on the south side of the river west of Blackfriars Bridge, and when the new street is completed from London Bridge to Stamford Street, that will be ample for all the traffic. The compensation to wharfingers would be very enormous.

2272. (*Chairman.*) I glean from your statement

what rent you pay to the duchy?—Quite so; we bought our lease; it belonged to Lett's estate, which was in Chancery, and the leases were sold, and the rent we pay to the duchy is 217*l.* a year; but we paid a very high price for the lease, that is merely ground rent.

2269. (*Mr. Hunt.*) What is the frontage?—About 106 feet.

2270. And the reserved rent to the duchy expires in 1909?—Yes; that is an apportioned ground rent; it is not the amount paid to the duchy, it is an apportioned ground rent paid upon that particular wharf; there are three or four other wharves in the same lease.

that you very much prefer the river being left as in is?—Undoubtedly.

2273. Supposing that this embankment had a depth of five or six feet of water at low water, that would afford you no increased facilities for bringing up the timber and deals?—Do you mean outside?

2274. Yes; outside?—No; but then you propose to have the same depth of water inside.

2275. No; supposing it were a solid embankment?—The result of that would be that we could not moor timber outside to the extent that we do now; the space could not be given, neither do I suppose that we could moor craft outside the embankment to the extent that we do now, because if the river were narrowed by a solid embankment, there would not be space outside that again to allow of any further obstructions.

2276. You now make use of the mud in front for the purpose of timber lying there?—Yes; we do for the timber and the barges, and we have a special grant in the lease from the Duchy of Cornwall of all the low ground in front of our wharf down to low-water mark.

2277. You have not alluded to that in your statement?—No; I made the remark that we hold the lease from the Duchy of Cornwall; the special grant had been referred to by our solicitor.

2278. It is the same lease?—It is the same lease as has been alluded to.

2279. It is part of the original lease from the Duchy of Cornwall?—Yes, the lease was sold by Lett's representatives by direction of the Court of Chancery.

2280. Then any embankment would rather damage your business than otherwise?—A solid embankment, it strikes me, would render the wharf altogether unsuitable for carrying on the trade, for the reasons I gave in my statement. It would be a long way out, and the expense of carrying the goods that distance from the waterside up to the wharf would be prodigious; and it appears to me that even if it were practicable, as a road it would be of no use to the public, because there would be a continual impediment to the traffic from each wharf taking their goods across it; and I cannot conceive how it could be of any use to the public with an open embankment, because you must have numerous openings for the craft to come in. It is quite clear that if it were an open embankment, there must be incessantly some of those slipways open; it could not be used for public traffic.

2281. With long balks of timber there would, you think, be a difficulty in getting them into the inner docks?—Yes; it would depend upon the distance between the embankment wall and the camp-shedding wall; the lightermen would have to bring up when they came up with the tide, and wait outside until the water slackened, which, in fact, they have to do now.

2282. (*Captain Galton.*) Do you use the river now as a storehouse for timber?—Yes; on the mud we do, and in the river too.

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2283. It is convenient to store the timber in that way?—Yes.

2284. It is not from any benefit that the timber gets in the water?—No; although I noticed one absurd remark that was made here by one of the witnesses, an engineer, that the timber-merchants keep it there to cause the timber to swell, and so the timber increases in bulk five or six per cent.; it is one of the most absurd remarks that a man could make. The fact is that the timber-merchants never measure their timber at all; it is discharged in the docks, and the Custom-house officers are the parties who measure it, and they mark the contents upon it; and by those contents so marked upon it, it is bought and sold. We never measure a piece of timber ourselves.

2285. Most of the timber that you bring into the river you send away again by the same medium?—No; most of it is landed.

2286. I observed that certain of the timber yards along the shore of the river stack their timber; there is one close to Westminster Bridge, where there is an immense quantity of timber stacked?—Balks of timber?

2287. Not balks of timber, but deals.—Deals are always kept stacked, of course; but the balks of timber lie in the river.

2288. Are no balks of timbers stacked?—I should not say none, the yard to which you allude may keep a few; they may have an object in stacking a little lot, but no timber-merchant ever thinks of stacking timber for sale; it is brought up from the docks and moored outside the wharf upon the foreshore, and there it remains till a purchaser buys the raft or such portion of it as he may require. A portion of the timber goes away by being towed to waterside wharves on the river.

2289. Of course any embankment would abolish all that store room?—It would abolish it, as we say, entirely.

2290. Suppose that the river was embanked out to a certain point, and that you got the additional land so acquired, how would that be? would that meet your views?—I think, as is observed in my statement, that that would be of no advantage to us compared with the facility of keeping timber and craft moored outside the wharf which we should lose. If it were given to us, we should be compelled to go to a very great expense in landing the timber and stacking it as you now describe.

2291. At present you are saved the expense of stacking the timber?—Yes; it is all a question of the saving of labour. When a buyer comes down he selects a raft of the length that he wants, but if the timber was piled in one very large stack, a great deal of it might have to be turned over and turned back again in order to get at any special lengths that the man wants, while of course where it lies afloat there is no difficulty in picking out a half a dozen or any other number of logs that he wants, and they are landed and put upon the waggon at once.

2292. Then it is the most convenient form that you can have to keep the timber in for selecting and for landing?—No doubt of it; there is a very great saving of expense in labour. In respect to those places where they do stack their timber now, they have no accommodation for laying it afloat, and are obliged to incur the expense of landing and stacking.

2293. (Chairman.) Which expense falls upon the consumer?—No doubt it adds to the price.

2294. (Captain Burstal.) Do the public get the timber in consequence at a cheaper rate?—It is perfectly clear that competition regulates the charge and the profit; and if there is an unnecessary charge of 1s. 6d. a load thrown upon it, the price must be increased to the public. I presume the public must must pay for it.

2295. It would not come out of the profit at all?—I suppose it is my business to tell you that the profit is too small for anything to come out of that.

2296. I presume there would be no objection, if it could be done, to trimming the wharves, if one may use the expression, that is to say, from one projecting point to another projecting point, so as to prevent any unnecessary recesses?—I should think not; to that principle there could be no objection.

2297. Supposing it pushed you out 30 or 40 feet, there would be nothing objectionable in that?—No; if no obstruction was put outside again.

2298. You think if there was a roadway between you and the river, and space given to you between your present premises and the roadway, that the expense connected with it would be so great as that the public would have to pay more for their timber?—Yes, I am sure that the public would have to pay more for their timber, because the expense of landing and loading would be greatly increased by the incessant obstruction caused to us by the public traffic on the roadway.

2299. Do you suffer any inconvenience in conveying your rafts towards your present frontage?—Oh no. The inconvenience we sometimes suffer is that which Cory's people cause, when they do not bring up their craft so low down as they ought to do, then the barges swing up in front of our wharf.

2300. You do not do anything in barges, I think, at all?—We have some few of our own barges.

2301. I suppose that inconvenience is not to any great extent, because the current is tolerably slack over there?—It is an inconvenience to the lightermen, but they settle it among themselves. They scold each other when they trespass upon each other's ground. Of course, if it goes on to such an extent that our trade is interfered with, we send in word to Mr. Cory that we must insist upon its being stopped.

2302. (Mr. Hunt.) From your knowledge of that locality, you can tell us whether you think it is absolutely necessary for the convenience of the public that a thoroughfare or new street should be made upon the bank of the river between Westminster and Blackfriars?—It is totally uncalled for. As you know, there are now two parallel streets, Stamford Street and Belvidere Road; Belvidere Road is used mostly by large heavy kind of traffic, although I find that the cabs get very much into the habit of using it; it is a few yards shorter than the other; but on neither of them do you see a chance of stoppage. Those two roads, I am sure, could readily dispose of half as much traffic again as they have got.

2303. If the new street that leads from Stamford Street to Southwark is made, that will get rid of the difficulty beyond Blackfriars Bridge?—Yes, beyond Blackfriars.

2304. (Captain Burstal.) As you have to convey such large quantities of timber, I would ask you whether you are of opinion that the street accommodation is sufficient between Westminster Bridge and the Borough?—Yes.

2305. Supposing we turn our attention to the district from Westminster Bridge up to Nine Elms. There is a good deal of business going on at the Nine Elms Railway Station and at the Vauxhall Station. Does it occur to you that any facility of communication by any new street, by the river, or any other mode that you can think of, would be desirable to shorten the route?—My own opinion is that a street carried up from either the York Road, or from Belvidere Road would be the real remedy for any evil that is complained of; a new street would at once accommodate the traffic that comes from London Bridge, and would be a direct communication from London Bridge right up to Vauxhall; and if you cut through that property, you would by general improvement of property cause what is necessary to be done, namely, an alteration in the camp-shedding walls.

2306. Cut through what property?—The neighbourhood of Fore Street, Lambeth, which is the only part which now is liable to flooding, and which is subject to that simply because the owners of the

property have not provided sufficient camp-shedding walls. We never have floods with us; I think it is 10 years since I recollect a flood. I remember that there was a miracle of a tide, and that it came right across the wharf. The Trinity high-water mark is upon our camp-shedding; the Thames Conservancy people have put it there, and I think our camp-shedding wall is two feet above Trinity mark.

2307. A new street in the direction suggested would take about half a mile in distance from your place up to Nine Elms?—I should think it would fully, but I cannot speak as to the distance.

2308. In carrying on your business in conveying large quantities of timber to and from that station, as I suppose you do sometimes, do you think, as one of the public, that a short cut in that locality would be desirable?—There is no doubt of it, and if you look at the approaches now to the Nine Elms Station, you see what a very roundabout way you have to go; you appear to come to a dead stop when you come to the end of the York Road.

2309. You turn away to the southward and then go round?—Exactly.

2310. You pass the Bishop's Palace?—Yes; if you could only get a straight road through there, you might be at Nine Elms in a very little time.

2311. Past the Bishop's Palace?—Near the Bishop's Palace; that I think would be a very great advantage to the public, quite as great as any new street from London Bridge to Stamford Street.

2312. (Chairman.) Should you consider going outside Bishop's Walk into the river preferable to going round some other way?—I should not, unless there is some obstacle in the way of property; near the palace there may be spots that must not be touched; at least I cannot tell how that may be, but for the advantage of the public, I am quite satisfied that a street carried right through there would be the best.

2313. Right through Bishop's Park?—I do not say right through Bishop's Park, but I say right through that district.

2314. (Mr. Hunt.) You know Palace Road, Stan-gate, opposite the York Road?—Yes.

The witness withdrew.

Mr. PETER DAVEY examined.

Mr. P. Davey.

The following statement forwarded to the Commissioners by the witness was read.

2322. I am the owner of the coal wharf called Old Barge House Wharf, in Upper Ground Street, having a frontage to the river of 141 feet. It is occupied by my son and his partners. It is part copyhold of the manor of Old Paris Garden, and part freehold; it has been for upwards of 60 years used as a coal wharf by my family, that is, by my father, myself, and now by my son, and the use of the foreshore is absolutely necessary for the business; indeed it could not be carried on without it. The right to the use of it has never been questioned during these 60 years that we have occupied it, and I have always considered I had a title to it by prescription, which I understand to mean a grant by the Crown at some previous time. The manor of Paris Garden was formerly a royal manor, having been granted by Queen Elizabeth to Lord Hunsden, and the King's Barge House occupied the site of my property, which has always been called the Old Barge House. I consider, therefore, that there is no difficulty in the presumption that the use of the foreshore for barges and boats was granted to the owners of the property on the river side. All the wharves between mine and the bottom of Holland Street are within the manor of Old Paris Garden. The use of the foreshore is, in fact, so important a part of the wharf, that if it were taken away, the value of the wharf for the coal trade would be destroyed. Any gain of space by means of an embankment would be of but little use to the tenants.

2315. Where the brewery is there, at the entrance of the Bishop's Walk?—Yes.

2316. You know those rotten wooden houses and things of that sort?—Yes.

2317. Suppose a road were continued there from Palace Road, and the river embanked so as to make a road wide enough without interfering with the Archbishop's Palace at all, and that road were continued right away to Vauxhall Bridge on the bank of the river, taking away all those lime places and gas-works and those things, the leases of which are very nearly out, do not you think that would be a very great convenience to the public?—No doubt a very great convenience.

2318. And an ornament to the metropolis?—And an ornament to the metropolis, but my impression is that you are not at all overdone with wharf property; and I think that the improvement that would take place in the wharf property necessarily upon the new street being more inland would be of more advantage to the public than taking the roadway by the water-side, but undoubtedly the course you have described would be a very great advantage.

2319. (Captain Burstal.) That new street from the Borough will tend to draw the traffic more towards the York Road than it is now?—It will I have no doubt, except from the difficulty on London Bridge. I do not think we can pass more traffic over it. The regulations on to the bridge are now so strict, that the increased quantity of traffic which is now passed over it compared with what used to go over it is surprising.

2320. It will be relieved, I suppose, when the new Blackfriars Bridge is built?—I do not know whether it will; it might be relieved if a new street were made from Blackfriars Bridge more directly up to the Mansion House; then some of the traffic would come down directly to Blackfriars Bridge, and go over Blackfriars Bridge.

2321. You are of opinion that a street from the Mansion House to Blackfriars Bridge will relieve the traffic?—I think so, I have no doubt about it.

2323. (Chairman.) From the statement which has been read, your evidence appears to be much to the same effect as that of the other witnesses as regards the destruction of the property by being deprived of the foreshore; if it is a question of your legal property in it, that would be a separate question?—Exactly.

2324. (Mr. Hunt.) Have you heard Mr. Cory's evidence?—Yes.

2325. Do you concur with him?—I have known the foreshore for many years; I can go back for very nearly 60 years, and from my earliest recollection the foreshore has been occupied by my father's barges and my own barges; in fact, during that 60 years, without the slightest question.

2326. (Chairman.) I suppose you have made use of it, and considered it as available to you as a means of storing coal?—Yes; we lay our barges there with the coal, and I should consider it quite as much my property as I should the other part of my property.

2327. To what extent would you make your claim out into the river?—We have always considered that our foreshore extends to low-water mark, but we do not quite occupy it to low-water mark, because of course low-water mark varies between spring and neap tides; it is not very clearly defined.

2328. What is the average distance to which you reckon it to extend, or to which you lay your barges?—The practice is generally to lay our barges in and out; that is, with the head up to the wharf, and about two, and sometimes three barges astern of that.

2329. What space does that occupy?—About 130 feet.

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2330. (*Captain Galton.*) Have you ever known the Conservators of the Thames complain of the distance to which the barges extend into the river?—Not for many years. I recollect at the time that the small wherries for the conveyance of passengers were at work upon the river, sometimes the watermen used to complain; they would complain just for the first hour or two after high water, when the stream was running hard; they used sometimes to say, "You are laying out too far," and that kind of thing; but since the wherries have been done away with, I have heard no complaint.

2331. (*Chairman.*) It does not interfere with the steamers?—No; the steamers never come upon the south side, they go up the mid-channel always.

2332. (*Captain Burstal.*) Have you any piles or barge beds upon the foreshore off your premises?—There are piles laid out there at the edge of the wharf; in fact, for the protection of our premises from the next.

2333. Is that the only object of those piles being there?—The piles were put up originally to fix the mooring chains to.

2334. I suppose the barges rest against those piles?—They rest against the piles; without the piles you cannot moor the barges quite straight; they get uneven, but with the mooring chain you can keep them quite straight and level.

2335. You have always paid a rental for that accommodation, have you not?—No, we have never

paid a regular rental; when we wanted to put a pile, we have applied to the City Conservancy for leave to put a pile out, because the City Conservators of the river have always had the power of removing nuisances, and of course they would take care that we did not put our piles out so far as to be any nuisance to the navigation of the river.

2336. I suppose you had that liberty during pleasure upon the payment of a certain consideration?—We generally paid two guineas to put down the piles, but we never considered that it was for the use of the foreshore. For instance, if there were sufficient space to bring up our barges to anchor, and we did not require piles, we should not pay the City anything.

2337. You mean to say that you do not entertain the question for a moment of any body having a right to the foreshore in front of your premises except yourselves?—Undoubtedly, we should fight that.

2338. Under those circumstances you, as freeholder of that property, would claim the foreshore for your own use?—Yes; I am the owner of that property, part by copyhold and part by freehold, but I do not occupy it myself; I let it.

2339. But supposing, for instance, an embankment were to be made in front of your premises, you would consider that you would be the proper person and the person to be entitled to receive any monies in payment for that piece of embankment below high-water mark?—Distinctly.

The witness withdrew.

Mr. H. Howell.

Mr. HENRY HOWELL examined.

The following statement forwarded to the Commissioners by the witness was read.

2340. As manager to Messrs. Goding, Jenkins, and Co., of the Lion Brewery, Belvidere Road, Lambeth, I have been requested to attend this meeting, and I beg on their behalf to submit the following in evidence against the proposed embankment:—The brewery has been erected at an outlay of nearly 50,000*l.* (exclusive of plant and machinery), with a frontage on the river of 140 feet, the same having been constructed upon the best and most improved principles for the purpose of saving a large amount of manual labour and expense in loading and unloading barges and other craft alongside the river frontage, and under the hoisting pent over the river that communicates with the several floors of the brewery, malt-bins, and other parts of the premises. The plant and machinery of the brewery has been constructed expressly for working the same in connexion with the facilities now afforded by the extensive and convenient frontage on the river. The present river frontage with the appliances of the brewery form a considerable adjunct, and afford every facility for unloading malt, hops, and coals, and at the same time for shipping beer. About 10,000 tons are annually put on board and landed from crafts, all of which is now done without interruption or inconvenience to the premises in front of the brewery or street (Belvidere Road). The barges and other craft are enabled to lie close alongside the brewery, and can now be either loaded or unloaded during high or low water without inconvenience or damage. If the present facilities and convenience of unloading goods or shipping of beer were in any way disturbed, it would materially affect the expenses of working the brewery, and thereby create considerable loss and much additional cost, as well as most materially affect the value of the brewery and premises, which are held under a lease, and for which a large rent is paid. The premises are so constructed on the south or land side of the brewery that they would become quite inadequate for the business of the brewery if any embankment were formed, and the present river frontage disturbed. If there was a solid embankment formed, we could neither load nor unload goods of any kind direct from barges or other craft without being compelled to carry them across the embankment, and at considerable additional expense,

inconvenience, and loss. If there were an inner waterway or basin, the sailing barges could not enter, unless the roadway was at a level, which would render it useless for traffic for the wharf owners, and there would be many difficulties attending openings for the several wharves. Any extra space that might be gained by an embankment would not be of much service, considering the arrangement of the brewery and premises, that have been formed expressly to work in connexion with the facilities afforded by the present river frontage and water carriage, and would be no compensation for the injury that would accrue. In decreasing the present waterway or width of the river it is reasonable to expect that the current will be considerably increased, and thereby found almost impossible to move any barge or craft alongside the embankment for the purpose of loading or unloading goods without incurring a large amount of risk and damage thereto. The obstructions that would be caused to the business of the brewery during the progress of the works in forming the embankment would be both very serious and ruinous to the firm—the present lessees.

2341. (*Chairman.*) You hold these premises on lease?—Yes.

2342. For what term?—About 45 years unexpired.

2343. (*Mr. Hunt.*) From the Archbishop of Canterbury?—Yes.

2344. (*Chairman.*) Whereabouts are your premises situate?—The brewery itself is built directly from the water, but we hold adjoining premises, which formerly belonged to the Lambeth Waterworks Company, by which we are enabled to take our beer down to the lighters, under the walls of the brewery. From our pent loft we hoist up the malt and hops directly by steam power from the lighters, and the coals are taken from the lighters on men's backs up an inclined plane into the brewery.

2345. Whereabouts is your brewery?—Near Waterloo Bridge, or rather near Hungerford Bridge, next to Bennett's straw wharf.

2346. I see that you have given a very clear account of the position in which your property is, and of the circumstances under which your property is held, and you state that any change would be a disadvantage to you?—It would be a disadvantage

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certainly; it is a matter of labour principally, because our steam power applies in that way, that it would be a very difficult matter indeed to remedy our loss in that respect.

2347. (*Captain Galton.*) You have lately built a warehouse close to the river, on the river wall?—No, not lately.

2348. The brewhouse is on the other side of the road, is it not?—No; the brewhouse is built directly upon the water side.

2349. What is that building on the other side of the road?—Our stables.

2350. Then the whole of the operations of brewing go on near the water?—Between the Belvidere Road and the water; our brewery is of recent construction; it was not built above 20 or 25 years ago, and it was built expressly with a view to water facilities; had we built the brewery where we could not have depended upon water facilities, it would have been differently arranged and constructed.

2351. Do you think it would be an advantage to you to have power to embank out to any point in the river, so as to get additional room?—We should not think it worth while to do so; it would be a loss to us by means of the additional labour it would involve; it would be a positive loss. I do not mean to say that it would prevent our carrying on our business; we should meet with some difficulty with regard to our lighters, I dare say, by reason of their not being so easily watched and protected.

