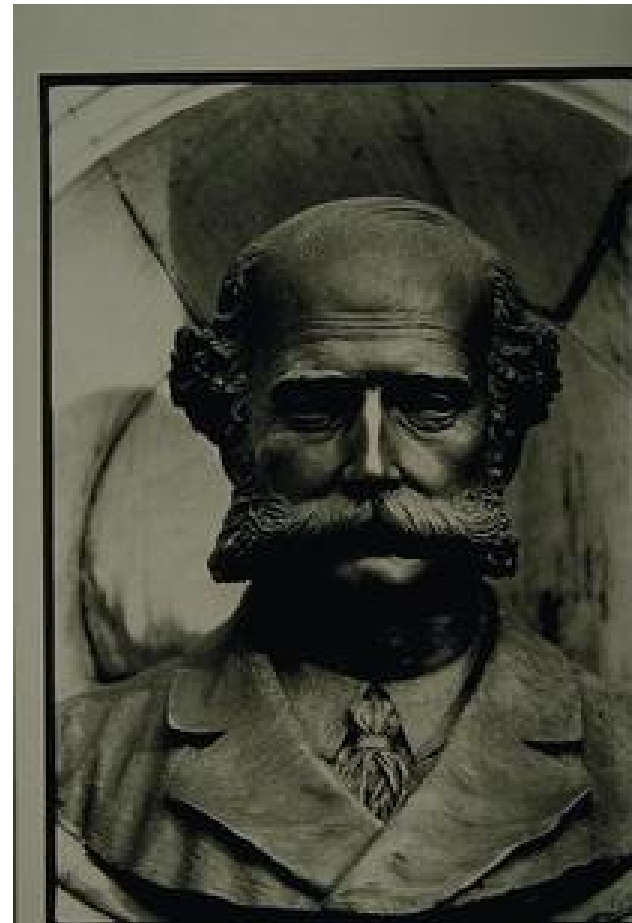


Sir Joseph Bazalgette, 1819-91

“That great, far-sighted engineer, who probably did more good, and saved more lives, than any single Victorian public official”



The Times, 8th July, 1855

“Sir, I traversed this day, by steam boat, the space between London and Hungerford bridges...The appearance and the smell of the water forced themselves at once upon my attention. The whole of the river was an opaque, pale brown fluid...The smell was very bad, the whole river was for the time a real sewer...If we neglect this subject we ought not to be surprised if, ere many years are over, a hot season gives us sad proof of the folly of our carelessness.

Michael Faraday, Royal Institution



*FARADAY GIVING HIS CARD TO FATHER THAMES;
AND WE HOPE THE DIRTY FELLOW WILL CONSULT THE LEARNED PROFESSOR.*

"Faraday giving his card to Father Thames" (*Punch*, 1855)



DEATH'S DISPENSARY.

OPEN TO THE POOR, GRATIS, BY PERMISSION OF THE PARISH.

Death's Dispensary: a cartoon in *Fun*, 1860 showing a water pump dispensing cholera to its unwitting users; see page

Cholera: 4 epidemics in London

1831-2: 6,536 deaths

1848-9: 14, 137

1853-4: 10,738

1866: 5,596 (East End of London only)

1892: Hamburg epidemic; panic in
London; no deaths

Believed to be caused by foul air: Florence Nightingale &
Edwin Chadwick: “all smell is disease”.

