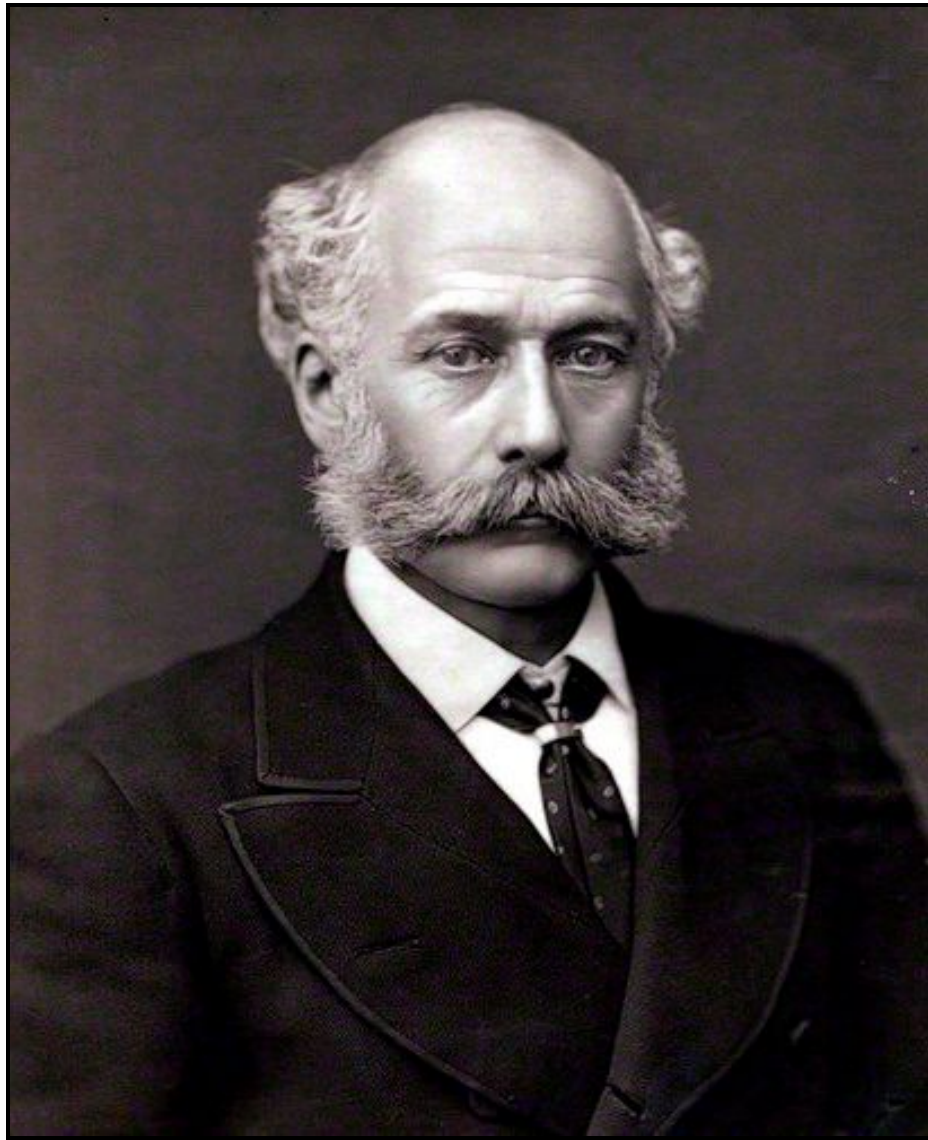


# **SIR JOSEPH BAZALGETTE and LONDON'S INTERCEPTING SEWER SYSTEM**

**By Brian Roberts, CIBSE Heritage Group**

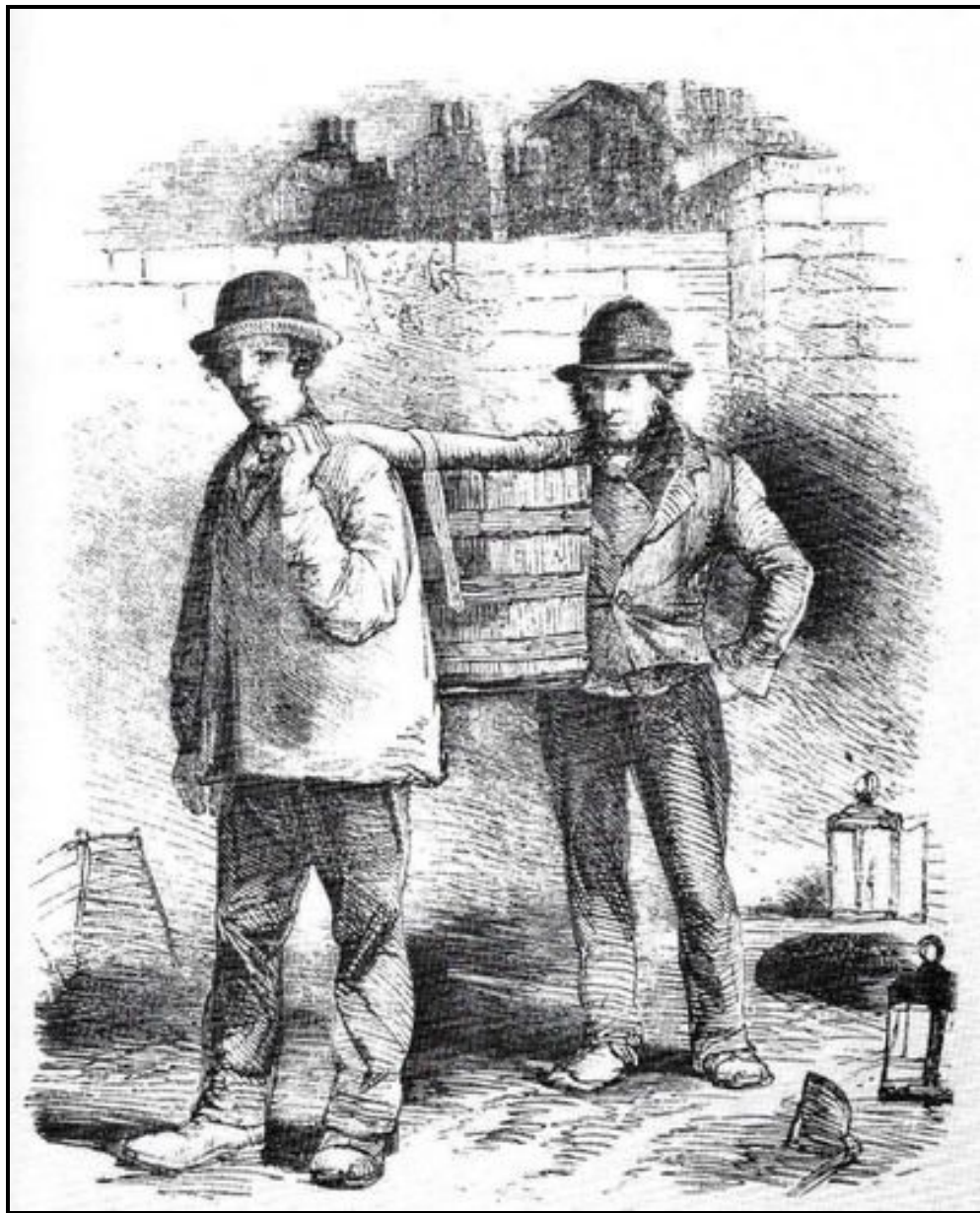


*Joseph William Bazalgette, 1819-91*