2352. Would it be a disadvantage to you to allow the lighters to lie afloat during the whole time of the tide?—I conceive it would be no advantage.

2353. Why?—A certain portion of our business is done by land carriage. We have as much business by land carriage as we have by lighters; we only ship beer at one season of the year, but we take malt and hops, coals, &c. all the year round. We ship beer principally in the winter months.

2354. You receive all your malt and hops, and coals, from the river?—We do; the malt by very large sailing vessels, I may mention; because the vessels that bring malt come direct from the coast, and they would find certainly much difficulty in getting into any inner basin; much difficulty.

2355. (*Mr. Hunt.*) You store your beer, do not you?—We store the beer for home consumption.

2356. Cellarage for beer is a very important thing, is it not?—For exportation we do not store it.

2357. But cellarage is of very great importance?—Yes.

2358. If you acquired a large area in front of your present brewhouse, and turned it into vaults, would not that be of advantage to you?—I would answer that question in this way, that if there was an embankment, and it was a solid one, and the ground were given to us in perpetuity, it would be an advantage; we could turn it into an advantage.

2359. You could build vaults?—Yes, and do many other things; but we do not require more vaults. If it were a solid embankment we could make use of it in various ways; but to roll our beer across that embankment into lighters, if it were a roadway, would be a matter of great labour, and certainly some danger to the passers by; it would be a matter of continual interruption; and the same remark would apply to landing our malt and hops, and coals, and everything else.

2360. Where is your racking room now?—Our racking room is the first floor above the water.

2361. In the front?—In the front.

2362. Then you take it out of the racking room at once into the barges?—No; it undergoes altogether a different treatment. As to our export beer, we take the beer directly down to the wharf, instead of taking it into the store, but not from the racking room.

2363. I think I gather from you substantially this, that if there were a solid embankment, and no roadway, and the space reclaimed here added to your brewery, that that would be a gain to you?—No; it would not balance the loss.

2364. You think not?—Oh dear no; the manual labour that we should have to incur would be enormous; it would be a slight compensation, but a very slight one. If you can imagine that we had to load and unload 10,000 tons of goods in the course of a year, and that all that had to be conveyed on men's backs, or even upon trams, or anything else, from the water side, you will see what an enormous amount of labour that would entail.

2365. But mechanical contrivances could get rid of that?—But even then it would be attended with enormous labour. You understand that we use our steam power for lifting everything, and we could not do that, I suppose, if there were an embankment. Our establishment is the only one along the water'side where steam power is used for loading and unloading. Our brewery is very high, and we lift large sacks of malt from the barges directly under the walls, and they are conveyed to the bins, which are of very great depth on the floor, to which they are lifted in under the pent-house.

2366. Could not you extend your brewery on to the line of the proposed embankment?—Simply as a warehouse?

2367. No; as a brewery?—Not for the purposes of brewing.

2368. Why not?—Because the plant for brewing is on the land side of the building, altogether on the other side. Our coolers are on the water side. I may also observe that there would be a very serious loss to us whilst the works were going on.

2369. (*Captain Burstal.*) At what time of the tide does your ship or barge usually go away after being laden with beer?—Just on the turn of the tide.

2370. Just after high water?—Just after high water.

2371. Most of your ships or barges come up with the flood tide?—Yes; some come up empty to load.

2372. They never come from up the river, do they?—No, not from up the river; we always send one way, in fact.

2373. Therefore there would manifestly not be much advantage to you in having six feet of water alongside the wharf?—No, none whatever; we can fill a barge with beer even when the barge is on the mud.

2374. She always goes away just after high water?—She does. The question is not one which affects us very much as regards the lighters.

2375. I suppose in your brewery you have a well sunk?—We have three wells; one is 375 feet deep.

2376. Have you any knowledge of what the stratum is through which those wells are sunk?—No, I cannot state that; our deep well goes down quite through the London clay. I do not know actually what else it goes through, but we have two other wells of about 40 feet deep, and we do not find those wells affected by the tide at all; we have watched that.

2377. There is no weeping at the sides from the river?—No.

2378. Nothing to induce you to believe that there is percolation?—No, nothing of the kind.

2379. Supposing an embankment were put in front of your wharf, with a high road there, what would be your opinion of that?—It would be useless to us.

2380. The roadway would be useless to you?—Perfectly useless; because it would be higher than our wharf.

2381. But it would be no more injurious to you than a simple plain embankment would be?—It would depend upon the height of the embankment.

2382. You mean the height of the roadway?—The height of the roadway and the height of the embankment.

2383. The same objections would stand good against an embankment with a roadway upon it as you have to an embankment without a roadway?—Far greater with a roadway. The roadway would be a far greater objection to us.

2384. Why?—Because the nature of our business would be such that we should interrupt the traffic, and

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the traffic would interrupt us. We could never carry on our business.

2385. Suppose it were a high level roadway, you could pass under it?—Then it would obstruct our light; it would entirely shut out our light from the lower portion of our premises, and it would cut us off from our wharf, because our wharf is constructed upon that side. The edge of our wharf is about three feet above high-water mark, and there is an inclined plane made down to it, and we should be cut off from that entirely.

2386. Do you find your communication at the rear of your premises sufficient for all your purposes?—Quite so, as regards land carriage. If you will permit me to remark, I reside over the counting-houses of the brewery, and I have as much opportunity as anybody of seeing the traffic of that road, and my family have too; and all I can say is, that the traffic of that road is very free. Indeed, I never knew of any stoppage; and after five or six o'clock in the evening you might as well believe in a suburban residence, it is so quiet. I am put to some inconvenience in getting a cab to my door, because the two nearest roads from the Belvidere Road into the York Road are closed by bars. It would relieve the traffic a good deal if we could get them removed.

The witness withdrew.

Adjourned to Thursday next, at 12 o'clock.

Thursday, 3rd April 1862.

PRESENT :

Major General Sir JOSHUA JEBB, K.C.B.
JOHN THWAITES, Esq.
Captain D. GALTON, R.E.

Captain BURSTAL, R.N.
HENRY ARTHUR HUNT, Esq.

MAJOR GENERAL SIR JOSHUA JEBB IN THE CHAIR.

MR. ROBERT JONES examined.

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(Witness). I have brought with me a plan of our premises, thinking it might be useful to refer to in giving my evidence.

The following paper forwarded to the Commissioners by the Witness was read.

2391. I am lessee of a wharf in the Commercial Road, having a frontage to the river of 435 feet, and having a dock on the east side which admits of five barges to lie and be worked together. There is also on the west side a drawing dock used by other persons for loading into carts from barges at low water, and one side of it is also used by us for landing deals. The timber (some of it 50 up to 60 feet long by 12 to 15 inches square) is brought up from the public docks in floats of from 12 to 18 pieces each. These floats, sometimes one and sometimes two, according to their dimensions, are fastened together and towed by a boat, and laid along the foreshore covering about 116 feet outwards. When timber is required to be landed the pieces are floated into the entrance of the eastern dock, beneath the end of a travelling crane by which it is lifted and placed on carts or carried forward to the sawing mill near the west side of the wharf. Deals are landed from the barges on men's backs, and are carried by them along temporary stages up to the piles where they are finally placed and whence they are subsequently redelivered, partly by a similar process; the load thus carried by each man being from $1\frac{1}{2}$ cwt. to $2\frac{1}{2}$ cwt. We land and ship at this wharf above 40,000 tons per annum. If there were a solid embankment with a public road, the incessant passage of the men carrying deals across it must materially impede the traffic or be impeded by it; the timber logs must be raised and carried across the traffic. An additional travelling crane must be had which must be at a right angle with the present travelling crane, which would receive and carry them

2387. Do you ever communicate, in your business transactions, with the Waterloo station or Nine Elms station?—With the Nine Elms station a good deal; we send a great quantity of beer round there.

2388. Has it ever struck you that there is any want of communication, or any facility required in that direction?—No. Of course to the goods station at Nine Elms it is almost as direct a line to go south or south-west as it would be to go along the banks of the river to the goods station.

2389. In going there you make a detour to the south?—Yes, there is some difference.

2390. It is half a mile exactly?—About; but I quite agree with the remarks of Mr. Alderman Gabriel, that a street leading directly from Westminster to Vauxhall would be a very great advantage. I am a very old resident in Lambeth myself, and I can speak to that. It is a very shocking neighbourhood. I think it would compel the owners of wharves to protect it from water inundation. But our case is certainly very different from all the wharfowners, having erected a large manufactory depending upon our water communication and the right to the foreshore.

in a different direction. The chains break sometimes, and it would not be safe to have these logs so carried across a public road. The frame of the traveller must project its full width into the river, and obstruct the rigging of sailing vessels alongside. The higher the level of the embankment the greater would be the danger and difficulty of lifting the logs. The timber lies on the foreshore, and covers 116 feet outwards; if this is to lie outside an embankment it would not lie safely, it could not be held against the stream, it sometimes gets loose now though it is in an eddy. We should lose the landing accommodation at our dock at which we can unload five barges at the same time. We must have several cranes for the timber, and even if we were to land the deals by a crane they must still be taken on men's backs to the different piles to which they are appropriated. If there were a raised roadway to admit passage of goods under it, it must be at such a level as would be useless for traffic of goods to and from the wharfs, on account of the necessary incline up to it, and it would confine the landing to that particular spot instead of the whole frontage. If there were an embankment with an inner water way there would be much confusion among the several parties having access to it; our timber floats (50 feet long or upwards) would block up the entrances and the inner way; an officer or dock master would be necessary at each entrance and exit; the appointment and payment of him, and the expense of clearing the mud, and repairs of flood gates, would be the subject of dispute among the several wharf owners having the use of the same entrances. A rate (as proposed) would be highly objectionable. There would not be time

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before high water to get in all the craft required; this would cause the loss of a tide and create expense by the detention of the barges; they can now come alongside and get away along the whole line of the wharf whenever there is water enough. With a strong current there would be great difficulty in getting the timber floats into the entrances, and they could not be safely moored outside, and if they could be so they would much obstruct the navigation of the river and be liable to be struck by vessels. Independently of these considerations, the proposed embankment would entail upon the occupiers of wharfs an enormous additional expense, and expose the public at large to serious inconvenience by diverting the present water traffic into the streets. For example, our 40,000 tons per annum, now conveyed by water, if taken by land would occupy 26 carriages carrying five tons each drawn by 104 horses, passing through the streets twice (to and fro) every working day throughout the year, and at an extra expense of 3s. to 3s. 6d. per ton, or a total of 6,000*l.* to 7,000*l.* per annum. If, therefore, 40,000 require 26 carriages and 104 horses, 1,000,000, being the lowest estimate of water traffic at all the wharfs, would take 650 carriages and 2,600 horses all transferred from the river into the great thoroughfares of the City and the Borough already over crowded with the ordinary traffic. Besides, it would be impossible to procure the extra horses and stabling, whilst the barges now employed would be rendered valueless and the lightermen thrown out of employ. Nor is it likely that the several dock companies would be able to find quay room for such an accumulation of vehicles, or provide the necessary appliances to load them with the immense quantity of goods which they now deliver afloat; and even if this were possible, the change would involve extra dock charges to a considerable amount. As a further natural inference the transfer of so much traffic from the river into the streets would render it necessary greatly to increase the roadways on the southern side, where the existing thoroughfares afford sufficient accommodation for the purposes of trade as now carried on, especially when the proposed new street from Stamford Street to the Borough, now in the course of construction, shall have been completed. The obstruction of our business during the works necessary for forming an embankment would be very serious. Our drawing dock would, from its nature, be entirely destroyed as a drawing dock either by a solid embankment or a dock, because it is only used when the water is out.

2392. (*Chairman.*) You have given us so full an explanation of the circumstances in which your traffic is placed, that very few questions appear to arise upon it?—I shall be very happy to answer any question.

2393. (*Captain Galton.*) I do not quite understand where your wharf lies; is it in the Commercial Road?—The Commercial Road. The plan is there (hung up in the room); there is the Commercial Road, and the buildings are there (*pointing out the same*).

2394. The other side of the Waterloo Bridge?—Yes. There is the plan of the whole premises shown; the stabling, for instance, and the saw mill; and there is another dock called the drawing dock, partly used by the public; that belongs to us. Then this is where we bring our timber to, this long dock here, under the crane to be landed.

2395. Is it just beyond where Messrs. Brassey and Peto's premises are?—Just at the end of Princes Street.

2396. Do you stack timber over the whole of that black area?—The deals we stack, deals from two and a half to three inches thick, but the large timber is left in the water always.

2397. What do you use your dock for; landing deals, I suppose?—Yes, and for the barges to lie while loading or unloading.

2398. You say you have accommodation for five barges for landing?—Yes.

2399. Are you always employing that?—So much so that we could do with additional barge way, for we have 27 barges constantly employed; and that number not enough for our business.

2400. Did I understand your statement right that pieces of timber 60 feet long were carried upon men's shoulders generally?—No; the deals; the deals to the extent of one and a half cwt. or two cwt.; sometimes two or three deals perhaps on one man's back.

2401. Is that the most convenient way of landing deals?—There is no other way, in fact they could not be landed by machinery or a crane of any sort; it would be using a larger power than would be necessary, and it would not have the desired effect. The piles are 20 or 30 feet high; they have to lay them regularly upon the piles.

2402. You would not be able to save anything in labour by machinery, in stacking deals?—No. I do not see how we could apply it at all. We have a travelling crane for timber, worked by steam.

2403. Do you land all the timber you sell, or do you sell it sometimes from the river?—Of the timber we bring to the wharf and sell, some we send off by water, and some we land and send off upon carriages, but we sell and deliver all we can direct from the docks.

2404. Without bringing it on the wharf at all?—Yes.

2405. But that which comes on to the wharf?—That which comes on to the wharf must be landed by the travelling crane, and some loaded by the travelling crane to go out to the different parts of the town or country, wherever it is wanted, and other portions of it taken along the wharf to the saw mill to be sawn.

2406. You saw it up yourselves?—When it is required we saw it for our customers.

2407. Is the wharf freehold property?—It is a leasehold, unexpired, of 21 years. We have already held it 30 years.

2408. Do you pay a high rent for it?—1,600*l.* a year, and we have laid out within six or seven years from 25,000*l.* to 30,000*l.*

2409. What is the frontage; 400 feet?—The frontage is 435 feet upon the river; then it is about 350 feet deep from the water side to the Commercial Road.

2410. I suppose its value is very considerably increased by the possession of the dock?—Very much; and the other dock is also useful to the public for landing, and we land and ship some deals upon that side as well; but this is the dock which I refer to when I say as many as five barges can load and discharge at the same time (*pointing to the plan*).

2411. (*Chairman.*) Is the frontage you have described all along the river, or do you include the frontage within the docks?—No, including the dock here; we have a space beyond the dock which abuts upon Mr. Gabriel's premises, and upon the other side there is a drawing dock. That is the whole frontage.

2412. Then it is not 435 feet along the river?—Yes, it is, along the river, taking the docks across their entrances.

2413. In your statement you say that a very great additional traffic would be thrown into the streets in consequence of any alteration in your premises?—Yes.

2414. But how does that appear?—Because all the goods now brought by water from the docks, as well as those sent off afloat from our wharf, would then have to be conveyed on carriages through the streets.

2415. You mean that the bringing of the timber would cause an additional traffic because the dispersion of it from your premises is still upon the road?—Not only so, but because the whole of our wood, whether conveyed from the docks or from our wharf, would then be thrown into the roads. At present we convey all we can by water, this being the cheapest and most convenient mode.

2416. I did not understand that you distribute much by water from your premises?—We do; we

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send down by water whatever we have to ship to the different public wharves as well as to other places on the river side; and we frequently load sailing vessels, some lying below the bridges and some alongside our wharf.

2417. Does it improve the timber to keep it in the water?—It does it no harm.

2418. But if it could be arranged to get it equally conveniently by land, should you prefer keeping it upon land?—No, for many reasons; first of all it is not damaged in the water, I mean timber of 12 or 14 inches square; deals of course are wanted to be kept dry, but the timber is not injured at all in the water; but if it were upon land it certainly would be more likely to be shaken and deteriorated.

2419. It would crack?—It would be deteriorated.

2420. Then it does preserve it to keep it in the water—it is an advantage to the timber?—It might be said perhaps to preserve it in a certain sense; of course timber kept too long in water you may readily conceive may be injured, but the time it is kept in the water till it is disposed of we never find the least objection to in any way; the timber left upon the land would be subject to the weather a great deal more than in the water.

2421. (*Mr. Thwaites.*) I suppose the fact of its being in the water simply conceals the cracks?—Oh dear no, not at all, we import it; it is received at the public docks, and they do everything; we never give them the least hint how to dispose of it, how to raft it, or how to measure it; it is measured by the Government officer, and that is the established rule and standard between all parties; the shipowner as to freight, the Government as to duty, and the purchaser and seller as to price, as far as regards the quantity. We never put a rule upon it at all, but take the marks as they are, showing the cubical contents.

2422. I do not mean that you are at all anxious to conceal anything in your trade; what I meant was this; that so long as it is kept in the water those cracks are not visible, which they would have been on land?—It is natural to suppose that they are not so likely to shake in the water as on the land, no doubt about that, but still there is much wood that will not shake at all; it depends upon its character very much.

2423. But for the general public it would be better for this timber to be out of the water?—Not at all.

2424. Why is that?—I never knew timber kept on shore except at Liverpool, and there there is a reason for it.

2425. What is the reason at Liverpool?—At Liverpool there is no public dock; at least there was not, at the time I refer to, any public dock company engaged in landing goods. The dock company at Liverpool are merely the proprietors of docks where they admit ships upon the payment of dues; but every merchant lands his own goods there, takes them upon the quay, and carts them to his own premises, there being no water way available to lay timber.

2426. Is it not the practice to take these large timbers out of the water, and for the builders to cut them up immediately, and use them as joists in houses?—Yes.

2427. Is it not a common result, that those timbers, so cut up and used immediately after being taken out of the water, seriously shrink?—No; I do not think it is so at all for scantling of that kind.

2428. I mean, that the partition walls of the houses settle, in consequence of resting on these timbers?—No; there has been no such complaint ever made by practical men; in fact there is no necessity for having that timber which is cut into scantlings for the purposes of carpentry dried at all; the carpenters would rather have it from the water I am quite sure.

2429. Your objection, I think, is to a solid embankment?—Chiefly; most decidedly to a solid embankment, and I cannot see how the evil can be

obviated even with openings; but certainly a solid embankment would be destructive.

2430. Supposing, that in front of your premises there were constructed spacious docks, with an entrance of sufficient width to admit of good sized timbers which you are in the habit of piling; would not that be as convenient as the present arrangement?—If there was sufficient space, and it was sufficiently wide in the entrance; but the great difficulty would be in getting it in. At present it is a regular place adapted for the purpose of laying timber. The men bring it in floats from the docks, and they lay it in any part alongside the wharves, extending as far as 116 feet or 120 feet out into the river.

2431. What is the width of that dock that you spoke of as the entrance dock?—There is a mark upon it on the plan, I think; 32 feet.

2432. Supposing docks were constructed with an entrance of 32 feet, giving you a reasonable internal area, would not that meet all the difficulties that you have suggested?—No; the space that we have is immensely larger than that in every way. It extends into the river as much as 150 feet altogether.

2433. Do you mean by right or by trespass?—By right. In the first place it is in our lease, for the lessor claims the right of granting that foreshore; and in the next place we pay for it. I have got a receipt here which shows that we pay the conservancy an annual sum for it.

2434. Does that lease give you a right to low-water mark?—To low-water mark.

2435. It does so by covenant?—Yes; I think I am quite sure about it.

2436. (*Mr. Hunt.*) Is it the Duchy of Cornwall freehold?—It belongs to the Duchy of Cornwall; our deed is not from the Duchy direct; our lease is from Mr. Lett's executors; but the duchy gives that right to their lessees, and they convey all they have to us.

2437. (*Mr. Thwaites.*) They follow their own covenants. What area of dock would be sufficient for your purposes?—First of all we have a dock there that will hold five barges; but it is not merely the barges, for it will admit sailing vessels also. The barges we lay here chiefly (*pointing to the plan*). Some we put outside, as well as the timber, occasionally, but five or six come here, and some more upon the other side of that dock (the drawing dock). Nothing in fact would be equal to the accommodation we have now, except it were equal to the space that we have, with the same facility of access. I was going to observe, that beyond where the timber lies there is what is called mooring chains, for which we paid something to a person who had them before. 150*l.* or 200*l.*, I think. We call them roads; private roads, where the barges are moored by chains, waiting till there is room for them to come into the docks.