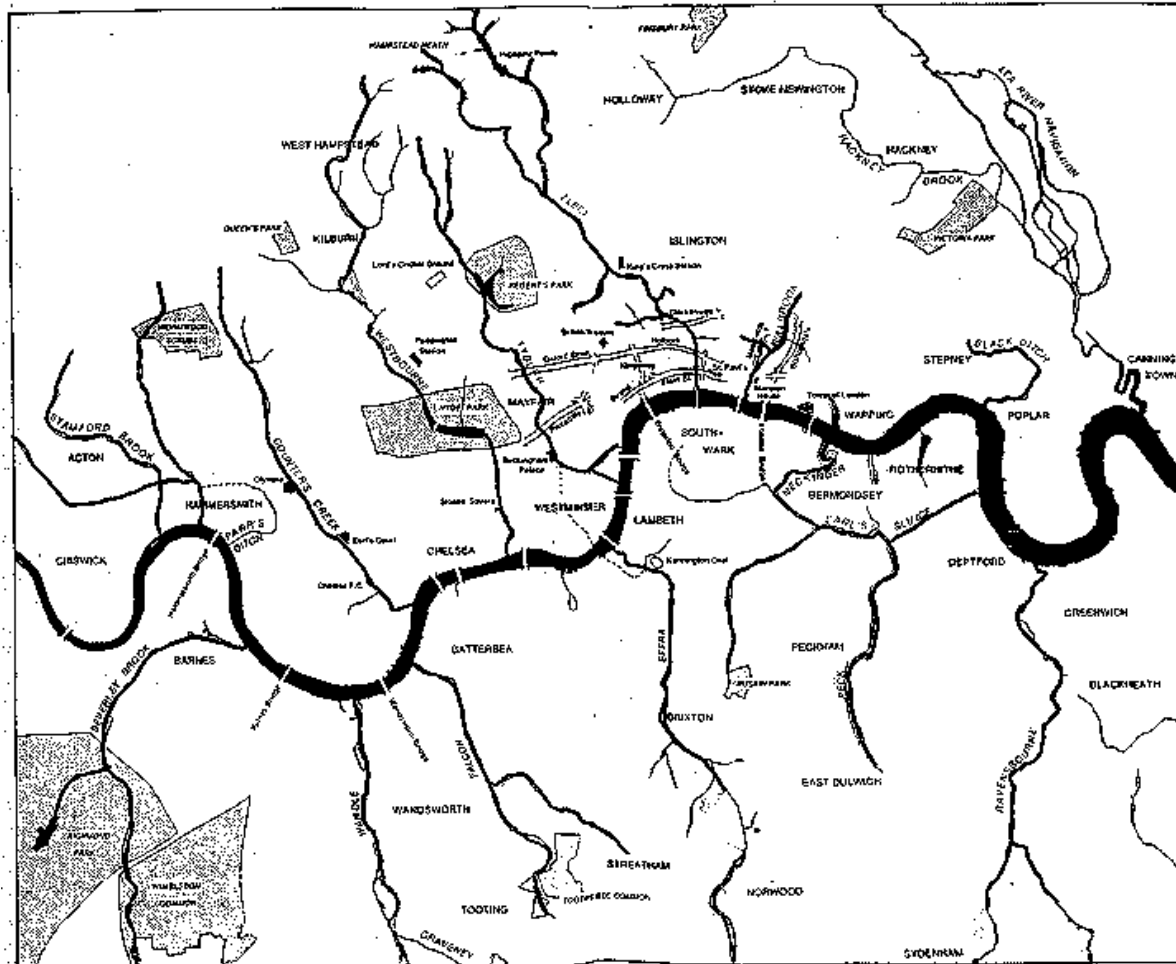
1858: *The Great Stink*

Hansard, 7th June 1858: “It was a notorious fact that Hon. Gentlemen sitting in the Committee Rooms and in the Library were utterly unable to remain there in consequence of the stench which arose from the river”

***The Times*, 18th June 1858**

“The intense heat had driven our legislators from those portions of their buildings which overlook the river. A few members, bent upon investigating the matter to its very depth, ventured into the library, but they were instantaneously driven to retreat, each man with a handkerchief to his nose. We are heartily glad of it”.