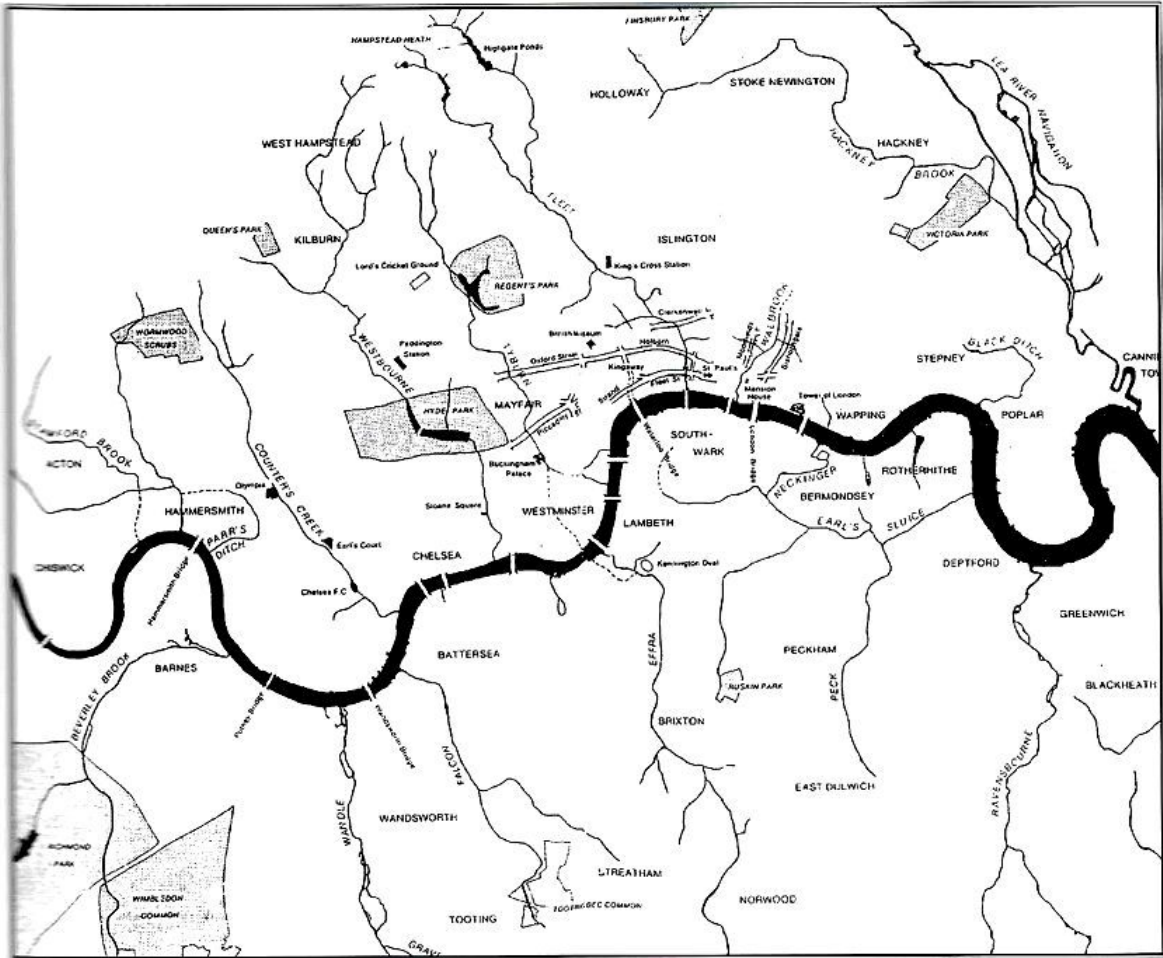
Bazalgette was born at Hill Lodge, Clay Hill in Enfield, Middlesex, London. He was the son of Joseph Wm Bazalgette Senior (1783-1849), a retired Royal Naval Captain, and Theresa Philo, nee Pilton (1796-1850).