2438. Then I understand your answer to be this; that you object to a solid embankment, and you object to an embankment even with docks, unless you can have such an area as would be equal to that which you now possess, either by right or by trespass upon the foreshore of the river?—Of course, if we have as much space as we have now, we do not wish to impede any public measure in any shape.

2439. At present, at low water, a great deal of your timber lies upon the mud bank?—On the mud.

2440. Would it not be more convenient if it were constantly floating?—Timber will float in a depth of water equal to its own thickness, but if we had closed docks we could get in and out only about high water, when the gates are opened.

2441. I am aware of that; but my question is, would it not be better for the purposes of your trade if the timber were always afloat and not lying upon the mud bank?—In some respects it might; but there are other disadvantages if you have docks of that kind. There would be great difficulty in keeping them clean, because the water being constantly

in these docks of course settles, depositing its sediment.

2442. But I thought the way to keep a piece of timber clean was to keep it out of the mud?—But I am speaking of barges that come in and out. Some barges come now into that very dock with masts; the timber of course floats every tide, and is not injured by the mud at all; it is the accumulation of mud that would block up the dock and create the difficulty of ingress and egress for craft.

2443. You are under the impression that if docks were made the deposit would be such as soon to fill them up with mud?—That is my impression; though the present docks being open the case is rather different, because the tide flowing in and out carries away the bulk of the mud, and we have, moreover, at the end of one a reservoir filled with water which is let off while the tide is out, clearing away the remaining deposit.

2444. Do you suffer at all from the water percolating through your retaining wall?—Do you mean overflowing?

2445. Yes?—No, never; but I was inquiring the other day, and the last instance was about 9 or 10 years ago, and then it came a little way over the end of that dock, but not into any of those houses; not into the kitchen or any way here at all; but that is 9 or 10 years ago.

2446. If you were called upon to heighten or repair that wall; supposing you were called upon by any authority to do that, do you see any difficulty in doing it?—None at all; we should be quite prepared to do it to a certain height; it would not require more than a foot or two at any time. But I ought to explain further, that when the water came in 9 or 10 years ago, it came through a spot which was a little dilapidated, and then it did not come into any building. We have got buildings in front, but it did not come into any of those; it only came just across the edge of the wall.

2447. Supposing your wall were found in such a condition that its rebuilding was absolutely necessary, would you then, supposing you were called upon by any of the parochial authorities, be disposed to rebuild that wall?—I think we should upon our own account, quite irrespective of the parochial authorities; anything that is dilapidated we make a point now of keeping in order; but certainly we should, if we were called upon by the parochial authorities to do so.

2448. Have you ever been interfered with, as to the extent of your storage upon the foreshore of the river, either by the corporation, or the conservancy board?—Never; except there may have been occasionally some observation made, when perhaps our barges were rather too much upon the outside of what is called the mooring chains, perhaps a little further into the stream than might have been desirable, and of course we have attended to it.

2449. Has your right, real or assumed, ever been questioned?—Never.

2450. Either by the corporation or the conservators?—Never in any shape.

2451. Do the necessities of your trade require that you should occupy so much space throughout the year, or only at particular periods?—In reply to that I should be glad if the Commissioners would do me the honor of looking at our place, and walking round it, and they would see that the nature of it is such that it would be difficult for us to carry on business in any other way than we do now. For instance, in one wharf, we have sometimes 10 or 12 or 15 waggons and horses loading together. We have about 30 cart horses engaged all the day long, and we cannot hire more. Those are all our own. We want to hire even at this present moment, but we cannot get them.

2452. You mean that your wharf accommodation is not sufficient?—Our business with all the advantages of water conveyance, requires more horses and carriages than we can procure now.

2453. Do you mean to say that there is a scarcity of horses?—There is a scarcity of horses; we have a difficulty, in fact, when we want to buy, to replace any of our horses; and if we wanted 100 horses more, as I have shown in my statement, we should never be able to get them, nor should we be able to find stabling, and by the same rule all those gentlemen along the bank who employ horses in the same manner would experience similar inconvenience if the present water traffic were turned into the streets. The streets are blocked now, not upon our side certainly; I never knew any obstruction at all up to the present time; but the leading thoroughfares of Southwark and the City are already so crowded that they could not afford room for additional traffic.

2454. (*Chairman.*) You mean with 30 horses and all the facilities that you have by water you have not sufficient to carry on your business?—Yes. We have not now sufficient horses even with our 27 barges each of which carries about ten times the quantity we could upon a carriage with four horses, so that we can bring up from the public docks by water about 50 tons for the same money as five tons by land carriage.

2455. May I ask you how many carriages loaded with either timber or deals you despatch away from your wharf in a day?—I can hardly answer that question; but they begin to load over night and start at 6 o'clock in the morning, and are engaged all day long, sometimes until 8 or 9 at night.

2456. Then you really do avail yourself of water carriage for sending away?—Oh dear yes; if we did not avail ourselves of the water carriage, not only for landing, but also for sending away, we should be quite blocked up, for we load daily upon an average about 35 carriages and carts.

2457. (*Mr. Hunt.*) The covenants in your lease, I suppose, bind you very stringently to keep that wall in repair?—They are the ordinary covenants to keep the premises in repair in every way, of course retaining the right for the lessor and his agents to go upon the premises and inspect the state of repair, and so on.

2458. I take it from your evidence as I understand that you do not object to have your premises enlarged by being embanked 100 feet into the river; but that you do object to have the water accommodation for your floats of timber curtailed?—Just so; but that would be of no value to us as compared with the water way.

2459. But it would be of value in other respects?—Any additional ground is of value to us.

2460. If you could get accommodation in the river for your floats of timber, or if your floats of timber could be otherwise accommodated, you would not object?—The floats of timber are always kept in the river; deals are of course stacked in piles upon the wharf.

2461. But if you could get accommodation for your floats of timber, then you would not object to have an embankment formed in front of your wharf, if you had the land so reclaimed thrown into your premises?—If we could have facilities of access to our premises equal to what we have now, water way and so on equal to what we have now, undoubtedly we should not object.

2462. (*Chairman.*) But I think I understand from your statement, that if there were a solid embankment, your timber could not lie in consequence of the stream?—That is one of the difficulties I am speaking of.

2463. (*Mr. Hunt.*) Do not mind about the difficulties, I ask you an abstract question?—We should not object, if it could be got so as not to be bought too dearly; the timber would have to be got in, and there would be an enormous difficulty in bringing it under the embankment, whatever it may be, in the stream where the water would flow much more rapidly than it does now.

2464. (*Captain Burstal.*) The current would run much more rapidly alongside the embankment?—Yes;

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we are in a sort of eddy where we are, and if an embankment were formed in that way, any barges springing a leak outside of that embankment must sink; here as it is now, they can run ashore directly and they are on the mud, and in safety.

2465. (Mr. Hunt.) Those architects and engineers who prescribe in their specifications that timber and deals shall be well seasoned, are under a delusion?—Unfortunately all architects and surveyors are not practical men; I know they have very great intelligence, but I know also, from my own experience, they are not always practical. It is a great pleasure to come in contact with some who are practical as well as scientific, but the carpenter is the man who knows what sort of timber he wants; but looking at the requirements in some specifications, I have often wondered how builders can be induced to sign a contract, which they cannot perform.

2466. I suppose you say that this seasoned timber is a thing not in existence; not known?—It is not required at all, nor do I think any attempt is made to procure it.

2467. Suppose timber 14 inches square landed upon your wharf and cut up into scantling of 9 by 2½ or 4 by 4 or 4 by 2½ were stacked upon your premises?—It is generally delivered; sent off at once. We do not stack it, nor is it necessary to do so.

2468. I am putting this proposition to you; supposing that done, and that it was stacked for a time equal to the time that deals are stacked, would that season the timber?—It would tend to season it; it would tend to dry it certainly, but it depends very much upon the size of it, because 2 inch and 2½ deals and boards will dry, as you know, much sooner than large timber.

2469. But I want to get from your evidence a little public information for the advantage of people who build?—I am giving an honest opinion of the results of some practical experience gained during half a century.

2470. (Mr. Thwaites.) Apart from the question as to what is the most convenient mode of transacting your business, you are of opinion that those joists would be better if they were seasoned prior to being used for building, and not cut up and used in building without seasoning?—I do not think that at all.

2471. Give us your reasons, as a practical man, for that opinion?—I only know this, that the men who buy them never attempt to season them.

2472. That is not the question. I ask you for your individual opinion, as a practical man, dealing with it and understanding its nature, whether a dry piece of timber is not better to be placed in a building than a wet piece of timber just taken out of the Thames?—I do not think it is, and for this reason, that it is cut up into large scantling. It is not intended to be jointed together, like flooring boards, and various joiners' work; it is not intended for that purpose; it is as good as if it were kept out of the water; and I believe, further, that many would prefer it so.

2473. I must beg to have your opinion, and not the opinion of carpenters, who are no doubt a very intelligent class of men; but I want your opinion, which I should value beyond that of any ordinary carpenter. Have you ever examined a house recently built, and have you ever seen that the internal walls of that house have settled, and have you ever ascertained that the cause of that settlement has been the wet nature of the wood that has been used as joists in those houses?—I have not made any particular inquiry of that kind; but I can quite conceive and understand the cause of that settlement. The settlement has nothing to do with the wood; the walls do settle in that way after building, but the settlement is in the walls, or the foundation, and not in the wood.

2474. Do you mean to state before this Commission that timber saturated with water, taken out, cut up and used immediately, and then undergoing the process of drying, will not shrink?—Well, it may

shrink, but not shrink so as to be at all less adapted for the purposes for which it is required.

2475. I am afraid the question is inconvenient for the mode in which you carry on your business?—No; I am perfectly straightforward, and will answer any question you put, the same as if I were upon oath, to the best of my knowledge; and I know something about building. My father was a builder, and when I was a boy I worked myself at the building trade.

2476. We have it upon the best of evidence, from gentlemen of the highest intelligence in connexion with the building trade, and surveyors of great experience and practical knowledge, that they require that the timber should be well seasoned, and I, with great simplicity, put the question to you, thinking I was addressing a gentleman experienced in these matters?—All I can say is, I do not think it does require the timber to be seasoned, because I have never heard anyone asking for timber seasoned. We have all sorts of buyers, and all sorts of customers, men who know their business practically, and if they wanted their timber seasoned they would say so. The only persons who ever ask for timber seasoned are a few gentlemen who do not know anything of the nature of timber as distinguished from deals and battens.

2477. Does not that arise from the fact that in London there is great difficulty in getting that sized timber in any other shape and in any other condition than taking it out of the Thames in that wet state?—Certainly there is that difficulty.

2478. Supposing that timber, as Mr. Hunt has suggested, were stacked upon ground where it would have the advantage of drying, would it not be in a better condition than wet timber out of the river?—I do not think it would be better; but, as I have stated before, there is no timber kept anywhere but in the water. I never knew of any but at Liverpool. I believe at Bristol and Hull and all those places they keep the timber in the water, and at Grimsby also. I never knew the question to be raised at all. I never knew any builder to ask for timber seasoned; all prefer having it fresh.

2479. (Captain Burstal.) It strikes me that with reference to seasoning the timber there is a part of the subject which has rather escaped notice here. Does not the seasoning of timber more particularly depend upon the evaporation or the exudation of the sap of the timber from the heart of it outwards, than from the simple fact of its being immersed in water for some time?—I cannot explain that. But with respect to deals, the best mode of seasoning is to place them in the open air; there is nothing like the open air; and not only the air but the sun, and the showers even assist. We have artificial modes of seasoning, but not equal to that.

2480. Then what you mean to say is, that the timber itself does not begin to season until it is cut into deals?—It is not cut into deals; it is cut into scantlings. They never attempt to season it. It is cut into joists, perhaps running from 9 to 12 inches by 2; rafters and large beams, and some used uncut.

2481. If it were only to be used for walls, probably it would be of very little consequence whether it should be kept in the water or not, but for timber which is required for the purpose of cutting up, to be used in carpentering, there can be no doubt that if that timber were stacked in sheds, with the air circulating about it, that timber would be much better for use than if it was subjected to the action of the water for a certain time?—It may be so scientifically, but I can only say they never require it.

2482. With respect to that dock you were speaking of just now, the Waterloo draw dock, is that a public dock or a private dock?—It is a private dock; it is part of the wharves leased to us. We allow others to land their goods upon the payment of a certain sum.

2483. There is no right of way there?—No not at all; it is closed at night.

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2484. Do you in that dock or in any of your docks and the mud accumulate?—Not so much; it does accumulate, certainly, but as I said before, we have a reservoir at the end and we draw it every day; the water goes out every tide, hence the advantage over stagnant water.

2485. Mr. Thwaites asked you a question about percolation, and you say occasionally it overflows the top of the wharf; about 10 years ago it did?—Just immediately across here; coming as far as that (*pointing to the plan*).

2486. The Commercial Road is the back of your premises?—Yes; those are the houses, but the tide did not reach them.

2487. Have you any knowledge whether the water percolates through the land into the Commercial Road?—I do not know.

2488. You do not know whether the cellars are damp there?—Except this, that I have inquired and was informed that the cellars are quite dry.

2489. Do you have to convey timber by land to the Nine Elms Station ever?—Yes.

2490. And, of course, you are obliged to take the roundabout road to the southward?—We send the timber by water when the quantity is considerable.

2491. Do you ever send anything by land to Nine Elms Railway?—We do, small quantities, but anything large, whether timber or deals, we convey by water, which in that case is cheaper.

2492. Would any additional road communication between the end of your road and the district through which you must pass to Vauxhall Station or Nine Elms facilitate your business?—No doubt about it; that is a part that wants doing something to.

2493. I want you to be good enough to give your opinion, as a large carrier of timber, to that particular subject. At present, there is no doubt but that the road round by Kennington is something more than half a mile longer than a direct road would be?—I should think it would be.

2494. Having a knowledge of that locality, do you think that any more direct communication from the Westminster Road to Nine Elms would be a public convenience?—I should think it would; from Belvidere Road, just from the foot of Westminster Bridge, by Bishop's Walk or some of those places, straight on to Vauxhall or Nine Elms, a road would be of great service; and, further, I think it would tend very much to improve the neighbourhood as well as being a public convenience.

2495. What neighbourhood?—Fore Street and those wretched places.

2496. Do you think the expense of constructing a road of that sort should fall upon the parish?—I really do not know.

2497. You have never thought about that?—No, I have not; but I can quite conceive that a road there of that kind would be of great service.

2498. With respect to the roads you have at present in the rear of your premises, do you find them, after your long experience, ample for all your own purposes?—Quite sufficient.

2499. As far up as Westminster?—Of course the traffic is increasing a little annually. There is another thing that ought to be observed upon our side of the water, there are certain branch railways constructing which will convey more passengers to London Bridge and that part over our district; that must tend, I think, to relieve any pressure if there were any, but we have none now.

2500. You have no pressure now?—We have no pressure now; but the streets you allude to would be relieved because there is no direct road in Lambeth. I mean Upper Lambeth.

2501. I did not allude to the streets; I want your opinion, as a practical man, as to any advantage that would be derived from any facility of communication there?—It would be no advantage to us in particular, but it would be a public advantage.

2502. (*Mr. Thwaites.*) I think you rather misapprehended one question that I put to you; I asked

you, if the effect of using wet timber would not be to make the walls shrink? I did not mean the brick walls, but the partitions; I did not mean brick walls, because, as a matter of course, they could not be effected by it; but I mean as to the partition walls that usually rest upon the joists from floor to floor, that a certain shrinkage takes place?—What we call standard partitions.

2503. Yes?—Filled up with lath and plaster.

2504. Yes; that is what I mean?—I do not know; I cannot conceive it to occur, because it is a sort of rough work. The wooden standards in these partitions, being 12 or 14 inches apart, and placed perpendicularly, it is difficult to conceive how they could shrink at all.

2505. You have been very happy in your building operations if you have never experienced it?—I have seen as much care taken in getting wood that is required to be seasoned as anybody, and all good houses must have for certain parts, joiners' work and so on, seasoned deals and battens, or else the work will shrink; floors, for instance, would shrink in the joints, but as to timber, and when I say timber I mean large timber that is cut into scantling, square or otherwise, for joists or beams, I never heard of anybody asking for seasoned.

2506. (*Mr. Hunt.*) But you know that the timber for ship building is cut and stacked for seasoning?—Ship building may be different.

2537. Have you not been in our dockyards?—I have not been very much there, though I have been there; I am aware that there was a complaint last year with respect to that, but the Government was in such a hurry to get what they wanted that they could not get it any other way.

The witness withdrew.

ADDENDA.

Questions 2418 to 2428.

The timber to which the foregoing evidence was intended to apply is of course fir, such as is generally used for house building; and that which is kept in the water runs from 10 to 20 inches square or upwards.

At Liverpool where this article is landed and piled closely together some 8 or 10 feet high, it does not undergo any genuine seasoning, but rather the reverse, for the pieces being drawn out of the ship along the dirty quays and roads into the timber yard, are often in the worst possible condition when put in the pile, where they remain impervious both to the air and the sun, and therefore tending to decay, a result which every one intimately acquainted with the timber trade at that place must have witnessed more or less. Indeed the assertion is further confirmed by the fact that the merchants there cannot obtain so high a price for timber which had been long laid up as they do for that recently imported and sold direct from the ship; whereas similar timber kept in the water, as in London, is clean and fresh, and continues in a state of high preservation, except on the upper side, lying out of the water, and consequently exposed to the action of the weather, whereby that part of the wood is somewhat deteriorated, which would not be the case if the piece were entirely immersed.

Questions 2465 to 2481; 2502 to 2505.

Timber is never cut into scantling until it is wanted to be used, nor indeed could it be so converted, inasmuch as different buildings comprise in their specifications such a variety of dimensions, which could not be ascertained in time to admit of any drying process (even if this were necessary) before the work commenced, nor could any builder provide every description and size of scantling in anticipation of obtaining a contract, whilst, with regard to those other materials that require a regular

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course of seasoning, such as deals and battens, so imported, and used chiefly for joiners' work, there is not the same difficulty, as almost any dimensions can be brought in. Besides, all the seasoning that timber, whether used whole or cut into scantling, requires, is more effectually gained after it has been placed in the building, where there is plenty of ventilation, and any shrinkage to which the wood might thus be subject would be so trifling as to be scarcely perceptible; and for the same reason this cannot be the cause of any settlement in the walls or floors of a building, which must, therefore, be ascribed to some defect in the foundation or in the brickwork. Nor is it to be inferred that timber kept in rafts afloat is saturated with water, for it has been observed that this when it comes to be sawn is internally in a better condition than some which had been lying on dry ground before it was cut, leading to the conclusion that the surrounding water, drawing out certain properties from the heart, virtually seems to aid the seasoning process, and with this view some persons have even taken hardwood, usually piled on dry ground, and immersed it for several weeks in water.

The dock companies on both sides of the Thames, moreover, have constructed additional ponds for the express purpose of laying timber afloat, and some-

times it is laid in double tiers, one over the other, a course which cannot be injurious to the wood in any sense, otherwise the merchants and consumers would long ago have protested against its continuance; and, further, no experienced builder purchasing timber would allow it to be taken out of the water and left on dry ground, unless he required it for immediate use.

ROBERT JONES,
Princes Wharf,
Commercial Road, Lambeth.
24th April 1862.

P. S.—Since writing the above, I have been inspecting some Baltic fir timber just brought up to our wharf from the docks, where it lay about four years, entirely under water, covered by an upper tier of the same description, and this wood has evidently retained all its original strength, exhibiting, moreover, the appearance of being nearly dry, whilst the pieces forming the cover show on their upper sides which were out of the water manifest symptoms of decay. I should be glad to show this timber to the Royal Commissioners, some of whom have promised to look round our premises, though I have not yet had the pleasure of seeing them.

ROBERT JONES.

Mr.
F. B. Morten.

Mr. FREDERICK BOYCE MORTEN examined.