London's hidden rivers



The Fleet river

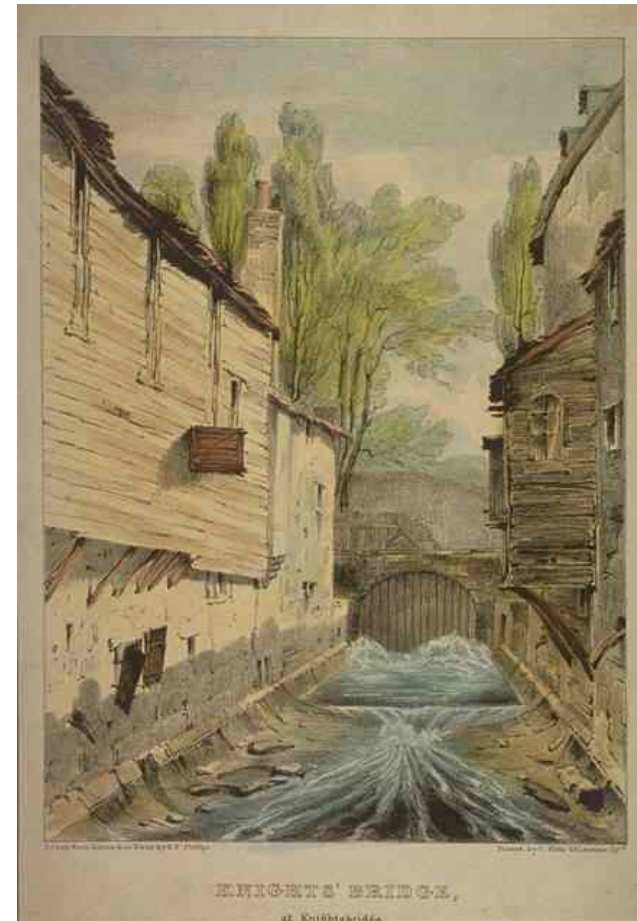


The Fleet joins the Thames: c.1750

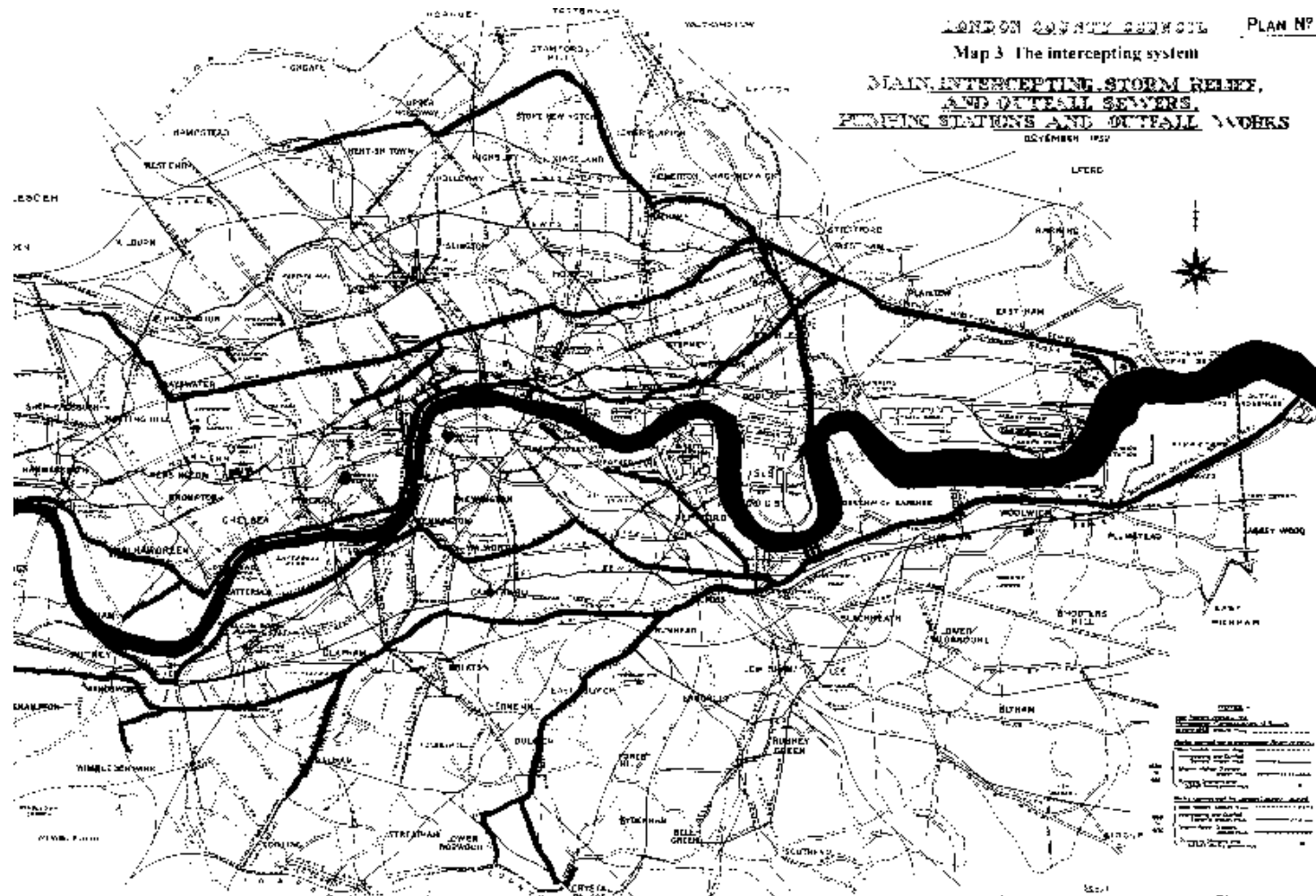


The Knights' Bridge

The river Westbourne rises on Hampstead Heath, surfaces in Hyde Park as the Serpentine, passes in a culvert across a platform at Sloane Square station and enters the Thames near Chelsea



Bazalgette's System



Big Ben



When was it built?

- January 1859: work began
 - April 1865: Crossness (Southern) treatment works opened by prince of Wales
- (1866: Whitechapel cholera epidemic,)**
- July 1868: Abbey Mills (Northern) treatment works opened
- (1892: the cholera epidemic that didn't happen)**