The following paper, forwarded to the Commissioners by the Witness, was read:

2508. We are the lessees of the steam mills next Westminster Bridge; our frontage on the river is 96 feet. The mill is built upon the whole frontage, and rises perpendicular from the bank. It contains four floors. It extends into the river 57 feet 6 inches beyond the line of the other wharfs, and consequently occupies so much of the foreshore. We land and ship weekly about 1,700 quarters of corn and 500 barrels of flour. The corn is in sacks drawn up from the barge below by hoisting tackle worked by steam engine, and it must be drawn up perpendicular. Our projection into the river is a great advantage, giving us earlier and later water. If there were a solid embankment with the public road everything must be landed and brought under our tackle, which would very materially increase the cost, and any increase materially affects our contracts and dealings; a small increase per quarter would prevent our taking many contracts. A public road on an embankment would be of no use to us, but a great detriment; it would be impossible for us to land and carry our goods across a public road, and situated as our mill is, any gain of space in front would be of little or no service. If there were an inner water way with flood gates the embankment must be carried out 57 feet further in front of our wharf than in front of the others, in order to give us the same advantage. Any embankment sufficiently high to allow country barges to come in would be too high to pass under Westminster Bridge. Any delay in getting into the opening would be extremely prejudicial to the rapid landing and shipping of goods at our wharf. We get many orders because of the facility of getting away, country barges not being detained at our wharf. Our premises are not wide enough, nor would the buildings allow of a separate basin being made for us alone, and the difficulties both pecuniary and otherwise, which would attend a dock made for the use of several different wharfs would be insurmountable. Our objections therefore to the proposed embankment may be comprised under the following heads. 1st. An entire loss of our present advantage of competing in trade from the peculiarly advantageous position, and facility for loading and unloading barges, sailing barges, and bellow buoys, delivered free of cost from lighterage, also rendering the means of bringing up craft loaded extremely dangerous, as from the greatly increased rapidity of the current of water, and will cause the stoppage of heavily laden craft almost impossible,

particularly at night with the wind blowing strong from north-west or north-east; the concussion by the drift or swing would seriously endanger the safety of the cargo besides injuring the craft. These weighty objections must be obvious to any observer. 2d. An embankment with basins would entirely prohibit vessels from approaching the mill at different stages of the tide, and would confine their getting alongside to the very short limit of still water, thereby preventing a great portion of the now existing trade, and depriving us of the great advantage as at present of getting craft alongside at the early stage of the tide, and discharging it in the same tide in time to get away, thereby incurring much loss, and under any circumstances fraught with disastrous and perplexing delays. 3d. If a basin or channel is made, a continued sediment of mud would be the result, causing a never ending expense to keep it clear, as also from the collection of mud it would render it very difficult as well as probable a loaded craft would not rise, thereby greatly increasing the chance of casualty. 4th. From the fact of our land approaches being so very limited, an infringement of our advantage of water approach would very materially affect and comparatively neutralize the present means of production of the mills, inasmuch as it would be impossible to secure a supply of wheat by land (1,300 quarters) per week, scarcely having accommodation for the delivery of the manufactured goods. 5th. The loss sustained by the extra charge for landing and extra labour for transit from the embankment to the mill, would be a very serious tax upon each quarter of corn or barrel of flour, or offal, for landing or re-loading into or out of every description of craft; also from the uncertainty of a clearance of small deliveries in a tide would drive a portion of our trade into other hands, thus causing a serious loss, and in this respect depriving us of a source of profit which now the existing position of the mill possesses. 6th. Another very important addition to our loss and inconvenience would arise from the fact, instead of one barge making four freights as at present in the week (being able to discharge in one tide), she would not be able upon an average to clear more than two freights, thereby requiring two barges to complete the work of one, and extra wages for four men instead of two, also much extra wear and tear to the barges from the want of quiet waterage, also the casualties and uncertainty of clearing vessels coming under demurrage. 7th. Great risks of sinking cargoes would of necessity arise from the craft being moored so far out in the river

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for unloading, causing a collision from other craft passing up and down to be almost unavoidable. 8th. The great consideration of water way to the mill is one of paramount importance as regards the value of the premises, and the interruption to so large a business is the most serious of all, causing confusion and inconvenience beyond calculation, the work never ended, with a number of strange men about the premises, causing greater facilities for dishonesty, the men's time not so valuable from being taken off and on, and continually waiting for shifting waggons, which must occur if the transit is at all changed from water to land. 9th. From the foregoing review we estimate our annual addition to working expenses to amount to over 2,000*l*. 10th. Much damage and delay would arise during the construction of any embankment.

2509. (*Captain Galton*.) Then it would be no advantage to you, if I understand your paper right, that the wharf should be extended further into the river?—Not at all.

2510. You do not want any further additional space?—Not the least.

2511. The only thing you require is unmolested possession?—Just so.

2512. At the present time for how long a portion of the tide do your barges lie aground?—They can get under the mill at about half tide, and we can commence unloading, and by the time the tide falls back half way she gets away clear.

2513. If you commence loading when?—If we commence unloading at the half tide, directly we come under the mill, we have sufficient time to clear the barge before the tide has fallen again.

2514. If you had water always under your embankment you would be able to do two barges during the whole revolution of the tide instead of only one?—It is possible we might; if we had water continually we might unload two barges.

2515. Then it would be an advantage to you to have water continually?—Decidedly.

2516. Do you load into each floor of your warehouse directly?—Yes.

2517. You have three floors?—Yes, and the bottom floor also.

2518. Is the current very slow near you?—It is nearly stagnant under the mill.

2519. During the greater part of the tide?—All the time the barge is under the mill.

2520. (*Mr. Thwaites*.) Would there be any difficulty in landing your sacks supposing the frontage of your wharf carried out say 100 feet by a solid embankment, and from the front of the retaining wall you had a tramway running back to the frontage of your present wharf?—It would as I have stated in my evidence be a very great additional expense, and certainly a loss of time.

2521. Just show us how it would be a great additional expense?—In the first place the barges would come alongside outside the wall, we must have men to back it out of the barge to put it on the landing.

2522. You would have a crane necessarily upon the front of the wharf?—A crane would necessarily save the manual labour, but the crane must be worked, and there would be the expense of putting the crane up. I do not know but what it would take as many men to work the crane as it would take to back the wheat out of the barge. I think it would quite.

2523. Would there be any additional expense beyond the mere moving the grain from the front of the wall to the present front wall of your wharf?—There would be first of all the additional expense of carrying the wheat from the barge on to the landing and then from the landing to the mill.

2524. At present if I understand rightly you have a series of floors?—We have.

2525. And at present you draw the sacks up by means of engines to each of the floors from the barge?—Just so.

2526. Supposing your wharf were extended 100 feet out, and the craft coming up at all times afloat you could lift the sacks by means of a crane fixed upon the wharf, then run them back upon the tramway to this point, and lift them either into floor No. 3, or lift them to No. 2 or No. 1 as you might desire?—But not quick enough to supply our tackles; we can lift 120 quarters an hour now out of the barges, and in that case I should imagine we could not do half the quantity.

2527. One hundred and twenty quarters an hour?—That is into the top floors; upon our bottom floors we can lift more.

2528. Then you are under the impression that if this second lift were to be employed with carrying it across the width of the extended ground you could not supply sufficiently quickly the capabilities of the power you now exercise?—Oh, dear no; nothing near it.

2529. But beyond that difficulty do you see any other objection?—We should be obliged to have the same staff of men in the mill to wait upon the machinery as we should have, provided we landed it by the tackle direct.

2530. Yes; that we understand?—I consider it would incur an extra cost of 4½*d*. for every quarter that we land.

2531. Have you made a very careful calculation of that?—I have endeavoured to do so.

2532. And that is the result?—That is the result.

2533. Do you place no value upon an extended frontage of 100 feet?—Not the least; the contrary decidedly.

2534. It would be no value to you?—Not the least.

2535. On the contrary, it would be an objection?—Certainly so, unless our mill is built and brought forward bodily to the extremity of the exterior wall.

2536. (*Captain Galton*.) You think that no application of machinery could be made to meet it?—I am sure it would not, I have been there now for 30 years working it, and I know pretty well what we can do with it.

2537. (*Mr. Hunt*.) You know this locality very well?—I do.

2538. You are opposed to any embankment of the Thames between Westminster Bridge and Waterloo?—I am quite.

2539. What is your opinion as to the expediency of raising wharves and making a roadway inland from Westminster bridge to Vauxhall?—I should say it is highly desirable.

2540. Why?—Because it would give us greater facility for communication with the railway terminus. We fetch a great deal of wheat by cart at the present time from Vauxhall Bridge and bring it into the mill, coming up by the railways; flour of all descriptions, offal, and many other things, and we find great delays from the circuitous route we are obliged to take; it would decrease the distance very materially; I should say in the distance a good half mile would be saved.

2541. Not confined to your particular trade?—I should say it would be a public good generally; the benefit would be reciprocated by everyone I should say.

2542. (*Chairman*.) Whereabouts is your wharf?—At the foot of Westminster Bridge.

2543. Below Westminster Bridge?—Just below Westminster Bridge on the Surrey side.

2544. (*Captain Burstal*.) There is a timber trade carried on at the premises next below you, is there not?—Yes.

2545. Does the timber from those premises extend beyond the line of their boundaries?—Not at all.

2546. It does not?—Except sometimes in a friendly way we accommodate each other in that case, but scarcely ever. I believe when they are bringing up at the roads it may come a little beyond, but that is an understood thing between us.

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2547. I think you said that if your building were to remain where it was, your extra cost of carriage would be 4½d. a quarter across the road?—From the barge, across the road, until it is landed into the mill.

2548. The same process would have to be gone through to hoist from the cart or waggon as you now pursue to hoist to your stores?—Exactly; we should hoist from the carts, but as I said in my evidence the approach to the land is so exceedingly curtailed that we cannot get the wheat in, and sometimes now we have hardly space to deliver the manufactured goods.

2549. Supposing your building stood where it stands now, and a roadway were put in front of it, and from the various landings, doorways, and so on, of your premises, there were communications with the river so as to plumb the barges hold lying outside the new embankment, would that be fraught with such expense and inconvenience as the other?—I have no hesitation in saying that anything that would give us facilities for getting our barges under the mill to load as we do at the present time would greatly mitigate the expense.

2550. Something like that (*pointing to the plan*), a sort of tramway from the door to come to the edge of the wharf?—Yes; I presume this is meant for the river side (*pointing to the plan*).

2551. Yes?—Any arrangement, whether it is a barrow or a waggon or anything that comes underneath would entail expense.

2552. Whatever appliance it was, you think it would be attended with loss of time and increase of expense?—Just so.

2553. What description of vessels are yours?—We have all sorts of vessels, we have bellow buoys

and coasting barges, and nearly all kinds of craft to unload.

2554. Supposing a line of wharves were carried from the lower corner of your mills, which is the projecting corner, down to off College Street, forming an even line, do you think that would be objectionable?—Well, as far as my own individual case would go it would not affect us, but I should say it would be very disastrous to the neighbouring wharves.

2555. But your neighbours below stand in a recess in the mud?—Yes.

2556. Do you find that not objectionable?—Not at all; the greatest inconvenience we find from the stench is this. I have lived in the neighbourhood 30 years, and I find that the stench we have suffered most from was from high water, when it was high water.

2557. That was about three years ago when the river smelt so badly?—Yes.

2558. Did you particularly notice that there was no smell in the mud?—I never observed any.

2559. You never tried it perhaps?—No, but the water is continually flowing over the mud, therefore to a certain extent it deodorises it.

2560. Not at low water?—No, but still at every tide it is covered.

2561. From your recollection there was no disagreeable smell in the river at low water, but it was always at high water?—It was particularly at high water. I was frequently awoke in the night from the fact of the great stench at high water.

2562. That was from the river water, not from the mud, you think?—Exactly so.

The witness withdrew.

Mr. S. Pegg,

MR. SAMUEL PEGG examined.

The following paper, forwarded to the Commissioners by the Witness, was read:

2563. "I am the lessee of a wharf and warehouse at Bankside. I am also a freeholder in trust of another in Holland Street. The river frontage of the warehouse at Bankside, is 41 feet; the wharf is used for landing and shipping iron castings, guns, pipes (some of 3 tons weight), and pig iron; the heavy goods are lifted out of the vessels alongside the warehouse by a crane direct on to the wharf; the light castings and small pipes are handed up, and all are left at the water's side, till they can be stowed away (for 2 or 3 days perhaps). The goods are brought in canal barges, or dumb barges, or sloops of about 60 tons burden. In the event of a solid embankment with a road, the loading across it would create extra labour, and consequent expense; the heavy articles must be landed by a crane at the waterside, and brought across the public road, and obstruct the traffic. If a travelling crane were used, the frame must extend over the river, and would catch the masts and rigging of the vessels close alongside. It would not be safe for persons and carriages passing along; would excite attention, and people would stop to look at it. The lighter goods are handed up rapidly, and this would obstruct the passers by, or be obstructed by them. If there was a road and a transverse tramway under (as proposed) the landing would be confined to one spot, and the road must be too high a level to be of any use to wharfingers; they would not send heavy loads up the incline. A road with inclines of various gradients would not be used for heavy traffic. If there were an inner water basin, it would silt up with mud, and being for the use of several wharves, there would be constant disputes as to the duty and as to the expense of clearing. A rate would be very injurious to the property; the shore here is very muddy, being in an eddy. If there were dock gates they would require a person to attend them, and there would be disputes about the payment to him and the expense of repairs. The entrance must provide a sufficient headway for

the sloops at high water, which would carry the road at too high a level. Our wharf is too narrow to admit the formation of a separate basin as proposed. Any space gained by an embankment would not be of sufficient value to us to compensate the injury of an embankment."

(Chairman.) 2564. I gain from your paper, that you are opposed to anything like a solid embankment or even basins?—I am certainly more opposed to basins than I am to a solid embankment, but I would rather be left as we are.

2565. (Captain Burstal.) Do you refer to your premises at Bankside?—At Bankside and Holland Street.

2566. Since the Clink authorities raised Bankside does the water ever flow up over that?—It did flow in 1852 once over it.

2567. That was since they raised it?—That was since they raised it, but it was an extraordinary high tide, and it only flowed over in parts where we could not induce the parties to raise their walls.

2568. But the Clink authorities raised the road?—They raised the whole of Bankside, but they did not raise it so high as was desired, and as they would have done if they had got the parties to raise their wharf walls.

2569. (Captain Galton.) Do you find the road at Bankside an inconvenience?—No; it is not an inconvenience.

2570. Upon that side any goods have to be landed and carried across the road?—It would be a great inconvenience to us to land and carry our goods across the road; but we do suffer that inconvenience; as we have a warehouse on both sides of the street.

2571. You use one side of the road as a warehouse for your goods?—Yes.

2572. (Mr. Thwaites.) Do you find any inconvenience in the narrowness of the road in front of the houses in Bankside?—It is an inconvenience because you cannot get to London Bridge by cab, or very rarely you can get to London Bridge in a cab down the

bank in consequence of the narrowness of the road and the stoppages that often arise.

2573. If that road could be widened say to double the present width, that would be a great convenience to all persons trading upon the banks of the river as well as the general public?—It would be a great convenience, but Bankside is occupied mostly by local traffic, and it will be very much benefited when the new street comes to be opened; I may say that there is very little through traffic in Bankside.

2574. There are several coal wharfs I think along that road that take all their goods across the road at present?—There are not so many as there used to be, indeed there is not one open coal wharf upon the road, but there will be one in a month or two. There is not one open coal wharf along Bankside, from Bank End up to the gasworks, but there will be one, because my brother has taken some premises, and he will be obliged to land upon the open wharf.

2575. You have had some experience as to the additional labour and cost of landing your goods at the wharf of your premises, and storing them upon the other side of the road, as well as in landing directly from the barge on to your present wharf?—We have.

2576. Have you found any considerable additional cost in carrying iron castings to the other side of the street?—It cost us about 6d. a ton more in taking it across the road from the wharf, hardly that; it would be 4d. a ton.

2577. Supposing in front of your present wharf you could have 50 or 60 feet width of additional space given to you, would not that be a very great advantage?—It would be a very great boon to us.

2578. Would not it compensate you for the cost of building the front walls and filling in solid?—I think it would not; I am inclined to think the landlord would want an extra rent from us.

2579. Let the landlord answer for himself; I want your opinion. You, as a wharfinger, are of opinion that the value of the land would be such to you in carrying on your business as to justify the expenditure that would be caused in building a front wall and filling up solid ground between that and the wall of the present wharf?—I do not think it would justify the whole expense, but it would be a great boon to us.

2580. Supposing you had a reasonable term as a compensation?—The embankment would have to be carried, I presume, much higher than our present wharf, consequently we should have an incline from our present premises at the base of the embankment.

2581. Supposing it were properly built so as to resist the action of high spring tides the value of the ground would be considerable to you?—It would, presuming we might occupy it entirely, and I presume we shall occupy it entirely; that it would be given up to us.

2582. Are there any traders other than coal merchants who would enjoy the same advantage that you have described, to whom the land would be equally valuable, contiguous to your present premises?—Our tenant at the Falcon dock would be benefited in the same way. I spoke to him yesterday.

The witness withdrew.

Mr. GEORGE BANKS RENNIE, of the Firm of George Rennie and Sons, examined.

The following paper, forwarded to the Commissioners by the Witness, was read:

2595. "Our premises consist of very extensive buildings erected for the special purpose of manufacturing marine and land engines, and mill-wright work. Our river frontage is 186 feet; consisting of machine and erecting shops and foundry, and rising directly from the present bank of the river. We land and ship very heavy and large goods, sometimes boilers nearly 17 feet square, and weighing from 29 to 30 tons, each requiring a very powerful

2583. What is his trade?—A lead merchant.

2584. He would like to go out into the river?—He did not say he would like to go out into the river, but he said if the land recovered from the foreshore was given up to him he would put a crane upon the face of the embankment and land his lead all there.

2585. To him as the tenant it would be a great advantage?—He said it would be a great advantage, and I should think it would.

2586. Would he be prepared to build a front wall and fill up solid?—No; he did not say that he would do that.

2587. But if it would be an advantage to him as the tenant, and give greater facilities for the carrying on of his business, can you conceive any objection that would be raised by the landlord if his property should be improved?—I think not.

2588. Then do you see any practical difficulty, having regard to the nature of the trades carried on in your locality, to an embankment?—To the coal merchants, to whom the foreshore is very valuable for their craft and for their barges, it might be objectionable, but to our particular business, where we have only about two barges alongside the wharf, and unload one at a time, it would be an advantage. I presume it would be carried out so far that the barges would be always afloat; we can only unload one barge at a time, and when one was unloaded then we should have another alongside; but to coal merchants, who always keep a number of barges upon the ground, it would be a great loss to them to lose the foreshore.

2589. You mean to the coal merchants who utilize a great portion of the river in carrying out their trade?—Yes.

2590. But for the ordinary purposes of trade you see no practical difficulty in the Thames embankment being carried out?—The coal merchants have had the foreshore so long that it has become a prescriptive right, and they consider that they are legitimately entitled to that convenience.

2591. But so far as you are able to judge, and so far as it might affect you individually, you see no objection to the embankment?—Speaking for my own trade, I see no objection to the embankment; but I would rather be left as I am, because it would increase the expense of carrying goods across the open roadway, as I presume there would be a roadway in front. If there was not, if there was no roadway in front of my premises, I consider that the land given up to me would compensate the increased expense of carrying to my premises.

2592. And building a wall?—Yes.

2593. (Captain Galton.) Does your trade lead you to feel any inconvenience from the want of communication between Westminster Bridge and Vauxhall?—It does; I have a great deal of cartage to do between Bankside and the South-Western Railway at Nine Elms, and we have to go a very circuitous route, and I consider that a line, if you could get it, along York Road from Holland Street and Stamford Street into Fore Street, Lambeth, would be a great convenience.

2594. A great gain to you?—A great gain to me; it would certainly save half a mile, if not much more.

water-side crane. We have two such crane travelling in rails, the height of which are 32 feet from the present wall, and project sufficiently far over for landing and shipping heavy goods. I have examined generally the different plans proposed for embanking the south side of the Thames, and find the main features of the different plans may be divided into three heads; namely, first, a continuous line of wall of uniform height in front of wharves, without a roadway, the projections of wharves beyond the line being cut off, and the hollows filled

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in ; secondly, a suspended or raised roadway on a level with the roads over the existing bridges, the wharves having water communication under the roadway, either on barge beds or quay walls ; thirdly, a roadway on an embankment or quay about 4 feet above Trinity high water, with either docks between it and the wharfs, or landing and shipping wharfs between the roadway and the river. The objection to the first arrangement is, that in some cases useful buildings now overhanging the river may be destroyed and cut off, and when the hollows are filled in the wharf cranes and shipping arrangements will be rendered useless, as in the case of Mr. Shield's plan, where it is proposed to cut off part of our foundry wharf, and fill up in front of the two wharfs where our cranes are erected. The advantages to be derived from a continuous wall would be to prevent the present deposit of mud in the hollows, and prevent flooding at the low part by extraordinary high tides. In the second arrangement, the raised roadway would be very inconvenient for the wharfs, without there was sufficient height underneath, so as to allow the cranes (which in our case are upwards of 30 feet above the wharf walls, to be used, and to allow large loaded barges and billy-buoys to come underneath. The roadway would thus block up the upper windows, or come nearly on a level with the tops of the wharf buildings. In the third arrangement, a public roadway on an embankment would be very inconvenient, by interrupting the present free communication from the wharfs to the river. The heavy goods must either be lifted by a crane on to a truck, and taken across the road, and from the truck to the barge or ships by means of another powerful crane or shears. The public traffic would thus be stopped during the transit of the goods ; and if the travelling crane is taken across the road, it would require supports, and I do not consider it would be safe to convey such heavy goods over the roadway without stopping the public traffic. If docks were constructed between the wharfs and the public road, they would require constant clearing out from the deposit of mud. We sometimes require three or four barges at the same time. The inconvenience of many barges going to and from the different wharfs through the same entrance would be a constant annoyance. In order that the public traffic might not be stopped, the roadway over the entrances must have a headway under them, in some cases as much as 20 feet above Trinity high water, which would bring the roadway about 23 or 24 feet above Trinity high water, or about level with the roadway at the springing of Blackfriars Bridge. As the present communications from Westminster and Waterloo bridges to London and Southwark are not over

crowded, I do not see the necessity of a public communication along the south bank of the river, especially as the distance would be increased by going on the embankment ; thus the distance from Westminster to London Bridge by the embanked road would be about 9,300 feet ; by the old and new streets making about 8,500 feet ; from Westminster to Blackfriars by embanked road 5,350 ; by old roads 5,000. I consider, also, that the new stations of Hungerford and Farringdon will diminish the traffic along the road towards London Bridge station. As I understand the low districts above Westminster Bridge are principally inconvenienced from flooding, I see no reason, more than the inconvenience to the occupiers of the wharfs, why the river walls should not be raised, and the roadway at the back of the wharfs raised, in order that the water may not flow up the draw-docks and over the roadway."

2596. (Chairman.) You appear to have specified all the objections that might be made to these several plans. I suppose the Commissioners may glean that you would consider your own interests seriously prejudiced by any of them ?—Not so much as regards merely an uniform wall without a roadway ; that would not be any disadvantage to us.

2597. That would depend upon the position of the wall, would not it ?—It would depend upon the position of the wall. If the wall were some considerable distance beyond our wharf, we should of course have to erect fresh cranes and fresh buildings too.

2598. Still the ground that would be reclaimed and added to your premises would be an advantage, if you could move your appliances to the outside of the embankment ?—Certainly any increased ground would be an advantage ; and perhaps there might be an advantage from the extra depth of water.

2599. You do not require in your business to have any foreshore to ground your barges upon ?—No.

2600. You would prefer, perhaps, to have 5 feet of water at low water ?—It might be an advantage to have water so that we could always get our barges away.

2601. You say something concerning the district above Westminster Bridge ; are you at all interested in an improved communication between Westminster Bridge and Vauxhall Bridge ?—No ; it does not affect us in the slightest degree. If we have any things to send, which we do sometimes, to the South-Western, we send them by water to Nine Elms Station, where we have a crane to get them out.

2602. Are you sufficiently acquainted with the locality to say whether it would be a convenience to other trades and to the public ?—I really do not know.

The witness withdrew.

Mr. J. Newell,
jun.

Mr. JOHN NEWELL, jun., examined.

The following paper, forwarded to the Commissioners by the Witness, was read :

2603. "I have been a freeman of the Watermen's Company for 22 years, and acquainted with the navigation of the Thames for 29 years, and for many of the earlier years I was accustomed frequently to go up and down with the barges. Believing that an embankment of the Thames will prove highly injurious to the navigation, I have been asked to give my reasons for so judging. From the narrowing of the stream the current would be considerably increased—it is impossible to say to what extent—there would be in consequence greater danger from collision with other craft or with the bridges. In case of accident we can now ground the barges on the shore on the ebb tide, or when it is flood time let them sink as close in shore as possible ; if sunk in deep water they can be weighed, by chains being passed under them and over another barge brought over them when the tide is low, the flood tide lifts them and the sunken barge is brought close in shore,

so that she is left dry when the tide falls ; she can then repair damages and her lading be taken out of her. If there is always deep water, what is to be done with her, or how is her cargo to be got out ? If saved it must sustain greater damage from longer immersion, and the danger would be much increased of its being in part or wholly lost. In the event of a solid embankment being made and the present wharves having the use of the frontage, in a rapid current barges must lie alongside the embankment up and down the stream, they could not lie as they now do in many instances "in and out ;" the river frontage of some wharves is too narrow to allow a barge to lie alongside, and in consequence their business would be much obstructed ; they could not be moored "in and out" without piles to lie against, either flood or ebb tide, and being made fast to them when the tide turned ; with deep water and a rapid current these piles must be of such increased length that the leverage of the barges near the top of them would be so great as to carry them away. Rafts of timber could not be moored outside an embankment

to the same extent they now are in front of the timber wharves, they would be too much in the way of the navigation; neither could coal barges lie in front of the wharves in the number they now do, for the same reason. In severe frost craft lying in the stream soon get a large quantity of ice under them which adheres to them, making them ride at their moorings very heavily; this with the pressure of the floating ice is almost sure eventually to carry them adrift, no moorings will hold them. The practice now is to moor them alongside the wharves where they are afloat for a short time only, and while afloat the tide in shore is slack, so that they are in safety. What is to become of them in a stronger tide, and this shelter taken away? In the case of docks inside the embankment, the openings should be 50 feet wide at the mouth to enable craft to get into them; they must enter partly sideways, they could not enter lengthways excepting at slack tide which is for much too short a period to admit many; they could not get into a narrow entrance athwart the stream; many barges exceed 70 feet in length. The height of the headway must be 20 feet, to admit hay and straw barges, and about 12 feet for other masted vessels. Timber rafts could only get in at the top of the tide unless made much smaller; they would also require stronger raft ropes and must carry kedges to bring them up and ride by. Barges must also carry anchors, as they would have nothing outside to bring up by. Several entrances to these docks would be necessary, with men in attendance at each entrance, to assist in getting the barges, &c. in and out, or it would never be done in time, and barges and other craft with rafts, &c. coming up more rapidly than they could be docked would be in great danger of being carried adrift by getting foul of each other. A dockmaster would also be necessary to keep order inside, that craft might be able to pass one another to get to the different premises. At all the docks below London Bridge there is a dockmaster, with many men in attendance at the locks to assist in getting the vessels and craft in and out. The entrances to most of these docks are in bights, and the tide is consequently not so rapid close in shore; under a point of land there is always an eddy the contrary way to the tide. On a large portion of the shore between Westminster and Blackfriars bridges on the Surrey side there is an eddy running the opposite way to the tide, which makes it much easier to bring barges, &c. up at the wharves. What are the objects sought after by means of a Thames embankment? Increased scour of tide to remove the mud; to cover the shores at all times so that they shall not be offensive either to sight or smell; to prevent the flooding of inland districts by the overflow of the tide. The first would be an injury to the river as a navigable stream; for purposes of commerce we want a gentle tide in which we may navigate in safety; the second would be partly accomplished by an embankment, but it would not accomplish the other part, neither would it be necessary if the new system of sewers be of any value, and the money they will cost be not thrown away. It cannot be proved that the smell comes from the mud; it is quite as bad or worse at high water than at any other time, and in the present docks below bridge as in the stream. The flooding of the inland districts may be much more cheaply prevented, and quite as effectually, by making the present wharf frontage of sufficient height where necessary to prevent overflow, and putting it in a proper state of repair. If an embankment is made with docks inside this must still be done, and if these docks have no gates, and the tide runs in and out of them, there will be more mud than ever; if with gates, the docks must be subdivided, so that one part may flush out another. If the embankment is solid the value of all the present wharf property is destroyed; the expenses would be very great of landing merchandise on the embankment, and getting it across to the wharves, and if a public road runs along the

embankment and there is any amount of traffic upon it I do not see how it is to be accomplished."

2604. (*Chairman.*) Amongst the plans submitted to the Commissioners there are one or more that avoid many of the objections that you have stated, by having a raised roadway with free access to the present wharves under them, would any such roadway raised upon piles answer?—I think it would be an obstruction of the light of the present wharves raising the roadway upon an embankment, and it would also give the wharves a great deal more labour in getting the goods across the embankment.

2605. I mean a raised roadway upon columns leaving access for the barges to the present wharves under the roadway; that would not be open to the same objections that you have stated?—It would be open to the objection of the increased velocity of the tide.

2606. The increased velocity of the tide and the convenience of access to the wharves?—I should still think we should have great difficulty in getting in and out of these various arches. We should have to go across the stream in between piles, which is no easy process, whether the piles are iron or timber.

2607. You would have to watch for the slack tide, I suppose?—That would be the only time to do it.

2608. (*Captain Galton.*) How many barges have you?—10 barges.

2609. Do you work at the north side of the river?—I carry corn to Combe and Delafield's wharf upon the north side, and to a mill on the north side just by the Houses of Parliament, and I carry to the railway station at Nine Elms, also to the mill the Surrey side of Westminster Bridge.

2610. You say that the dock openings should be 50 feet wide?—I think they require to be 50 feet wide at the mouth they would want a bell mouth.

2611. But the docks they have upon this side of the river have very much narrower entrances?—No, not at the mouth; they have, I think, 70 feet openings; but they are narrower inside.

2612. I do not speak of the public docks; I speak of the docks at wharves which the different barge and wharf proprietors possess?—That is always upon the shore, where there is no stream running by.

2613. There is one by Blackfriars Bridge?—That is in the slack.

2614. (*Captain Burstall.*) Take for example the dock at Thames Bank, just below Chelsea New Suspension Bridge?—I do not work up there; I am not acquainted with it. I know that there is a very rapid tide there since the embankment was made there. Some years ago we used to work to some malt houses just at the foot of the new bridge, and then there was a dead slack.

2615. (*Captain Galton.*) If I understand the first part of your paper right, your argument is based upon the assumption that the river should be framed for the purpose of saving cargoes, as if the cargoes generally sunk, as if the general principle was for barges to sink?—No, not the general principle, otherwise we might shut up shop. Unfortunately we are liable for all goods in our charge, and I have paid for the sinking before now. Some few years ago, as an instance of sinking in deep water, I had a barge sink in the Limehouse basin of the West India Dock. She was weighed by the plan I read in my paper, by bringing another barge over her and a chain from one over the other. The flood tide lifted the barge from the bottom of the dock, and we then had to draw her out of the dock, and ground her on the hard shore on the lower side of the dock, in order to save her cargo. The accident cost me 200*l.* If I had had no shore to ground her upon I might have lost between 600*l.* and 700*l.*

2616. (*Captain Burstall.*) I believe you have had some experience of frosts in the river?—Yes.

2617. Do you apprehend if an embankment were constructed, so as to narrow the river, and thus increase the current the whole way across, that the

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ice drifting down the river would endanger the craft lying near the wharves?—Very greatly. I believe it would carry them adrift. The ice as it passes under a barge adheres to her, which multiplies the force of the water against her; and frequently I have seen a barge raised 10 or 12 feet from the ground by the ice under her.

2618. Has it been your experience to take barges over to the Surrey side to avoid ice?—We always get them to the shores. My premises are below bridge, but at the same time we always make it a practice in case of frost to get the barges to the shore. I have worked up to the mill at Nine Elms. Above that I am not experienced.

2619. Do you find that in that part of the river, between Blackfriars Bridge and Westminster Bridge, the stream is so sluggish as to make the progress of barges slow and unsatisfactory?—No; the strength of the tide is nearer the Middlesex side than the Surrey side, and of course in going long distances that is the part we occupy.

2620. You find the current runs rather slack, not probably, above half the speed at Hungerford that it does at Waterloo Bridge?—I should think the current is less rapid by Hungerford Bridge, where the river is wider, than in the narrow part near Southwark Bridge.

2621. You do not object to a little increase of current at that wide part of the river?—I would rather not, because we of course find that in striking a barge anywhere it does it some mischief, and the less rapid the tide is the less damage is done to us.

2622. Do you think a tide of a mile and a half an hour would be preferable?—You are not likely to accomplish that for us. I believe our present current with a strong spring tide to be three and a half to four miles an hour.

2623. I admit that the current runs from three to four miles an hour, and more than that, particularly under the arches of bridges; but what I am referring to more particularly is, the wide part of the river at Hungerford, where the current is at present diminished; and therefore I wish you to understand this, that if an embankment were made at that part of the river, thereby equalizing the current at Hungerford to what it is at Blackfriars, increasing it from a mile and a half to probably two and a half miles, or somewhere about that, would not that be an advantage to the barges?—I do not think the tide runs so sluggishly as one and a half miles an hour.

2624. I speak from actual experiment; it is not

The witness withdrew.

theoretical at all?—We always find that we get as fast as we require if the wind does not stop us.

2625. As to the navigable space in the river, do you find, as a lighterman, that there is any objection to the space occupied in the navigable channel by the barges at the wharves; that the space from the coal barges at the wharves to the centre of the channel is sufficient?—I never found any want of space.

2626. There is no practical obstacle to the navigation by that?—The space may be narrowed occasionally between the barge roads and the craft lying at the wharves; it may be occasionally rather narrow, but it is not generally so; they may occasionally trespass a little upon it.

2627. All the traffic in there is local?—All the traffic in there is local; all the through traffic is on the Middlesex shore, where the current is stronger; the set of the tide from Westminster Bridge is into the bight at Waterloo Bridge.

2628. Do you agree with that, that if that unsightly bank which exists over upon the Surrey shore of the Waterloo Bridge, occupying nearly half the river, were to be removed, that the current would not set so directly over into the bight of Somerset House; that it would be diverted more towards the middle of Waterloo Bridge?—Yes, it it would have that effect.

2629. Surely, therefore, it would be desirable to conduct barges more towards the middle of the river than they are now, being sent over to the second arch of Waterloo Bridge by that bank?—I should think the arches of Waterloo Bridge which are most used for traffic are the third and fourth arches from the Middlesex shore.

2630. Therefore, if that bank were removed, and the tide diverted more towards the fourth arch it would be a benefit to the navigation?—I should not object to your deepening the water, but I should object to your destroying the foreshore, because you destroy our harbour in case of accident.

2631. The proposal that I submit to you is not to touch the foreshore, but simply to touch that shingle bank that exists about and below the fifth and sixth arches of Waterloo Bridge?—That I think would be an advantage provided it could be done without doing any injury to the bridge. I may be allowed to remark, that if my memory serves me right, a ballast engine some years ago was working about Waterloo Bridge, cutting down the bank, and deepening the water, and the bridge authorities thought their bridge was in danger, and a quantity of Kentish rag stone was thrown over to fill up the vacuum.

Mr. THOMAS GEORGE HENSHAW examined.

Mr.
T.G. Henshaw.

The following paper, forwarded to the Commissioners by the Witness, was read:

2632. "I have been a lighterman and acquainted with the navigation of the Thames for 12 years. I am employed entirely at Messrs. Dowson & Co's., Timber Wharf, between Blackfriars and Waterloo Bridges. I have considered the probable effect of an embankment on the south side. In the case of a solid embankment with deep water at low tide, the current of the river must be considerably increased; it now flows at spring tides near $4\frac{1}{2}$ miles an hour in the narrow parts. I think that when Blackfriars Bridge is removed and the eddies at Bankside and other parts taken away, we may estimate that it would increase to above five miles an hour; barges could not lie against the wharfs "end on" in such a stream, they must be sideways, and so diminish the use of the wharf. In bringing barges up the river to different wharves, we should lose the advantage we now have of the foreshore, there being no difficulty in getting barges upon it. The lighterman calculates the distance at which to begin rowing his barge to the side, and when it will get into the eddy (which there is in front of the wharves on a

considerable part of south side), he shoots his barge round to meet the eddy which runs in an opposite direction to the tide, and this enables him to bring up the barge, and even if he overshoots it, there is no difficulty in making fast to the piles or barges at the next wharf. Supposing the embankment to be four feet above high water, it would be 26 feet above low water at spring tides, and there would be great difficulty (I doubt whether it would be possible) for men to carry deals on their backs such a height, for as the barges would lie close to the embankment they would have no inclined "run" as they have to get up to the stacks of deals on the wharf. In the case of an embankment with an inner waterway, there must be dummy barges outside or timberheads on the embankment to which headfasts may be fixed or a warp thrown for the barge to bring up to before approaching the opening. It would never do to shoot for the opening on account of the danger of the head of the barge striking the further pier instead of this they might have anchors to hold by, but I think it would be found, that to save the labour and time of weighing the anchor, the lightermen would make fast to

other barges; they are not a very orderly set of men, and I think there would be much quarrelling about getting in early. If the openings were not wide enough to admit barges in sideways, I think we could not get them in on spring tides, the strong current would carry the stern up the stream, and the contention among the lightermen would, I think, frequently cause the blocking of the entrances. If the entrances were wide enough to admit a barge sideways, I think two or more would be trying to get in together "endways," and so block the entrance. Many barges would have to bring up in this way, waiting to get in. The hay and straw barges would lie a long time, because they can only come through the bridges at low water; they would therefore get the first turn, and being the largest, would cause the greatest obstruction. The coasting barges coming to our wharf are sometimes 80 to 90 feet long, and the Lee steam barge 92 feet long. Those that could not get near enough to the opening must lie alongside and make fast to the others, and the tier would probably extend a considerable distance into the river. There would be great danger in all this, for with such a current, and especially with a wind in the same direction, the strain on the ropes, especially of the outer barges, would be very great; and, if the inner one gave way several would be carried up the river together, and besides, when the barge to which they make fast goes in they must cast off, and if it is not their turn they would be carried up the stream or else fight to get in. The rush of steamers passing would add very largely to the strain. I think the gates would have to be closed very soon after high water, and consequently could not be opened much before the next high water; and we have so many barges and lighter craft at every tide, that we should require all the time, and so would other wharves. A barge drawing four feet six inches of water, and from the edge of water to gunwale one foot six inches (and we stack deals eight feet,) making a height of nine feet six inches out of the water, and reckoning a fair spring tide to flow 22 feet 6 inches from low water mark, would require a height of 32 feet 6 inches from low-water mark. For getting timber or barges into the wharf (the timber rafts running 60 feet long by 20 feet wide) we should require a length of 70 feet from embankment to the

wharf. I think that timber or barges could not be safely moored outside the embankment with the increased tide; timber rafts could not be fastened there. If there was always deep water in the river from shore to shore, the danger in case of accidents would be much increased. Barges are continually meeting with accidents in shooting the bridges; they are also subject to accidents by being struck by the steamers and other barges, and when struck we can now generally make them safe by getting them ashore, but in deep water they must sink if leaking much, and of course the increase of current would increase the damage in being struck. This applies also to deeply laden barges not leaky. If barges sink, they will sometimes empty their cargo and roll over and be carried along with the tide a considerable distance, and be dangerous to vessels passing above them; such accidents would of course be much increased if there were always deep water; the barge and cargo must be weighed up, and sometimes we should not know where to find the barge. Messrs. Joseph Dowson and Company have a private dock, the mud is cleared from it by means of a sluice; there is a tank at the head of it holding from 50 to 100 tons of water. The draw dock is kept cleaned by men employed on purpose. The sets of tide at flood tide are as follows:—From London Bridge into Bankside, north to south; from Bankside into Blackfriars, being an eddy it causes the tide to throw over from south to north; from Blackfriars up to Temple Pier, it edges on the north shore, setting hard into Somerset House; from Somerset House up to Hungerford Bridge, straight, shoot of tide edging slightly into the north; from Hungerford Bridge to Westminster Bridge, bears on Middlesex shore; from Westminster Bridge to Penitentiary, edging on the north shore. At ebb tide from Vauxhall Bridge to Westminster Bridge, west to east; from Westminster Bridge to Hungerford Bridge down as far as the Temple Pier, south to north; from Temple Pier to Blackfriars Bridge, north to south; from Blackfriars Bridge to Southwark Bridge, south to north."

2633. (*Chairman.*) We are very much obliged to you for this information. You have so clearly explained your views, that I do not think we need put any questions to you.

The Witness withdrew.

MR. CHARLES BUCKERIDGE examined.

The following paper, forwarded to the Commissioners by the Witness, was read:

2634. "I am lessee of a wharf and barge house in Upper Ground Street. I have the frontage to the river, and I have the foreshore, which has been prepared with gravel, &c. to form a hard bottom; it extends out 120 feet to low water. On the shore I have barges under repair; the hard clear shore is necessary, for the men have to be on their backs to repair the barge bottoms; it is washed over every day at the ebb of the tide. This shore is absolutely necessary for my business in repairing the bottoms of barges, which is done at low water only. I do not think any stage (as proposed) would serve the purpose, so that a solid embankment or an inner water with flood gates would destroy my trade, and render useless my barge house, and take away my means of livelihood. Barges are constantly coming for repair. There are several barge builders between Southwark Bridge and Westminster Bridge; they would be sufferers in a similar way. It would be very difficult to find other premises. It is a convenience for the wharfingers to have a place near at hand for repairs, and barges sinking can be weighed and readily brought on shore for repairs. Great inconvenience would arise if there were no shore to which they could be brought, and with tidal docks they would not have this benefit, for they could not be left near the entrances, for they would be in the way; they can

now be brought on any part of the shore. I have now building a large sailing barge of about 100 tons which will be launched very shortly from my barge house. I expect it will run out as far as the roads. Any solid embankment would prevent my launching barges, and a dock must be extremely wide to enable me to launch in safety."