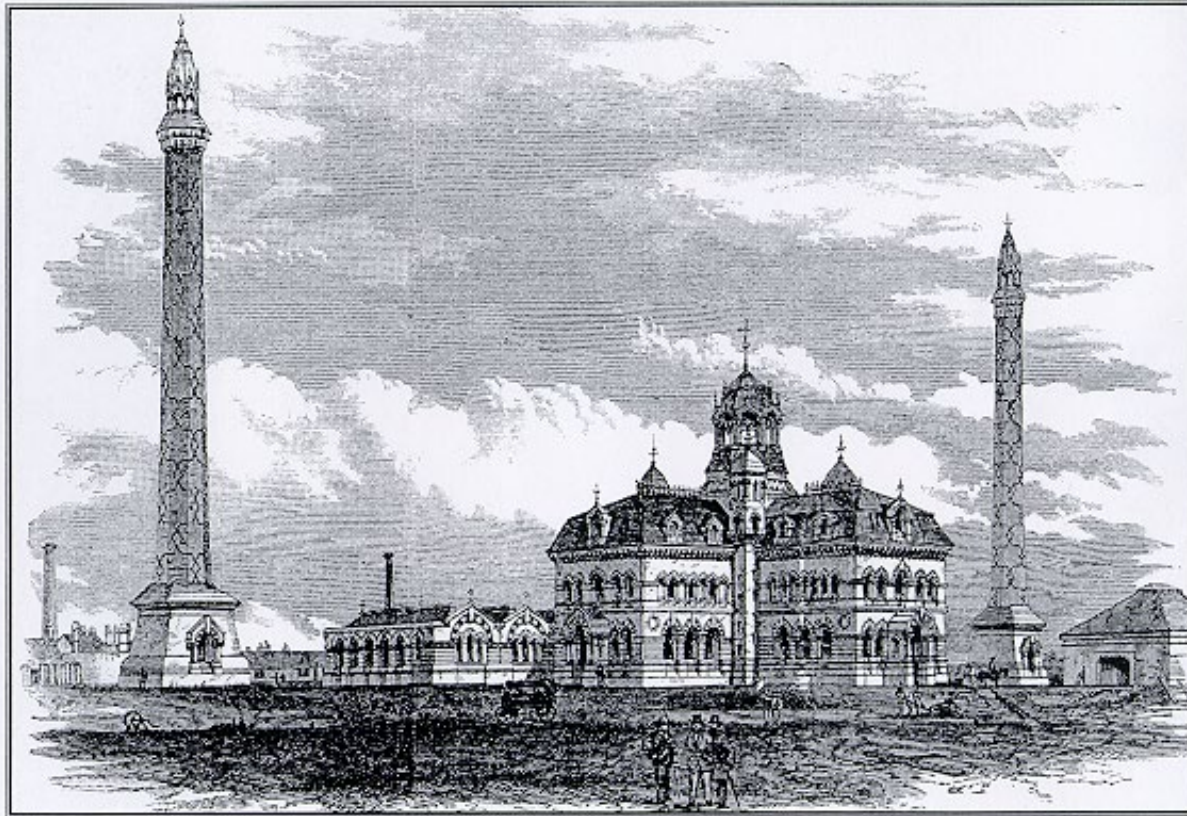
The Scale of the Enterprise

- **82 miles** of new intercepting sewers
- **165 miles** of re-constructed main sewers
- **1,100 miles** of new street sewers
- **4** pumping stations
- **318 million** bricks: inflation
- **80,000** cubic yards of concrete
- **3.5 million** cubic yards of earth excavated

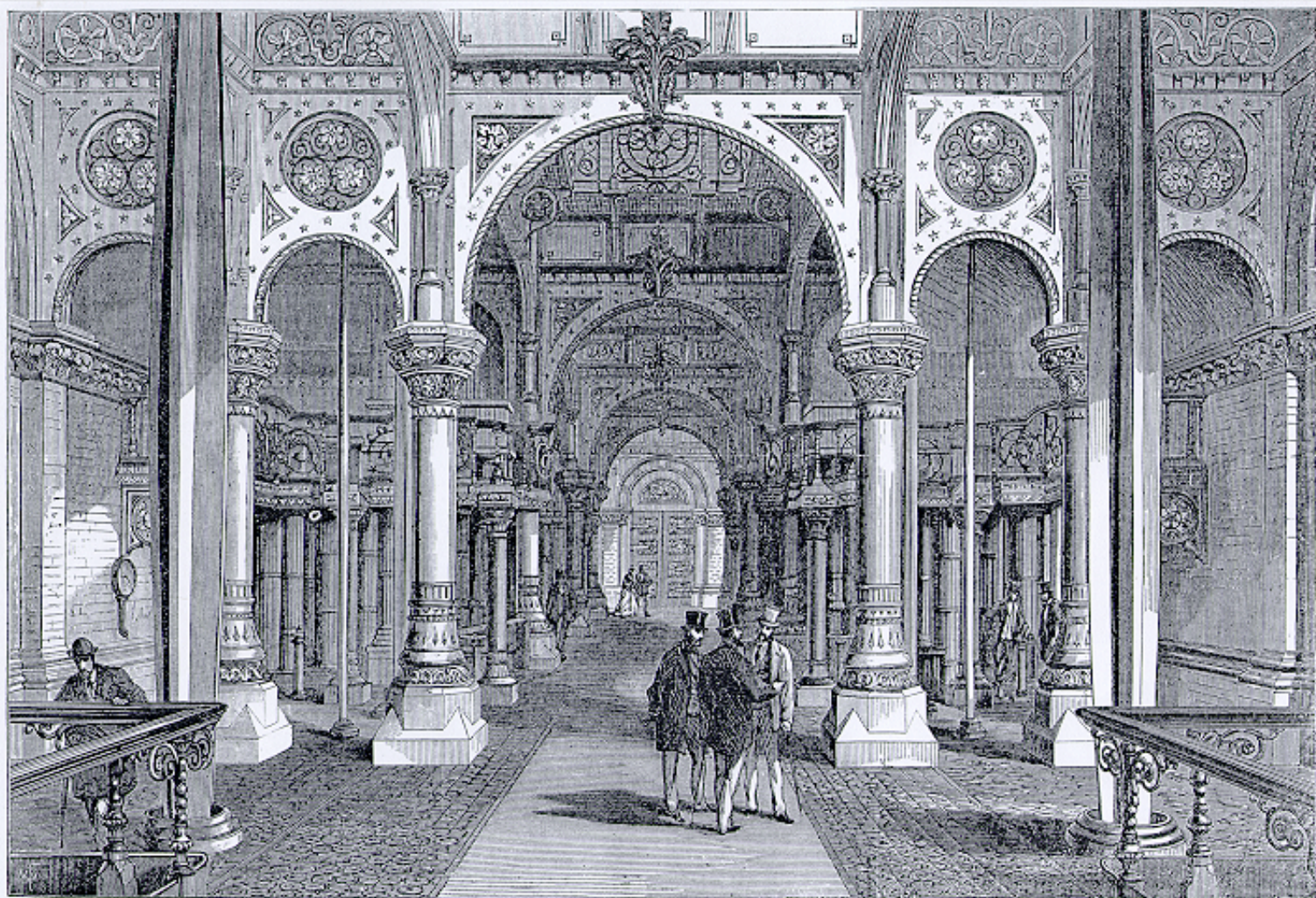
“A Moorish Extravagance”