2635. (*Chairman.*) Then any change in the way of a solid embankment or a road along the river side would be injurious to your premises?—Yes; I should not be able to carry on my business at all.

2636. (*Captain Galton.*) You must have the shore?—I want the shore expressly for the purpose. I repair from 200 to 300 barges a year; that is nearly one a day.

2637. (*Chairman.*) I do not think anything has been before the Commissioners which would obviate your objection?—I believe not.

2638. (*Captain Galton.*) You cannot repair the barges at high water; at high water your men cannot work?—They can work inside them, but our shore is risen so that we have only water at ordinary times to the block, just keeping up about two feet from the ground.

2639. You would have to put the barges into a dry dock if you did not have the rise and fall of the tide, I suppose?—Then very often the block would be in the way of a leak, and we should want to have the water in again before we could finish.

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2640. (*Mr. Thwaites.*) I understand at present your efforts have been to secure as much dry time or as long dry working hours as possible?—Yes.

2641. If an arrangement were made by which your men could work during the 12 hours without reference to tide, do you think that would be more advantageous to you?—We could not have the same room to do the same work.

2642. Then you are making a workshop in point of fact of the fore shore of the river?—Yes.

2643. (*Captain Burstal.*) I suppose it is rather difficult to find any other mode of repairing barges but getting them as high as you can up the bank near the wharf?—Some of them are so very old they would not bear pulling up.

2644. Supposing yours to be an exceptional case, and supposing an embankment to be determined upon, are there no other places upon the river that would be equally available for such work as yours, as the locality in which you are at present?—If the barge owners would bring their barges.

2645. Just so. Supposing yours to be the only trade dependent entirely upon the fore shore of the river, and supposing every other trade could be carried on equally well with an embankment, then

The witness withdrew.

Mr.
J. C. Meymott.

Mr. JOHN CLARKE MEYMOTT examined.

The following paper, forwarded to the Commissioners by the Witness, was read:

2650. "I am solicitor to a Committee of wharf owners and occupiers. I have ascertained from the parish rate books the sums at which the parish officers have assessed all the wharves from Southwark Bridge to the end of Palace Road, Lambeth, exclusive of the wharves taken by the railway company; the total sum so assessed is 25,612*l.* I believe this would represent an annual value of about 30,000*l.* The signatures to the memorial presented to the Royal Commissioners represent 15,541*l.* of the above 25,612*l.* I have obtained returns of the tonnage of goods loaded and shipped at most of these wharves, representing 17,006*l.* of the 25,612*l.*, and it amounts to 1,070,063 tons per annum. The wharf property belonging to the duchy of Cornwall, and of which the foreshore is expressly demised, extends from Waterloo Bridge wharf to Messrs. Cory's coal wharf next Old Barge House, and the property comprised within the manor of Old Paris Garden extends from Old Barge House to the east end of Holland Street. The Thames Conservancy Act, 20 and 21 Victoria, chapter 147, in the preamble, excepts from the claim of the Crown to the ground and soil of tidal rivers and the shores thereof such parts thereof as are "held by or vested in certain bodies public and corporate, and others by prescription, &c.", and section 173 declares that the Act shall not interfere with any of the possessions, rights, privileges, powers, or authorities vested in or claimed or enjoyed by the Duke of Cornwall, or in or by any lessee, grantee, or other person holding under the said duchy; and section 179 declares that the Act shall not take away, alter, or abridge any right, claim, privilege, franchise, exemption, or immunity to which any owner or occupier of any lands, tenements, or hereditaments on the banks of the river, including the banks thereof, are now by law entitled. The whole of the Surrey shore from Messrs. Cory's wharf to Vauxhall Bridge is in the parish of Lambeth, and is under the jurisdiction of the vestry appointed by the Metropolitan Local Management Act, 1855 (18 and 19 Victoria, chapter 120). By this Act all the powers of the Commissioners of Sewers, except as regards the main drains, are transferred to the vestry; and a reference to the Sewers Act, 3 and 4 William 4, chapter 22, shows what are those powers. Section 10 declares that all walls, banks, culverts, and other defences by the coasts of the sea, and all tidal rivers, and all walls, banks, &c., erected adjoining, shall be within the jurisdiction of the Commissioners. By section 15, if any person

you would necessarily be driven to some other place. Could not there be another place found up the river where barges could be taken equally convenient, and where your business could be carried on equally convenient?—Equally convenient, but more expensive; we should be obliged to take them further, which would be more expense.

2646. That is merely a matter of tide drifting?—There would be a loss of money upon the repair of a barge.

2647. It would be merely the expense of 5*s.* upon the repair of a barge?—Then those who have places below London Bridge would have all the advantage; people would not bring barges to me.

2648. That is a personal affair?—It would be the ruin of me.

2649. You are representing your own interests, and therefore, supposing every other interest was in favour of an embankment, and you had to move away, it would be merely a question of whether you went to Chelsea or whether you remained where you are now, and whether you could get a sufficient amount of work in case of removal, because there are barge builders at Chelsea already?—I do not think you would find one there.

who is liable by reason of tenure, shall not keep in repair any walls, banks, &c., it shall be lawful for the surveyor, &c. to put the same in good repair, and the expenses shall be paid by the person liable to the repair. By section 19, the Court of Sewers may decree any new walls, banks, &c., and other works, aids, and defences to be made for the more effectually defending and securing any lands, &c. against the irruption or overflowing of the sea, or for draining or carrying off the superfluous fresh waters. By section 24, the Commissioners may purchase land, &c. for the purpose of widening, deepening, strengthening, maintaining, repairing, and amending any rivers, streams, watercourses, walls, banks, and other works, aids, and defences. By the Metropolis Local Management Act these powers appear to be transferred to the Lambeth vestry; and by section 69, the vestry shall from time to time repair and maintain the sewers vested in them, &c., and shall cause to be made, repaired, and maintained such sewers and works as may be necessary, &c., and shall cause all banks, wharves, docks, or defences, abutting on or adjoining any river, stream, &c., in such parish or district, to be raised, strengthened, or altered, or repaired where it may be necessary so to do for effectually draining or protecting from floods or inundations such parish or district."

2651. (*Chairman.*) Have you anything else to state?—No.

2652. (*Captain Galton.*) Do you consider that the separate vestries have power to cause the wharves to be raised?—I collect that from the Act of Parliament.

2653. How would you enforce such a thing?—There are many ways of enforcing such a thing. Wherever there is an obligation by an Act of Parliament there are means of enforcing it. I do not know that there is any penalty.

2654. If there is no penalty, what is the remedy?—If there is no penalty provided by the Act of Parliament, you may do it by indictment, that is the ordinary way, or in the Court of Chancery by injunction; but in any case where you can get a clear obligation there are plenty of means of enforcing it.

2655. Do you reside in either of the parishes affected by this question?—No, my office is in Christchurch.

2656. Have you any opinion as to the value of an embankment between Westminster Bridge and Vauxhall?—No; I am not competent to form any opinion upon that.

The witness withdrew.

The following paper, forwarded by Mr. James Newton to the Commissioners, was read :

2657. "I am lessee of a wharf on Bankside, used for landing and housing fire bricks and half ton casks of clay, and other goods of a like description, and also a drawing dock adjoining. The fire bricks and clay, &c. are landed from sloops of a tonnage from 70 to 100 tons, and from barges; the bricks are handed up by men to the quay, and then wheeled in barrows to the stowing place. The casks are lifted by a crane, and left near it till convenient to load them into barges or into carts. If there should be a solid embankment with a public road, the goods would be exposed to injury and depredation during the landing; the landing or wheeling the bricks across the road could not be carried on without seriously interrupting the traffic, and damage to the said goods, and it would be delayed, and thereby expense would be increased as well as by the increased distance the casks would have to be lifted by crane

from the vessels, and again lifted by another crane from the trucks, creating also increase of expense and consequent increase in the price of goods.

If there is an inner water there must be a headway of 12 or 14 feet above high water for the sloops with the masts lowered. The drawing dock is used by many persons, who pay me a tonnage; it produces about 250*l.* a year; either a solid embankment or an inner water-way with flood gates would destroy this dock, it being used only when the water is out, the carts loading by the side of the barges; this work is necessarily stopped when the water rises. The mud now accumulates very fast in the dock, it requires to be cleared every day by stirring the water during the fall of the tide, and this is assisted by the wash of the steamers. If there was still water or a tidal dock we should never be able to keep it clean. The obstruction of our business during the works necessary for forming the embankment would be very serious."

Adjourned.

Mr. J. Newton.

3 April 1862.

Saturday, 10th May 1862.

PRESENT :

The Right Hon. the LORD MAYOR.
Maj.-Gen. Sir JOSHUA JEBB, K.C.B.

Captain BURSTAL, R.N.
JOHN ROBINSON McCLEAN, Esq.

The Right Honourable the LORD MAYOR in the Chair.

PETER WILLIAM BARLOW, Esq., examined.

P. W. Barlow,
Esq.

10 May 1862.

2658. (*Chairman.*) You are an engineer in considerable practice, as we know?—Yes.

2659. And the son of Professor Barlow of Woolwich?—Yes.

2660. You are the engineer to the Lambeth Bridge now in course of erection?—Yes.

2661. Can you give the Commissioners any information with regard to the percolation or non-percolation of the Thames through the bank on the Surrey side at Lambeth?—At the abutment of the Lambeth Bridge, on the Lambeth side, an excavation, 50 feet by 36 feet, was made nearly all inside of high-water mark. The abutment was 16 feet beyond high-water mark, and the remainder was inland. In the excavation, I had an opportunity of judging whether there was any percolation. I made repeated observations, and found that there was no perceptible difference between the height of the water at high water and at low water. There was very little land water. We made an excavation about 30 feet by 10 within a foot of low-water mark; you could hardly perceive the difference there between high and low water; the same men did the work of pumping; there might have been half a man difference; but though at high water the water increased a little, the same number of men kept the water down. That was on the Lambeth side; but on the Westminster side the result was different. The work there was executed in a peculiar manner, which I will explain. The principle adopted was square cast-iron caissons driven down to the gravel through a bed of peat, and on this side of the river I found a good deal more water come in. These photographs (*producing the same*) show the state of things on different days. This one is nearly down, it being excavated and ready to put the concrete in. This one (*pointing to another photograph*) is higher than that. This is a very excellent mode of making a foundation where you have peat to go through.

2662. You are of opinion that water from the Thames does not percolate to any very great extent on the Lambeth side?—Yes. In making the North Kent Railway, the percolation was very great in the chalk strata. The river water came in very much indeed; but this is quite different from that; that was at Woolwich and Erith.

2663. (*Capt. Burstal.*) The question is this,—whether, when the water in the river rises up to a certain height it does not act the part of a backwater, preventing the exudation of the land water through its natural channel?—It does down the North Kent Line, but not at Lambeth.

2664. (*Chairman.*) From Shooters Hill, and in that direction, the land waters are continually running down to the Thames, but at high water they are dammed up by the rise of the water?—Yes.

2665. (*Sir Joshua Jebb.*) Had you any reason to think that it was a purely local cause that prevented the water percolating at Lambeth Bridge?—I have no reason to suppose so.

2666. You think the same result would have occurred had you sunk to the east or west of it?—I think so. I have had no experience of it, but I think the material is similar as far as Hungerford Bridge. The London clay is covered with a bed of sand or gravel, and on this side there is a quantity of peat which occurs also below London Bridge on the Surrey side.

2667. (*Chairman.*) On the Middlesex side?—Yes; here on the Middlesex side there is a quantity of peat; there is gravel under that before you come to the clay; it is not all gravel and sand. On the other side of the river it is all gravel and sand above the clay to the surface; and I have reason to think the same result would arise as far as Hungerford Bridge. I have no reason to think otherwise.

The witness withdrew.

Mr. THOMAS DOCWRA examined.

Mr. T. Docwra.

2668. (*Chairman.*) What is your profession?—I am a well-sinker and contractor of waterworks.

2669. Have you had any experience in sinking wells on the Surrey side of the Thames?—I have sunk

Mr. T. Docwra.
10 May 1862.

very few in London, but I think I have sunk the deepest and the largest and more wells in England than any well-sinker we have. I have been engaged in the principal large towns, and a great deal in London, but I have not sunk many wells on the south side. I have made some borings for the London Gas-works on the south side. I found there made ground for a few feet; the rest was sand and gravel to the depth of about 20 feet; then we came on to the blue clay. I found there, every time the tide rose, the sand blown in the bore-hole something like two or three feet.

2670. (*Sir Joshua Jebb.*) Did you notice any particular fluctuation as the tide rose or fell?—As the tide rose the sand blown into the bore-hole something like two or three feet; when the tide was going down we were not troubled with it at all. Every time the tide rose we had to keep our pipe something like two feet ahead of us to prevent the sand blowing. That shows that the tide does affect that side. Some years ago I bored for Sir John Rennie and Mr. Milne at the old Westminster Bridge; that was on the south side in the coffer dam of the last arch. We were about twelve feet there through sand entirely down to the blue clay. There I found the same as I did at the other place. Every time the tide rose the sand blew into the hole. At Lambeth, in the New Cut, I sunk a well. That was something like 20 feet, but we did not touch the blue clay there. We were troubled in the same way there with the sand. In Guy's Hospital I sunk a well. I suppose we went about 33 feet, to the best of my recollection, on to the blue clay. There the water was so strong that we did not pump. We misered our cylinder through the sand into the blue clay. Then at Bow Creek we sunk a well. That is on the north side. There, I suppose, we went about 26 feet, to the best of my recollection, on to the blue clay, and that was affected in the same way. At the Isle of Dogs, where we sunk a well, we went on to the chalk. There the strata is sand and gravel down to the chalk. There is no blue clay there. The blue clay crops out before you get there. I have sunk several more near the Thames, but I do not remember any more at present.

2671. (*Captain Burstal.*) What you wish to point out to the Commissioners is this, that when you get to somewhere about the level of low water the water begins to show itself and there begins to be a fluctuation in the wells?—Yes; you come upon water before you come to low-water mark.

2672. How deep do you go below the level of Trinity high-water mark spring tides before you have an appearance of water, generally speaking?—It all depends upon the district.

2673. Say at Lambeth?—At Nine Elms, I think, we went something like 11 or 12 feet; but there the ground, I suppose, was something like three or four feet above Trinity high-water mark, so that that would be eight or nine feet. In some places you get more and in some not so much. It all depends upon the strata. For instance, when you come to a strata to which the water has free access it is affected more by the tide rising and falling than it is in another part. You may sink a well in one place and you may sink another 300 yards off, and though you come to the same thickness of strata, one will be more gravelly and sandy than the other.

2674. It is clear that the wells are all affected by the state of the tide. If in the river, there arises this question; at low water, the soil being sufficiently porous to allow the water to run off, the drainage of the district would run through the gravel and thence into the river?—It would run to the level of the tide; as soon as the tide begins to rise it heads it back again.

2675. When the tide in the river rises to a height equal to the level of the water that is running about in the gravel in the district, you think that the water of the river keeps back the land water, and prevents it from running into the Thames?—Yes; and if the

land water does not come down in sufficient quantities, the water from the Thames will find its way from the Thames, and mix with it. Suppose we have a strata of sand and gravel, a certain quantity of water runs down from it, the only outlet for which is the river. If it were not for that it would run over the surface at the weakest point; it comes down and gets vent there. As the water in the Thames rises up to that point it keeps heading that back, and if that ground is very porous,—very rank gravel, for instance,—the water of the Thames rises faster than the water in the gravel, and it will head it back. In sand I much question if it would have that effect. There are many strata in which it would not have so much effect as in strong gravel.

2676. Sand resists the water better than gravel?—Yes.

2677. With respect to the percolation of the water from the river into the districts on the south side of the Thames, considering the short time that the water rises to the level of high water, and falls down again, within a range of about 4 feet; and also bearing in mind the average levels of the district, which probably might be about the level of high-water mark, or a little below it; do you think the water from the Thames could find its way into those districts by percolation, so as to render them damp and unhealthy?—No; I do not. It depends, as I say, upon the strata; if it is a gravelly strata it will do so, but not to a great extent. Take a district, for instance, just level with high water mark. The question you ask me is, if the Thames water will affect it to that level; whether there is time for it to go in? I say, no: because the tide is up a very few hours.

2678. There are eight hours for it to run back, to run it dry, whereas there are only two hours for it to be charged at that high level?—Yes. I may, perhaps, suggest that if you want to arrive at facts, the expense would be very small indeed to have a series of borings made right along the bank, 200 or 300 yards apart, or a quarter of a mile or half a mile apart, then you could ascertain what the strata was, and you could take the levels of the water in each; you could gauge them at low water, or any time you liked, and that could be done at very little expense; you would then be in possession of the facts on the whole line from one end to the other, and I think that would furnish you with more information than you could gain from any one.

2679. Have you ever observed in going along the streets the gas pipes and water pipes being laid down?—There is not a street in London in which I have not laid down pipes, also in the suburbs of the New River Company, and in part of the West Middlesex Water Works districts.

2680. Such works would lead you to form a pretty good opinion whether water would come from the river so as to damage the ground floors of the houses generally along the banks. For instance, in laying a water pipe along York Street, would any percolation be perceptible?—None whatever. In all our pipes in the City of London there are no effects from water in the trenches, or any thing to affect the houses.

2681. Those pipes are quite as low as the ground floors of the houses?—Yes; in some places we are obliged to lay them lower. There used to be a great number of wells in Shoreditch at one time, but as soon as the sewer was put down in Shoreditch, which ran half into the blue clay, and half into the gravel, it laid all that district dry.

2682. Are you of opinion that the main sewer going through the Surrey district would, to a very considerable extent, drain the district?—It will lay the land dry down to that level.

2683. And all the district above the level of the sewer would drain down to it?—Yes; at whatever level that is carried it will tend to lower the land water down to that level.

The witness withdrew.

Mr. GEORGE SCOTT examined.

Mr. G. Scott.

10 May 1862.

2684. (*Chairman.*) You are a well-digger of great experience?—Yes.

2685. Can you give the Commissioners any information as to whether the water from the Thames in the neighbourhood of Lambeth percolates from the river, or whether the water which is found in the strata anywhere within a quarter of a mile of the river is water that comes from the land of the district?—I do not know as to a quarter of a mile, but close to the river the water from the river will come in as soon as you get below low-water mark; on this side of the water, in Millbank Street, for instance, where I have had to do some work, it will come very rapidly through at low water.

2686. Have you had any experience in well-sinking in Lambeth?—Yes; I sunk one for Mr. Doulton.

2687. How far is that from the river?—About 40 or 50 yards.

2688. Do you recollect how far you got down before you met with any water?—We did not get any till we got to the blue clay. There was plenty of water at low water; it comes in underneath to the top of the clay; the clay is deeper there than further up.

2689. Did you sink into the blue clay?—Yes, we touched it. We put the cylinder just level with the blue clay.

2690. The water comes in from the sand and gravel strata?—Yes, it does.

2691. You found that the water came in at high water from the sand and gravel while you were sinking, and you kept on sinking till you got a little

way into the blue clay, and then you found that at low-water there would always be water sufficient to meet the object which you had in sinking the well?—Yes. There are clay beds in different places near the Thames, and in some places you have to go a greater depth to reach the clay than in others. Where you go below low-water mark, through the gravel, the water from the river will come in.

2692. (*Capt. Burstal.*) Supposing you were directed to dig a hole six or eight feet deep in Lambeth, would you expect to find any water there?—Yes, we should get water—not if it were a distance off the Thames; you would have to go a depth of ten or twenty feet, I dare say, if you were to go a distance off.

2693. Do you think the water from the river coming through the ground soaks the district so as to render the houses in Lambeth damp?—I think it would, close to the water, but I know it would not further up.

2694. Have you ever seen the streets taken up when they have been laying down gas pipes or water pipes?—I have seen the water at Lambeth Bridge.

2695. But that has come up the sewers, has it not?—Yes; otherwise I do not think any water gets into the trenches.

2696. Do you know the character of the land about Battersea Fields?—It is very strong indeed.

2697. In a dry summer, and when the tides are high, do Battersea Fields require any watering?—They will not water themselves; they require watering.

The witness withdrew.

Adjourned.

Wednesday, 4th June 1862.

PRESENT :

Major-General Sir JOSHUA JEBB, K.C.B.
Captain D. GALTON, R.E.

Captain BURSTAL, R.N.
HENRY ARTHUR HUNT, Esq.

Major-General Sir JOSHUA JEBB, K.C.B., in the Chair.

Mr. RICHARD JAMES WHITAKER LEITH examined.

2698. (*Chairman.*) What position do you occupy?—I am secretary to the London and Westminster Steam Boat Company (Limited).

2699. We have requested the favour of your attendance to give evidence upon any general questions which occur to you respecting the advisability of embanking the Thames between Westminster Bridge and Vauxhall, and making a communication in that direction by the river side. Will you be so good as, first of all, to make your statement, and if any question occurs to any of the Commissioners they will elicit further information from you?—I will first state the holding which we have: we have two holdings—one from the Archbishop of Canterbury, which constitutes our dock, and a yard which we have for workshops, and the other is a holding under a Mr. Wyatt. Under the archbishop we hold from year to year upon sufferance, under Mr. Wyatt we hold by a 21 years' lease; we have two places there, the one adjoins the other. We have looked at the plan now on the wall, and the plan which we should like best is the one which would go outside our yard; that is to say, making a continuation of Bishop's Walk, because it would not at all interfere with the repairs of our boats.

2700. You mean by the road going to the rear of your premises and then getting to the side of the river by Bishop's Walk?—Yes.

2701. (*Mr. Hunt.*) That is, continuing the Palace Road, Stangate?—Yes.

2702. (*Chairman.*) Will you state the particular difficulties which would occur if the road were taken from Westminster Bridge along the front of your premises?—It would occasion no difficulty to us if you would allow us to have the use of our dock to go in with the boats as they are at present. We should want about 12 feet, and 4 feet besides; that is to say, about 16 feet to get in and out. We should have no objection provided that our landlords did not object to it.

2703. (*Capt. Galton.*) You mean 16 feet headway at high water?—Yes; for the funnels.

2704. (*Chairman.*) Steamers come in?—Yes; ours are steamers; the funnel is above the paddle-box some little distance. If we had that accommodation our company would make no objection to the matter.

2705. You want about as much headway as you have under the bridges?—Yes; we want about one clear foot above the funnel when it is half way down.

2706. Your trade would be very seriously interfered with if you had not a convenience of that sort?—The premises would be useless to us without it; we always have two, or sometimes three, boats under repair, and of course the premises would be valueless to us unless we could occupy them for that purpose.

Mr.
R. J. W. Leith

4 June 1862.

Mr.
R. J. W. Leith.
4 June 1862.

2707. What is the extent of your frontage along the river?—We occupy about 110 feet; that includes both premises.

2708. Have they been used for a long period for that purpose?—Yes; we have had a 21 years' lease, and the present is the second 21 years' lease, it having commenced in 1859.

2709. Have you any means of knowing whether there would be great public facilities secured by erecting a road in the direction between the two bridges?—I consider that there would be now that the new bridge is about to be opened.

2710. You allude to the Horseferry Road bridge?—Yes; and the other, because of the communication from one to the other.

2711. The traffic which would come over the Horseferry Road bridge would require a road to carry it on towards towards the city—towards York Road?—Yes; a road of that kind would be a very desirable thing for the public.

2712. You have spoken of a communication in the direction of the York Road. There would also be traffic probably in the direction of Nine Elms, would there not?—Yes. It is a very dirty and unpleasant mode to go by all the potteries to Nine Elms; at present it is a very great nuisance to the neighbourhood altogether.

2713. (*Captain Galton.*) About what is the value of your wharf; supposing it to be bought up, for instance?—I do not know its value in that way, but I can give you the rental; we pay the archbishop, I think, 52*l.* a year.

2714. Is that upon a very old lease?—No; we are tenants at will.

2715. That sounds a very small sum?—I am merely giving you the amount; it was a bare yard before; there were two old boat-houses.

2716. And you have put a great deal of property upon it?—Yes; our repairing shops and forges, and carpenter's shops are there.

2717. You have spent a large amount of capital upon the place?—A good deal of money.

2718. Is that for the Boat Company?—Yes.

2719. Are all your workshops there?—Not all, because we have a boat-house; some of the workshops are in the boat-house, and some are upon this yard and dock. For the boat-house we pay 85*l.* a year; that is the adjoining place, with a bow window in front. The boat-house belongs to Mr. Wyatt. The dock where the two yards are belong to the archbishop.

2720. Do you think that there would be much advantage in having a road carried on from Lambeth Palace towards Vauxhall?—I should think so, for the public.

2721. You think that there would be a good deal of traffic?—I think very great.

2722. Goods traffic, or would it be for carriages?—I should say both; because they would save a great distance in going round, as they must do now, by the distillery.

2723. Do you think that the advantage would be equal to the expense. I presume that it would be a very considerable expense?—I think that it would be a great convenience; whether it would be equal to the expense I cannot say. I think that it is very desirable for the public convenience to have that road.

2724. If a road was carried at the back of your premises and into Bishop's Walk, just where Bishop's Walk ends, you think that the arrangement would be the most convenient one which could be made for the wharves abutting on the river?—Decidedly; it would not interfere in any way with their present usage.

2725. Are the wharves much troubled with mud-banks?—Not where we are. From below Baker's Wharf to the bridge I think they are, but above that, from the constant stoppages of the steamboats at the Lambeth Pier, the wash is very great, and clears the river; any thing above our place is clear, but below our place, down to the bridge, I think the

mud accumulates; between Baker's Wharf and Searle's it does accumulate.

2726. The shore runs back very considerably there?—Yes.

2727. And it runs back at your premises, in fact?—Yes; but I think that we have a greater slope in front of our place.

2728. Is yours the only dock in front of those wharves?—I think so.

2729. Do you retain the water at high-water?—No, we have no gates.

2730. The water goes in and out?—Yes.

2731. (*Captain Burstal.*) You say that the shore is pretty clean off your premises?—Yes.

2732. Next below, off the saw-mills, how is the ground; is it gravel or mud?—I think it is gravel, from recollection, but I will not say positively.

2733. Is there any deposit of mud between that and Westminster Bridge that you know of?—Decidedly; you see it from Baker's yard. At Baker's yard I think I have observed it more than anywhere else; it is covered with mud about there.

2734. Does that mud extend far out on to the foreshore?—I think that I have seen it nearly down to low water.

2735. Does the wash of the steamers which ply between Lambeth Pier and Westminster come so far in as to wash that shore?—That I cannot say.

2736. Have you observed any difference in the bed of the river immediately below Lambeth Pier since the steamers have gone in that direction?—I think that it is improved from Lambeth Pier down to our place, but I have not observed it so much beyond Baker's Wharf; I think that it is more flat just next door to us than at our place; it is better again towards Searle's.

2737. When you get down to Searle's the wharves project riverward again there, and I suppose that that is the reason why the river is clean at Searle's?—I think that that is it.

2738. Between you and Searle's there is a little bay?—Yes.

2739. And there the mud accumulates?—Yes.

2740. You think that it is quite necessary for the business which you carry on that you should have direct communication with the river?—Yes; we could not do without it.

2741. Supposing that there was to be a solid road intervening between you and the river, could you carry on your business over that road?—We could carry it on, if you would allow us to have an entrance underneath the road to the dock.

2742. Supposing that that road was only six or seven feet high, that would not do?—That would shut us out altogether.

2743. It would not be convenient for the steamers while under repair to lie on the foreshore of the river outside the road?—We could not do the repairs there; the plates have to be taken out, and the boiler-makers have at times to work on the ground, and consequently the water would flow upon them.

2744. (*Captain Galton.*) A roadway upon an arch, as you have suggested, would interfere with your light to some extent, would it not; assuming that a roadway was carried sixteen feet above the level of the water at high water in front of your premises, would not that interfere with your light?—I think not, because our light in the workshops belonging to the archbishop is a borrowed light from the top, and in the lower part of our place, belonging to Mr. Wyatt, we do not work so much; that would not be prejudicial to us at all.

2745. (*Captain Burstal.*) If there was free access to your wharf under a raised roadway you would not consider that there would be any case for compensation?—I should not like to answer that question; that is a question which I must get the directors to answer.

The witness withdrew.

Grand Surrey Dock Entrance,
Rotherhithe, London, S.E.,
June 14, 1862.

SIR,

I WAS away when your note reached here (dated 6th May), requesting my attendance to give evidence respecting the strata and percolation of water in this neighbourhood.

I am now making a dry dock adjoining the Horseferry Stairs, Rotherhithe, and find on digging within thirty feet of the bank that there is no perceptible percolation from the Thames. The upper surface is loose (made) ground. I then find a strata of clay about 6 or 7 ft. in thickness, afterwards black peat. To this depth (about 12 ft. below tidal high water) no water; lower there is about 2 ft. of black gravel and mud, afterwards a bed of clean gravel charged with pure water, and which I believe to be springs at a depth of 18 ft. Over a surface of 100 ft. by 50 ft. we

are able with an ordinary disc pump to keep the water out, except for about two hours, commencing at high water. As the tide recedes we are again free. The spot is surrounded by water, having the Commercial Wet Docks at the back. I believe the increase is not attributable to percolation from the Thames; but the river, being the natural drain of the land, becoming filled with the tide, the water in the springs is kept back for the time, consequently the increase of volume in the excavation.

With regard to this neighbourhood, I believe there has been no overflow of the banks from high tides for these last twelve years or more, and that the land is dry to a depth of 8 or 10 ft. in the street, although the tide at high-water (ordinary spring) is four to five feet above the level.

I am, Sir,

Your obedient servant,
WILLIAM P. BEECH.

R. Kingscote, Esq.

Adjourned.

W. P. Beech,
Esq.

4 June 1862.

Thursday, 10th July 1862.

PRESENT :

Major-General Sir JOSHUA JEBB, K.C.B.
Captain D. GALTON, R.E.
Captain BURSTAL, R.N.

HENRY ARTHUR HUNT, Esq.
JOHN ROBINSON McCLEAN, Esq.

Captain D. GALTON, R.E., in the Chair.

Mr. CHARLES RICHARDSON examined.

2746. (*Chairman.*) You have a wharf above Vauxhall Bridge?—I have.

2747. What is it chiefly for?—For sale of bricks, lime, cement, and building goods.

2748. Where is it as regards the Phoenix Gas works?—I am beyond the Phoenix gas works. I am next to Price's. My wharf joins Price's.

2749. Are you next to Mr. Francis's?—No; the South-Western Railway Company's premises are next me.

2750. Your wharf is between the South-Western Railway premises and Price's?—Yes.

2751. You see the plan which is upon the wall; assuming that an embankment was made the whole of the way from Westminster Bridge up to Battersea Park, and projecting into the river to the extent shown on that plan, do you think that any arrangement could be made by which you could be conveniently accommodated, if a water space was left inside?—What is the distance?

2752. (*Captain Burstal.*) From the edge of your present wharf to the inner part of the road would be 150 feet?—If you gave me a good lay-by, with dock gates, I should not be inconvenienced.

2753. (*Chairman.*) So to retain the water always at the same level?—Yes. If you gave me a good lay-by enough to hold, say, four or five barges, which that space would allow, I should not complain.

2754. Is your wharf broad enough for a barge to lie lengthwise along?—Yes, for two barges. With such an arrangement as I have just mentioned it would be a convenience to me rather than a draw-back.

2755. Without some arrangement of that sort the wharf would be entirely destroyed?—Yes, entirely. Because a great many barges come there to unload, for which I charge so much per barge. There is also a draw-dock, one of the best in London. And the whole of the river front has been at a great cost concreted by my predecessor. And barges prefer coming there to any other wharf near the shore, having been concreted.

2756. Is the current very strong now at that part of the river?—Very strong; and when the water is low the stench is dreadful.

2757. Is there a great deposit of mud on the banks?—Yes. In fact I employ a man constantly dredging.

2758. Do you anticipate that no evil effect would arise from having a closed dock there, from the water being constantly stagnant in it, assuming the embankment to be made which is shown on that plan?—If I had a dock we should let the water out when we chose. When there was a deposit of mud we should let out the water, and the mud would be cleared out.

2759. You would sluice the mud into the river?—Yes, the same as they do at the West India and other docks.

2760. And at the Grosvenor Canal?—Yes.

2761. Do you think that there would be any convenience as regards the district by having a road along the river to Battersea?—Yes; it would be a great convenience.

2762. In what way?—As a public road.

2763. For pleasure, traffic, or for business?—For business. It is very difficult to get along the present roadway at times near the Nine Elms Railway Station.

2764. In consequence of the great traffic across the road, from the railway passing backwards and forwards?—Yes. When the Queen goes to the Nine Elms Station the police stop all our waggons and carts for at least half an hour. I have known them stopped for an hour, which is a great loss. In the Wandsworth road especially.

2765. It is very narrow?—Opposite my wharf it is very narrow.

2766. At the gas works it is very narrow?—Yes. The traffic along there is very great; sometimes we have to stop two or three minutes before we can get out at the gateways.

2767. (*Captain Burstal.*) Where does the great traffic lead to at the inland part of your premises?—It now leads to the South-Western Railway goods station, Battersea, and Wandsworth.

2768. That is eastward; but where does it go westward, that is to say, up the river, where do the carts and vehicles on the roadway go?—They come from all parts of London to the South-Western Railway Station.

2769. In what way would a road along the bank of the river from Battersea Park improve that communication?—Everybody would go to Battersea that district; no one would pass along the present roadway, I think, when he could get along a good roadway.

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2770. If they came from the inland part into Battersea, they would not come down by the river first and then go along the river back, would they?—I should think that they would be sure to turn into the road as soon as they could get there.

2771. The nearest point to the road would be at Nine Elms?—Yes.

2772. With respect to a dock, you could not carry on a communication for your business without a lay-by for your barges inside the roadway?—No. I now get a small sum as wharfage for each barge lying there and unloading. If that was taken away from me those barges could not come there at all. Sometimes I have seven, eight, or ten barges unloading at a time, each of which pays so much wharfage; it is a matter of so much a year to me.

2773. If an embankment was made from your premises out there you would expect to be compensated for that loss?—Yes, decidedly; because it would be a great loss.

2774. Does the main part of your business consist of wharfage?—No; I am a brick, lime, and cement merchant, but this wharf was constructed by my predecessor at a very great expense; the concreting of all this part of the river was done by him.

2775. Does not the stench of which you complain arise from the foul water from the Effra, being so near your premises?—There is no doubt that a great deal

The witness withdrew.

Mr.
E. W. Jones.

MR. EDWARD WALFORD JONES examined, Manager to Jones Walford.

2782. (Chairman.) Where are your premises?—We have one set of premises at Nine Elms and one at Lambeth. (The witness pointed out the same.)

2783. (Captain Burstal.) Whose premises are yours next to?—They are next to a private house, they are just opposite the great gasometer.

2784. (Chairman.) Have you a draw-dock?—No.
2785. There is a draw-dock close to you is there not?—Yes.

2786. Your premises are near Robin's and Miller's?—Next to Robin's and Miller's, who have a cut in here (pointing out the same).

2787. The plan, as shown there, would interfere with your wharf entirely would it not?—It would not interfere with our business if we had a way underneath into the cut which exists there now, because the barges come up here and we load and unload at present on both sides of that cut; therefore, if there was a way underneath the road into the river it would not interfere with our business at all.

2788. Either with gates or without gates?—The barges lie on the ground at low water and therefore we should not want gates.

2789. Are you much troubled with the mud?—A good deal of mud accumulates at one part but nothing very particular.

2790. It is not sufficient to stop your traffic?—No.

2791. (Sir Joshua Jebb.) What head-way should you require if there was a passage under the road?—About 10 or 12 feet. The sailing barges go underneath but they can drop their masts.

2792. Ten or twelve feet above high water?—Yes; that would be sufficient.

2793. (Chairman.) You would want it for sailing barges?—Yes, as well as for dumb barges; we have both.

2794. (Sir Joshua Jebb.) Do you carry on any great extent of traffic?—Yes; there is a good deal of traffic there; it is a whiting and chalk wharf; a great many barges come up with chalk, and the barges go away laden with whiting in casks, and the Gas Company unload a good many coals there.

2795. (Chairman.) Yours are whiting works?—Whiting and lime works.

2796. (Sir Joshua Jebb.) Whereabouts are the gas works. (The witness pointed out the same.)

2797. (Captain Burstal.) If a road was put there and you had access to your lay-by under that road you would not want to unload outside the embank-

comes from the Effra, but the stench from the river passes a long way beyond that when it is low water.

2776. That stench from the water would also come from the King's Scholars' pond sewer opposite, would it not?—A great deal comes from there, no doubt; it comes right over.

2777. Do you find that the water comes into the road at the back of you at all, up your draw dock?—Yes.

2778. It does not inundate the Wandsworth Road?—No.

2779. Supposing that there was a solid embankment all the way out and that you were to unload by barges at the outer part of the embankment, and to transfer all the bricks, lime, and stuff across the embankment into your premises, would it, as far as your business is concerned, irrespectively of wharfage, be equally convenient to you?—It would be equally convenient to me if you gave me, say, two tramways and two cranes.

2780. So as to take any opportunity which might arise of being able to shove your carts across the roadway into your premises?—Yes.

2781. The only reason for a dock is that you should not be deprived of the money which you derive from wharfage?—Quite so; so much per annum; the other I should be glad to see done.

ment and to cross the road?—No, because we have this cut, which runs quite into our premises, and therefore it would be just the same to us whether the barge came up here or underneath.

2798. Who occupies the premises between you and the tidemill dock?—They are Messrs. Robin's and Miller's. The embankment would interfere a great deal more with our other premises between Lambeth and Vauxhall Bridge,

2799. You occupy premises in Upper Fore Street at the projecting point?—Yes; they are next to Hunt's bone wharf.

2800. It is a very miserable description of property in the rear of those premises, is it not?—Yes; just about there.

2801. If a roadway was [made along the embankment cutting off that point, about 40 feet off, do you think that the character of the property at the back between that and Prince's Street would be improved?—No doubt the property at the back would be very much improved but you would take away half our buildings.

2802. According to this plan it would cut off the river bank as far back as Fore Street?—Yes.

2803. If that was cut off and the frontage was on the inshore part of that road, would not the general character of the property in that neighbourhood be very much improved?—No doubt it would be.

2804. There would be no large inundations and things of that sort?—The property just about here (pointing to the plan) is mostly tumble down places. Between the proposed bridge at Lambeth and White Hart dock it would be very much improved; the buildings are of a very poor, dilapidated description.

2805. Do you know much of the sort of business which goes on in that locality between White Hart dock and Lambeth Bridge?—Yes; there are one or two large potters and one or two wharves. A great proportion of the buildings are very dilapidated.

2806. From what you know of that business, could the pottery clay be landed outside the embankment and trucked across the road?—It would be a great inconvenience to the potters and a great obstruction to the traffic; because the potters have not only large quantities of clay up, but large quantities of coal. Messrs. Doulton use more than 100 tons of coal a week, and every day they are unloading barges of clay, or sand, or coal, and I should

think that it would be a great inconvenience to them and that it would stop the traffic to land across the road; they are unloading barges every day of some description or another.

2807. If recesses were made under the road so as to slope up to Lower Fore Street for barges to go into, do you think that would answer their purposes?—It would answer their purposes if they could be brought up into their premises or close to their premises, but not without it, because if there were any distance to carry, the charge for hauling would very much add to their expenses.

2808. I mean, supposing that there were recesses to go from the outer part of the embankment right up to their present premises?—It might to some extent meet their views; but each set of premises would require a different roadway, or a different way of getting at them.

The witness withdrew.

Mr LEWIS H. HASLEWOOD, Mr. RICHARD CATTARNS, and Mr. JOHN EVANS examined.

2813. (*Chairman. To Mr. Haslewood.*) You are the chairman of the Iron River Steamboat Company?—Yes.

2814. You have large works near Battersea?—Yes, with a very large frontage to the river.

2815. (*Captain Burstal.*) You are between some saw-mills and Beaufoy's wharf?—Yes; We have a piece of those saw-mills.

2816. They are situated about 200 feet above the Nine Elms draw dock?—Somewhere thereabouts I should think.

2817. (*Chairman.*) An embankment, as shown upon that plan, would materially interfere with your works, would it not?—There can be no question about that.

2818. Would there be any means of carrying on your business if a road was placed in front of it?—I hardly want to say no, but I do not see how we possibly could do it. We launched three boats there the other day, and two more a short time previously, and how could we launch them over that road? We built three boats there and launched them, whilst several were being repaired on the foreshore at the same time.

2819. You build as well as repair?—Yes; within the last twelve months we launched four boats, and we could not bring them over that road.

2820. Would it be possible to give you any dock inside?—(*Mr. Cattarns.*) We had three boats building at one time, that took up the whole of our waterside frontage, so that it would be impossible to devise any means by which the three boats could be launched at once with a fixed embankment or with docks, and the foreshore occupied with repairing.