100

The Great Stink of London



Abbey Mills pumping station,
1868. The ornate chimneys



INTERIOR OF THE ABBEY MILLS PUMPING STATION.—SEE NEXT PAGE.



Electricity and Breeze Blocks, 1

Electricity and Breeze Blocks, 2



Public interest and tributes

Observer, April, 1861: “The most extensive and wonderful work of modern times. Every penny spent is spent in a good cause”

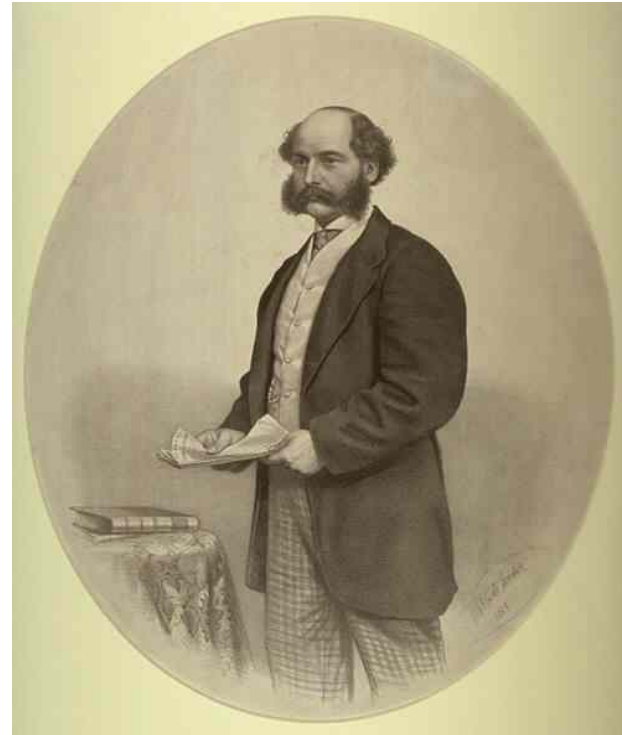
Marylebone Mercury, February, 1861: “To Mr Bazalgette no tribute of praise can be undeserved”

The Builder, April, 1865: “structural work that is the admiration of all who see it”

£6,000 bonus, 1865; railways

Bazalgette's other works

- The Embankments: Victoria, Albert and Chelsea
- Streets
- River Crossings
- Parks
- Other communities