2821. You could not get the same amount of accommodation?—Not by any possibility. I may mention that our roadside frontage is very irregular, and the parish very much wanted us to give them a part of our premises so that they might make the road straight; we said, "Yes, we have no objection, provided you will be at the expense of making the embankment out sufficiently far for us to take the whole length of our boats," (which we thought that we had a right ourselves to do,) "so that supposing this to be the length of a vessel, and that we are about to build it, we may have a sufficient foundation upon which to build our vessels." You are aware that there was an embankment commission some few years ago, in whose report there is a drawing of the river from Putney Bridge to Barking on the one side of the river, and Plumstead on the other. It was a joint report of Mr. James Walker, Captain Bullock, Mr. Saunders the Water Bailiff, Mr. Leach, Captain Fisher, and Mr. Rowland, the Principal Harbour Masters. Made on the 13th December 1841, and presented to the Navigation Committee in January 1842. There is a line of embankment shown there, and when we purchased the freehold of these premises we always understood that we had a right at any time to make an

2809. Do you think that along the whole length between White Hart Dock and Lambeth Bridge, it would be necessary to have direct access to the river?—Yes; for all the manufactories no doubt.

2810. Going across the road would not meet their views?—I do not think that it would.

2811. With respect to the space between White Hart dock and the London gas works, if that 40 feet was taken off, do you think that the improvement which would arise to the property inside would be commensurate with the loss of the property taken away?—It would be a very great improvement to the neighbourhood behind of course. All the neighbourhood about there is of a low class, and a good deal of it is waste land not built upon, as you see, going along the South-Western Railway.

2812. In fact, there cannot be a very much worse description of property than that?—No.

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embankment up to that point; and if I am not mistaken, Mr. Stiff the potter has himself embanked out according to the line of embankment laid down by Mr. Walker.

2822. He has embanked out to some extent?—Yes.

2823. (*Captain Burstal.*) The Battersea Park Commissioners have not embarked that line, it is a different line altogether from that?—(*Mr. Haslewood.*) But we as freeholders claim down to low-water mark, and if you make this road, our boats must go over that road, and we shall directly have the Commissioners saying, "You must not go over that road." We now build having part of the vessel over the water; when we pull a boat up either the head or the stern is supported on a temporary staging over the water.

2824. Do you claim the right of freehold from high-water mark to low-water mark?—Yes.

2825. As a user?—Yes; we moor our vessels there every night, and we claim the right to moor them there.

Mr. Cattarns.—That is to say, we have a right to ask the Thames Conservancy for permission to moor our boats outside. We do not of course claim more than other freeholders.

2826. (*To Mr. Haslewood.*) Supposing that for the purposes of your business you required a stone jetty out there, which would be a permanent structure, you would have first to get permission for that stone jetty to be erected, and if erected you would have to pay a sum in gross for the value in land which it covered?—That is a new idea of the Thames Conservancy, but still the Thames Conservancy cannot put out a jetty there without our permission.

Mr. Cattarns.—We claim no more than every freeholder claims; we are in the same position as Messrs. Fletcher or Messrs. Soames, or any of the great ship-builders are with respect to their river frontage.

2827. For the purpose of carrying on your business, you consider it actually necessary that you should have direct communication with the river?—Yes; we bought the premises expressly with that view, and with no other view in the world.

Mr. Haslewood.—We have blocks laid down there, and we often repair there on the foreshore immediately in front of our premises.

2828. Supposing that embankment to be made as you see drawn on that plan, which would be about 80 or 90 feet from your present wharf, and the water to be deepened to 6 feet at low water alongside, and supposing that your barges could lie outside the embankment, would it afford any facility for your business?—Our men constantly going across with iron, it would be constantly in the way.

2829. And it would stop your repairing business?—Yes; we lay our boats very often 20 feet in the river; they are 120 feet long.

Mr. Cattarns.—We built a temporary staging to

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carry the stern of the last vessel, the "George Peabody" which we built a short time ago.

2830. *Sir Joshua Jebb.*—What is generally the beam of your vessels?—(*Mr. Haslewood.*) 24 to 26 feet. This drawing (*producing a drawing*) shows our river frontage. It was not done for this purpose.

2831. (*Chairman.*) How long have you been established in that locality?—About 17 years.

2832. Ever since the Steamboat Company started?—No. We were established in 1838, and within a few years of our establishment we bought the lease of the premises, and afterwards the freehold; we have not had the freehold all that time, it was a leasehold for a long time.

2833. But the works have been established for that length of time?—Yes. This red line is the piece which the parish wanted to buy, and we could not part with it at any price because we had not room.

2834. (*Captain Burstal.*) Your boats are about 120 feet long?—Yes; but then we want to go round head and stern.

2835. What is your opinion as to the amount of traffic which would be likely to pass along that river embankment road if so formed; that is to say past your premises up towards Battersea Park?—(*Mr. Evans.*) It would be more for pleasure trips; the heavy traffic would not go that way.

2836. Do you know anything of the requirements of the traffic along the Wandsworth Road towards Battersea Park?—It is generally with heavy loads they come that way. The light vans for pleasuring come the Nine Elms Lane way.

2837. You think that the principal traffic would be for pleasure going people?—Pleasure and carriage folks, I think.

2838. And that would be very much diminished in winter?—Yes, of course so. I have not seen the plan, and therefore do not know where the road would come out.

(*Captain Burstal.*) According to that plan it would come out at the end of Chelsea Bridge.

2839. (*Chairman. To Mr. Haslewood.*) Could any arrangement be made to suit your views with an embankment?—I cannot see off hand how to answer the question, because I only heard of it yesterday. We always thought that there would be an embankment, but we never thought of a road.

Mr. Cattarns.—An embankment has been part of our suggestions, and the only question was with regard to the expense. The reason of our not making it earlier, was that the expense to us would have been very great without having assistance from our neighbours, because if only some parties made it, the wall on each side had to be protected from the ebb and flow of the tide; therefore we have always said "Make an embankment, and we shall be only too glad to make our share."

2840. (*Mr. Hunt.*) How far from the river did you propose to make your embankment?—We should have taken Mr. Walker's line.

2841. You know the embankment wall which has been built by the Railway Company and by the Waterworks Company?—I know that there is such a thing.

2842. Is that Mr. Walker's line?—I cannot answer that question.

2843. (*Chairman.*) You would be perfectly prepared to build your share of an embankment?—Perfectly; of course having it to ourselves. If our neighbours did so we should only be too glad to do our share.

2844. Do you suffer much from the mud at present in front of your works?—(*Mr. Evans.*) At a certain time of the year.

2845. At what time of the year?—From November to December.

2846. The mud is worse then than at other times, is it?—Yes.

Mr. Cattarns.—We have little blocks of wood laid

down in the nature of a gridiron in front of our premises.

2847. (*Captain Burstal.*) Do you find it important to your business to block craft?—(*Mr. Evans.*) Yes; we block one every week.

2848. Then the gridiron is of the utmost service to you, the shore being a dry shore?—Yes; we are obliged to keep a man there at a salary of 1*l.* a week to keep it clean.

2849. In winter time do you find that when there is much ice oscillating with the stream up and down the river your craft are obliged to be brought in shore?—Yes; it is a shelter for them in there; we lay 16 boats inside our premises.

2850. You do not put them in the stream at all?—No, or it would block up the river.

2851. If an embankment was there with six feet of water, with the stream going up and down all the time, your company would be subject to the effects of ice?—We could not then lay three boats abreast.

2852. (*Mr. Hunt. To Mr. Haslewood.*) Have you any right to put your vessels as you do now?—Decidedly.

Mr. Cattarns.—We get a licence from the Court of Conservancy. I have before said we had built three boats at one time whilst we were repairing others; we not only do that, but are obliged to have our boats surveyed twice in the year before we get certificates, and in order to get them surveyed properly it is necessary to have them drawn up in the docks in order that the surveyors may see every part of them.

2853. (*Mr. McLean.*) What width would you require from the face of the present wharf to the face of the proposed embankment?—(*Mr. Haslewood.*) Thirty or forty feet I consider; but then we do not want the road in our way.

Mr. Cattarns.—We want an access to the river whether it is only 10 feet or whether it is 40.

2854. (*Captain Burstal.*) You said just now that in order to carry out your business you required direct communication with the river?—That is so; that is the main feature in our case.

2855. (*Mr. McLean.*) Would a bridge in front of your premises be at all injurious if you had free access under the arches of it?—Yes, because we use the whole of our frontage; only a short time ago we were building three boats there, therefore we occupy the whole of the frontage.

2856. This would not interfere with the frontage, would it?—Yes, because we launch right into the river. It is not of so much importance to us that we should come right out here (*pointing to the plan*). If we came out to here (*pointing to another part of the plan*) it might do. We must have the whole of it whether we run over 10 feet of ground or over 40. We are just in the same position as all the great ship builders. The access to the river was the only object with which we bought these premises, we only bought them to build and repair.

Mr. Haslewood.—If we have an accident in the afternoon, as we constantly have, we bring the vessel on to the premises in the afternoon and repair it in the night.

Mr. Cattarns.—Our engineer lives on the premises. There may be an accident at any moment, and repair is wanted at a moment's notice.

2857. (*Captain Burstal.*) If one of your steamers sinks, you get her up and put her on to the gridiron and set her right immediately?—(*Mr. Haslewood.*) Yes.

Mr. Evans.—If we have it further out the tide will not allow us to put the plate in in the time; we manage the blocks so as to be on the spring tides as well as the ebb. If we find that a plate is wanted we work all night, and we manage it so that the tide shall leave us in two hours after high water. It is the principal thing that we have, if not we should have to haul up the other boats by the windlasses on to the slip, and it would cost us 10*l.* to haul them up.

2858. (*Mr. McLean.*) Will you look at this sketch; supposing that these are all docks, if that little viaduct were in front, would that viaduct interfere with your works in any way?—(*Mr. Cattarns.*) How could we get into the river?

2859. Through these arches, supposing them to be exactly similar to Vauxhall Bridge, in front of your premises; this would be six feet above high water, Trinity datum.—(*Mr. Haslewood.*) Would it be so deep that we could go in at half tide?

2860. Quite so. How would that interfere with your works; if a viaduct were in front of your premises, as shown upon that sketch, would it interfere with them?—(*Mr. Cattarns.*) How should we get into the river?

2861. Under the openings.—Then we could not get into the river under those openings, our boats are too high.

2862. (*Chairman.*) What head-way do you require?—(*Mr. Evans.*) We should require at least fourteen feet clear.

The witness withdrew.

Mr. HENRY LEE examined.

2868. (*Chairman.*) Whereabouts is your wharf?—We have two wharves (*the witness pointed out the same*), one is just below Downey's wharf, and we have another. We use that for contractor's purposes. One we do not use a great deal.

2869. Is it near to the Commissioners' wharf?—One adjoins it on the low side, and the other is within 200 yards of it.

2870. How would your wharf be affected by the embankment as shown by the yellow line on that plan, supposing you had openings allowed?—I do not know what the height and width of the proposed embankment is. We have built our quay-walls out to the Battersea Park line in both instances.

2871. Then that plan is incorrect as far as you are concerned?—I presume it is; and I think that our level is 4 feet above high-water mark.

2872. Did you obtain your land from the Battersea Park Commissioners?—Yes.

2873. And the right to build out to that plan?—Yes; it was compulsory.

2874. It was upon the condition of building?—Yes.

2875. Would you use your wharves if there was a roadway in front of them?—If there was a roadway in front, giving us a wharfage something like what there is on the other side at Mr. Cubitt's, keeping the road a little way back from the quay, and if we could put up proper cranes and arrangements so

The witness withdrew.

Mr. WILLIAM INNIS examined.

2879. (*Chairman.*) Your works are the Phoenix Gas Works?—Yes.

2880. Those are close to Vauxhall Bridge?—Yes; immediately adjoining the Bridge Road, between the Effra and the Bridge Road; they occupy the angular piece of ground which is marked there.

2881. You have made a great many improvements there?—We have carried out the embankment to the line which was arranged with the Thames Conservancy Commissioners. It was not Mr. Walker's line, the Conservancy Commissioners took 25 feet off.

2882. Do your warehouses abut upon the river?—Immediately upon the river.

2883. Do you raise coals into or discharge coke from your warehouses direct?—We carry coals directly from the water into our works from the barge without any break.

2884. Do you use the Effra much?—Considerably, for loading coke and breeze, but not so much for unloading coals.

2885. Your wharf is one side of the Effra?—Yes.

2886. The other side is a private wharf?—Yes; Mr. Holt's, the coal merchant. We use the Effra

2863. (*Mr. McLean.*) At what time of tide?—That would depend upon how the level of the shore would be.

Mr. Cattarns.—We always launch at high water.

2864. (*Chairman.*) You could not launch at any other time?—No; and we also take the spring tides.

Mr. Evans.—We generally like to launch at the five o'clock tide up there.

2865. Is that the spring tide?—We generally get a high tide up there; but that depends a good deal upon the wind.

2866. Then you would require a head-way of at least 15 feet?—(*Mr. Cattarns.*) Then there are our funnels.

2867. But do you launch with your funnels?—Yes.

Mr. Haslewood.—It is very questionable whether we shall be able to go under Lambeth Bridge. The Commissioners will understand that we do not wish to oppose the plan.

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Mr. H. Lee.

as to have trams across, we should have no objection to it. On the contrary, I think it would be a great public benefit to us, because this road is a bad road; the traffic there sometimes is so enormous from Wandsworth and what they call New Battersea, and the goods station, and what not, that it is almost impossible to pass along it. It would be a very great public benefit as far as we are personally concerned to get a road there. It would prevent warehouses being put on the edge of the quay, but that would not matter.

2876. Provided you had the means of landing and had tramways into your yard, you would not object?—No; I do not know whether that would come out to low-water mark.

2877. The idea is to excavate and to give 6 feet of water?—We should have no objection to that. We now use our foreshore; when we are obliged to have a good deal of timber up, it all lies on the foreshore; it would hardly do for it to lie in the stream; it would be in the way if it lay in the stream.

2878. Battersea Park would be embanked by the Commissioners?—Then it would not take a very great deal of the traffic if it stopped at Battersea Park. It ought to go further on. You ought to turn through where the Westminster Bridge works now are, and make a road from there. There is a road if it were kept in order.

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chiefly for loading the refuse and materials from our works. Coals come chiefly on the river side.

2887. In the winter, have you had a large number of barges lying off your works for the purpose of storing the coal?—From 50 to 60.

2888. Then you use the river in fact as a store-house?—We do; we have not unfrequently as many as 2,500 tons of coals lying in the stream.

2889. (*Mr. Hunt.*) For how long a period?—Something like three weeks. If a large quantity of shipping comes in at once we discharge the shipping as speedily as possible into barges, accumulate the barges at our wharves and discharge them into the works as the coal is required to make gas with.

2890. (*Chairman.*) But you have a permanent store in your works I suppose?—About 6,000 tons.

2891. And all beyond that you are obliged to store in the river?—Yes; it is floating store.

2892. Is it a large piece of land which you occupy?—It is rather over an acre.

2893. Is it freehold?—Yes.

2894. Have you had it long?—Since 1846.

2895. Assuming an embankment to come out as shown by that yellow line, and assuming that that

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green space within was to be water, how far would you be affected injuriously by such an arrangement?—We should not be materially affected; not injuriously affected, if we had a floating communication inside.

2896. A floating communication through?—Yes; and if that space enclosed was sufficient to accommodate about six barges, that is 300 tons of coal.

2897. Assuming that the green part was made all solid, and that that space was given to you as a warehouse space for coals, how would that accommodate you, assuming that the Effra continued as a dock to which your barges could come to unload one by one?—Without compensation?

2898. I am not speaking of compensation, but of the effect upon your factory?—It would be rather injurious, for this reason that: it would involve a considerable additional cost in discharging the coals into the works, carrying them over the roadway on which we should have no particular claim to appropriate a railway, or any thing upon which to lift. It would involve us in an additional 6d a ton I should say.

The witness withdrew.

Mr. D. Watson.

Mr. DAVID WATSON examined.

2905. (*Chairman.*) The London Gasworks are close to Burnett's vinegar factory are they not?—Yes.

2906. Of what extent are those works?—We consume about 70,000 tons of coal yearly to manufacture gas.

2907. You have large storehouses adjoining have you not?—Yes; we can store about 10,000 tons on those premises.

2908. I think that you have taken some premises adjoining yours, some old tumble down premises at the end of Fore Street?—No; we have some premises across Prince's Street.

2909. Those are premises at the back?—Yes.

2910. Are those freehold?—They are copyhold.

2911. (*Mr. Hunt.*) Do you manufacture gas there or are there merely gasholders?—We manufacture there also; we have large additional works now being constructed at Nine Elms; I may as well state that the lease of the works at Vauxhall expires in 1865.

2912. (*Chairman.*) Is it leasehold?—Yes, and the lease expires I think in 1865.

2913. Are you speaking of both premises?—No; I am not speaking of the copyhold; we have about 300 feet frontage which is copyhold, but the other part belongs to the duchy of Cornwall, and the lease expires in about 1865; our interest will then cease; and we are now constructing large works here (*pointing to the plan*) instead.

2914. You do not intend to apply for a renewal of that lease?—I think not.

2915. (*Mr. Hunt.*) Have you any waterside premises at Nine Elms?—Yes.

2916. (*Chairman.*) You are now constructing a large dock or pond at Nine Elms?—Yes.

2917. You are converting a mill stream into a dock?—Yes; it was a pond.

2918. Then as far as you are concerned an embankment would not interfere with you if you are proceeding to leave these premises?—It would only interfere with the part which is copyhold; when we give up the other part the copyhold would be the only part where we could unload our coal for that portion of our management.

2919. Have you space for your gas holders on the copyhold property besides space for your furnaces for manufacturing gas?—No; the gasholder room is now entirely filled up; we have only room there to extend our manufacture, not for storing.

2920. Then where shall you store the gas which

2899. What number of tons do you consume in a year?—About 40,000 tons at present at those works.

2900. (*Mr. Hunt.*) Have you facility to enlarge those works?—We have enlarged them to consume about 55,000 to 60,000 tons.

2901. Have you facility for enlarging them much further?—Not much more; I think that we have gone as far as we can there.

2902. Do you pay anything to the Conservators of the river for the privilege of making the foreshore of the river a storehouse?—We were mulcted in a trifle.

2903. (*Captain Burstal.*) You paid a certain sum gross for the amount of land which you enclosed I presume?—Yes; we paid 80*l.* for the piece of land conveyed to us by the Conservancy.

2904. Which is the whole length from the Effra to Vauxhall Bridge?—We did not complain so much of that as we did of another enclosure which we made at Greenwich, where we considered that we were rather heavily taxed.

you manufacture at those copyhold premises, supposing you do not renew the lease of the other premises?—We have four very large holders now which would be quite sufficient for all the gas which we make there.

2921. (*Mr. Hunt.*) You do not manufacture gas upon the copyhold property at present do you?—Not; on the distillery part; not next the river.

2922. The manufacture is on the leasehold property?—Yes. We have also copyhold property inside of the distillery.

2923. On the waterside?—No, not on the waterside; but the coals which we take to this copyhold property are landed at the distillery and carted into the other place; we have a tramway laid there across the road.

2924. That property is copyhold?—I believe so; I will not be quite certain about the term.

2925. (*Chairman.*) What does it cost you a ton to land coals in that way by carting them in as compared with landing them into your waterside premises?—About 1*s.* a ton.

2926. Does the railway deliver you any coal?—No.

2927. Yet you are close to the railway are you not?—We are.

2928. If you give up your leasehold premises and retain your copyhold waterside premises, and if that embankment was made, would it injuriously affect you if a water space was left within the embankment?—No, not at all; if we had water space inside to get our barges in it would be quite sufficient for us.

2929. How many barges would you require?—We want to get in four or five barges a day, to get them in when the tide comes up and to get them out, and we should repeat that every day. In winter at that part of our premises we consume about four barge-loads a day, about 200 tons.

2930. (*Captain Burstal.*) At the new premises which you are making up at Tidemill dock have you any barge traffic?—Yes.

2931. The roadway would not interfere with anything which you are doing there?—We have about 200 feet frontage adjoining these wharves (*pointing to the plan*), we are now embanking it and we shall use it for unloading. The traffic into the works inside would not allow large sailing barges to get under, because it would be level with the road.

2932. You want river frontage for other purposes?—Yes; for unloading our goods.

2933. Would it be conveniently done outside a public embankment road?—It might be done, but there would be the inconvenience of crossing the road. The more convenient way, according to what I see at present, is to have it inside.

2934. (*Mr. McLean.*) If you have proper access

into the dock under the embankment that is all you require?—Yes. *Mr. D. Watson.*

2935. If the road were kept 40 feet from your present wharf, allowing you free access underneath, it would not be injurious to you?—No; I think not.

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The witness withdrew.

Adjourned.

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