The Victoria Embankment

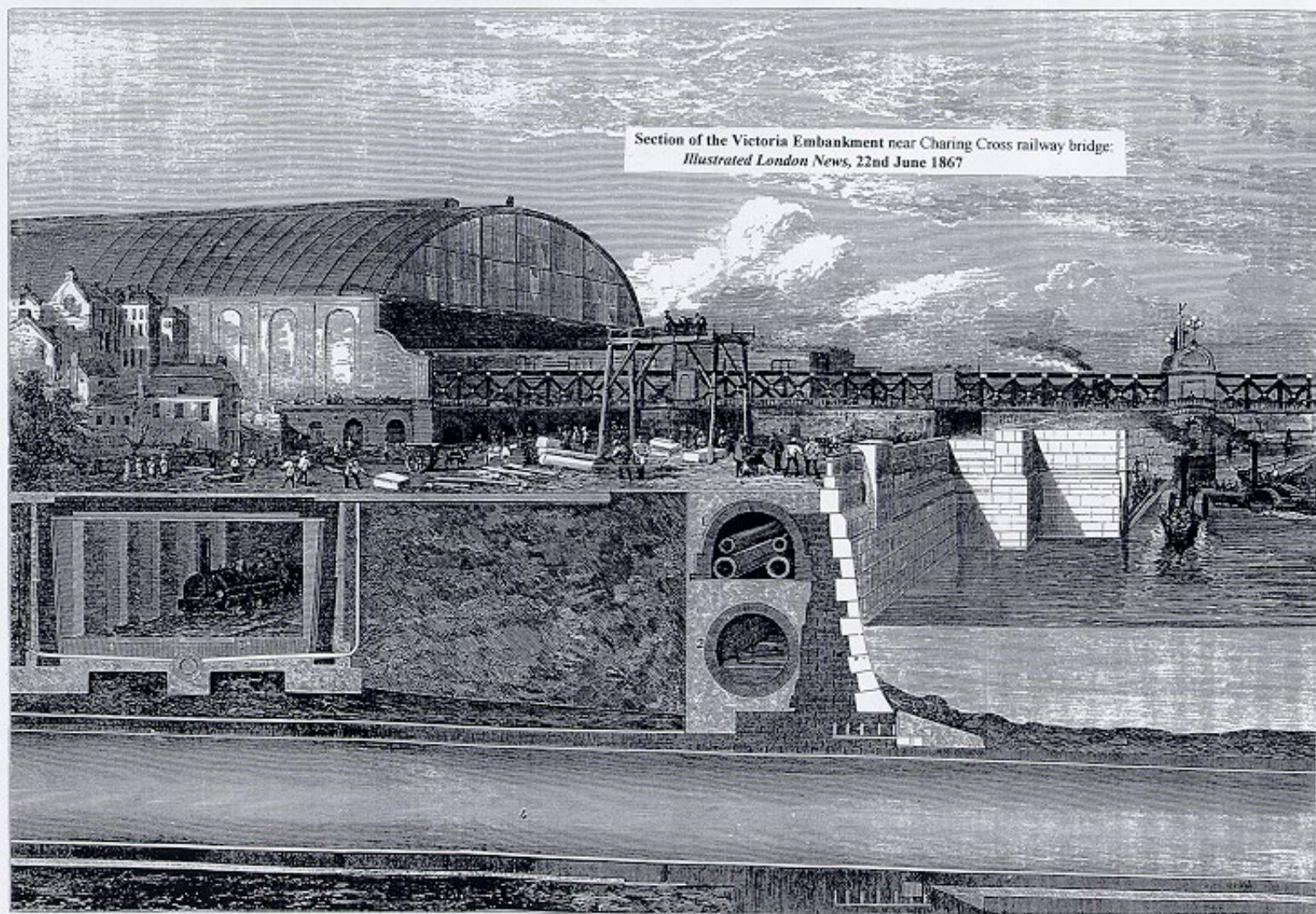
- Westminster bridge to Blackfriars bridge;
- reclaimed 37 acres from the Thames, replacing sewage-strewn mudbanks with a major new thoroughfare beneath which are:

the low level sewer

District and Circle line

tunnel for gas, water and now electricity

Opened 13th July 1870



Section of the Victoria Embankment near Charing Cross railway bridge:
Illustrated London News, 22nd June 1867

SECTION OF THE THAMES EMBANKMENT, SHOWING (1) THE SUBWAY, (2) THE LOW LEVEL SEWER, (3) THE METROPOLITAN RAILWAY, AND (4) THE PNEUMATIC RAILWAY.—SEE NEXT PAGE.

Work in progress

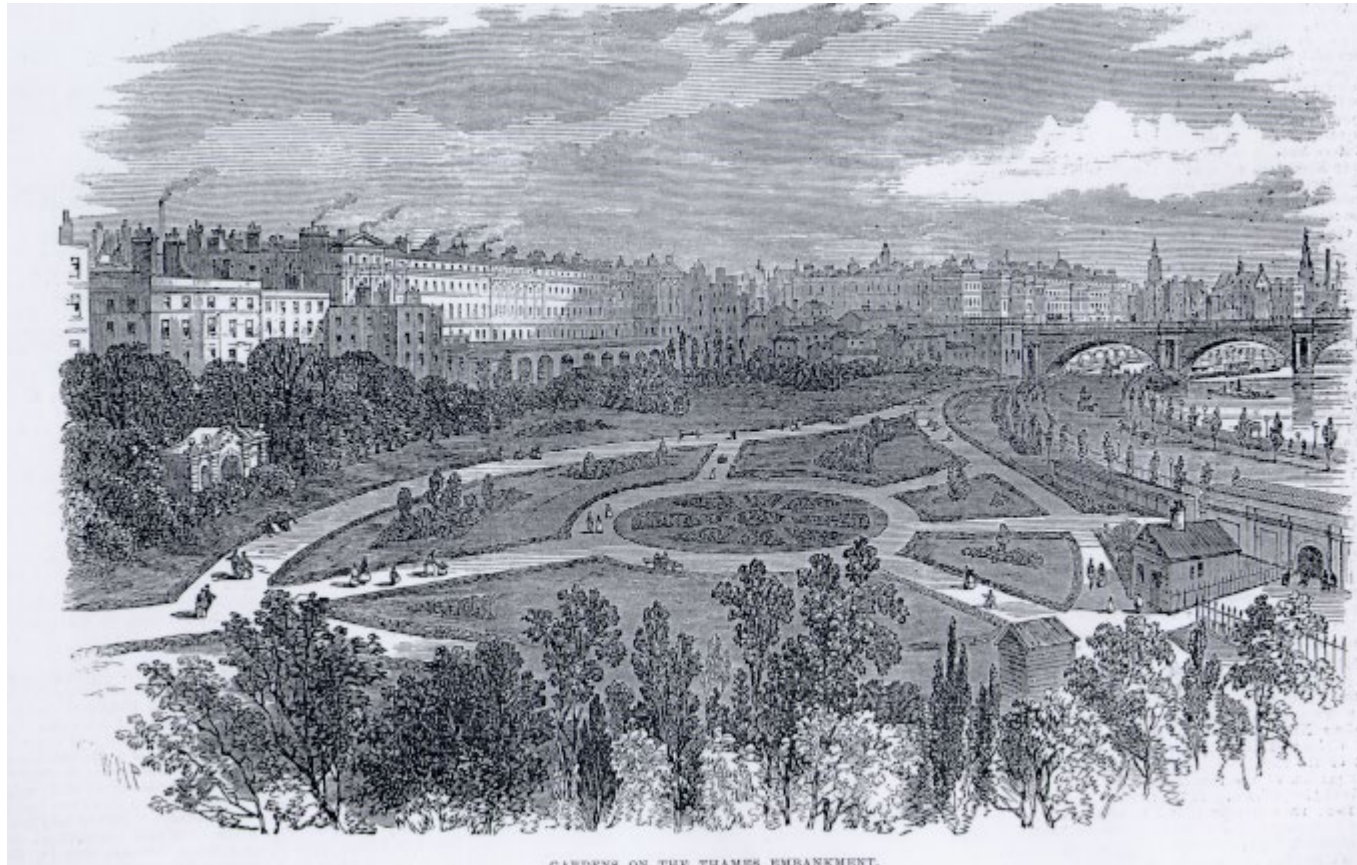


The Victoria Embankment in course of construction at Temple Gardens;
Illustrated London News, 4th February 1865

Opening Victoria Embankment



Embankment Gardens



Albert Embankment

- Albert Embankment: opened November 1869 to protect Lambeth from flooding and recovered 9 acres, providing a site for the site of Jeffrey Archer's penthouse and some other well-known London landmarks

James Bond's Office

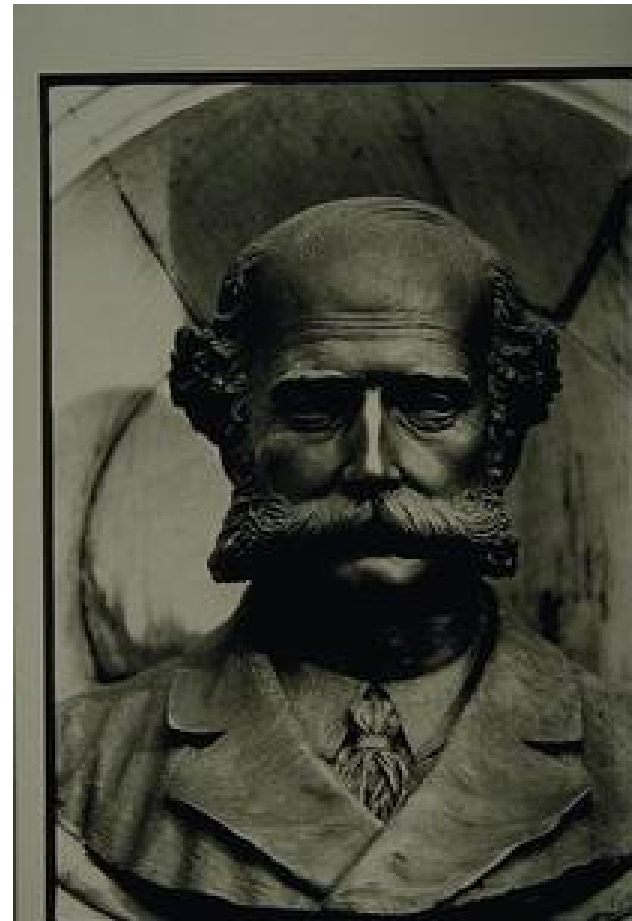


St Thomas's Hospital



Chelsea Embankment

- Opened July 1874,
between Battersea bridge
and Chelsea bridge,
providing another much-
needed road as well as a
route for the low level
sewer. Bazalgette
knighted



Cost & Construction Methods

**Cost: Main drainage, £4.2m; (other works
Embankments £2.5 m. c. £14m.)**

**Methods: “cut & cover”; tunnelling where
>30 feet below surface; min. fall 2 ft /mile.**

Bazalgette drew up detailed plans; contractors
executed them under close supervision, e.g.
on quality control

New Streets

- Charing Cross Road
- Garrick Street
- Northumberland Avenue
- Queen Victoria Street,
- Shaftesbury Avenue
- Southwark Street

40,000 re-housed; Duke of Northumberland paid off

River Crossings

Tolls abolished: increased traffic resulted

- Putney bridge demolished and replaced
- Battersea bridge demolished and replaced
- Hammersmith bridge: substantially re-constructed; lasted 120 years
- Blackwall Tunnel, Woolwich Free Ferry proposed and designed: opened after Bazalgette's retirement

Hammersmith Bridge



Tower Bridge

- 1878: Bazalgette proposed a new bridge by the Tower of London: City reaction:

“the need for any bridge or tunnel did not seem sufficiently proved to justify the City Corporation taking part in the promotion of a scheme”.

St Olave’s parish: “the bridge will have a prejudicial effect on the value of a large amount of property in the parish”

The winning design (well, almost)



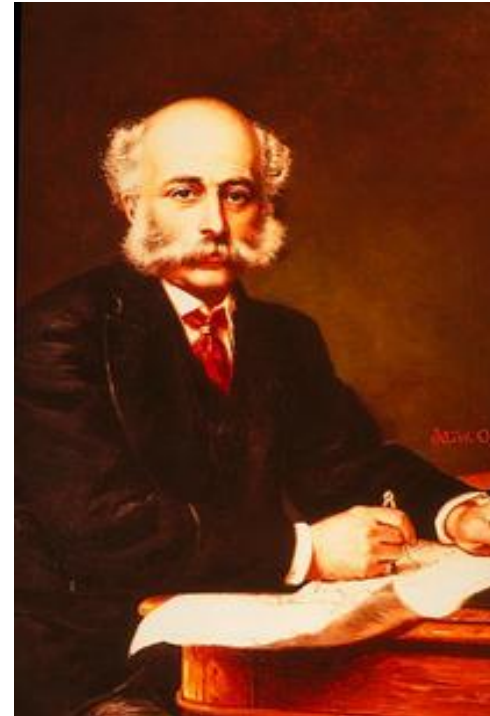
Victoria's forgotten engineer?

Why is he not better known? Why no account of his work until **110 years** after his death?

No personal papers

Most of his work is **invisible**:

- Sewers
- Treatment works
- Roads
- Embankments
- Parks



The Times, 16th March 1891

“When the New Zealander comes to London, a thousand years hence, to sketch the ruins of St Paul’s, the magnificent solidity and the faultless symmetry of the great granite blocks which form the wall of the Thames Embankment will still remain to testify that, in the reign of Victoria, ‘jerry-building’ was not quite universal. Of the great sewer that runs beneath Londoners know, as a rule, nothing, though the Registrar-General could tell them that its existence has added twenty years to their chance of life”

Thames Tideway Tunnel (TTT)

- Most systems deal separately with wastewater and rainwater
- Combined System deals with:
- Wastewater – flow easy to predict; WCs, baths, shops, factories, offices
- Rainwater – impossible to predict
- Bazalgette's is a combined system

How to deal with storms

- London system has 57 Combined Sewer overflows (CSOs) to release contents into Thames at times of heavy rainfall
- Bazalgette estimated occurrence 12 x per annum
- Currently occurring 60 x per annum
- Why

Reasons for more discharges

- Bazalgette provided for a population of 4 million
- Current population 9 million; 13m by 2030?
- Fields & Meadows absorb rain slowly
- More buildings, roads and hard standing to accommodate the needs of the population
- More frequent occurrence of storms
- 39m. Tons of overflow per annum

Thames Super Sewer

- 16 miles, Acton to Beckton beneath the river
- Separate branch Abbey Mills to Beckton
- 7.2 metres diameter (tube railways 3.5 m)
- 30-70 metres beneath the Thames
- Collects from CSOs & 6 pumps lift to Beckton Sewage Treatment Works
- £4.2b (Bazalgette's works £4.2m)
- Tunnel boring began Nov. 2018; complete 2023