Joseph Bazalgette was articled to the noted engineer Sir John MacNeill, beginning his career working on railway projects and then in land drainage and reclamation works. In 1842, he set up as a Consulting Engineer in London. In 1845, he married Maria Kough. Two years later, he suffered a nervous breakdown due to overworking.

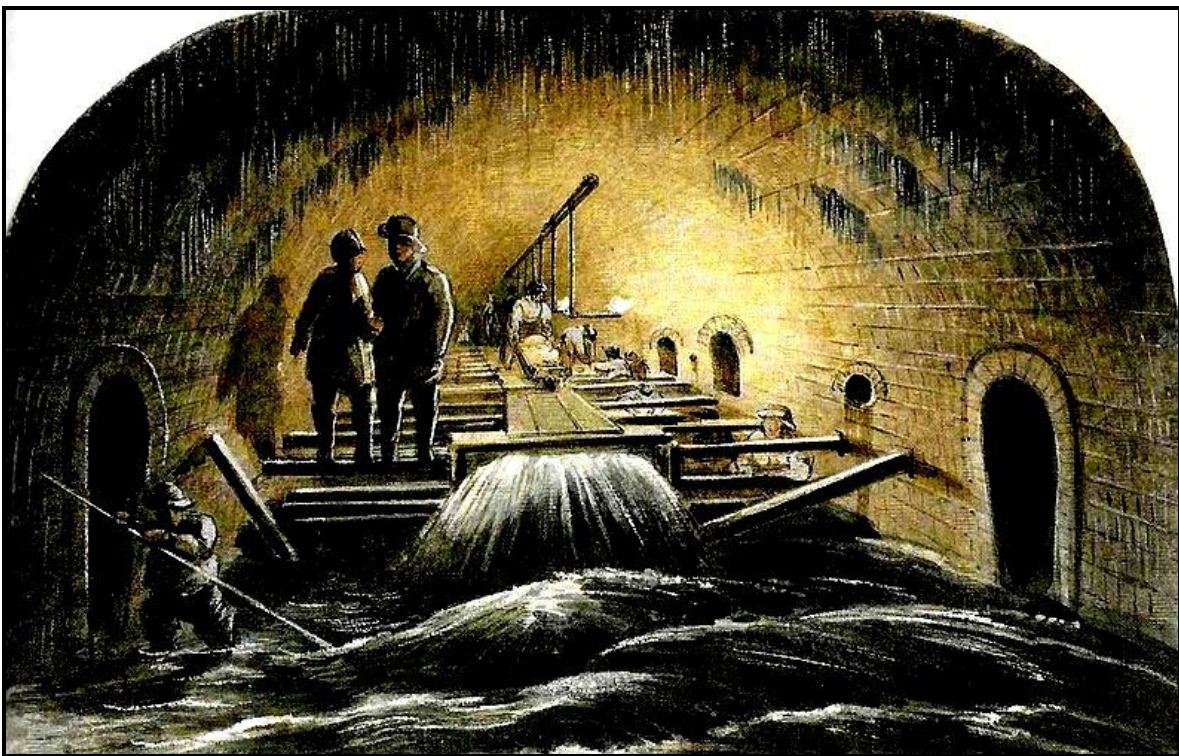
At this time, London's short-lived Metropolitan Commission of Sewers ordered that all cesspits should be closed and that house drains should connect to sewers and empty into the Thames. This caused the death of over 14,000 Londoners due to the resulting cholera epidemic of 1848-49.



*London Nightmen, who before the widespread network of sewers emptied and took away the contents of cess-pits*

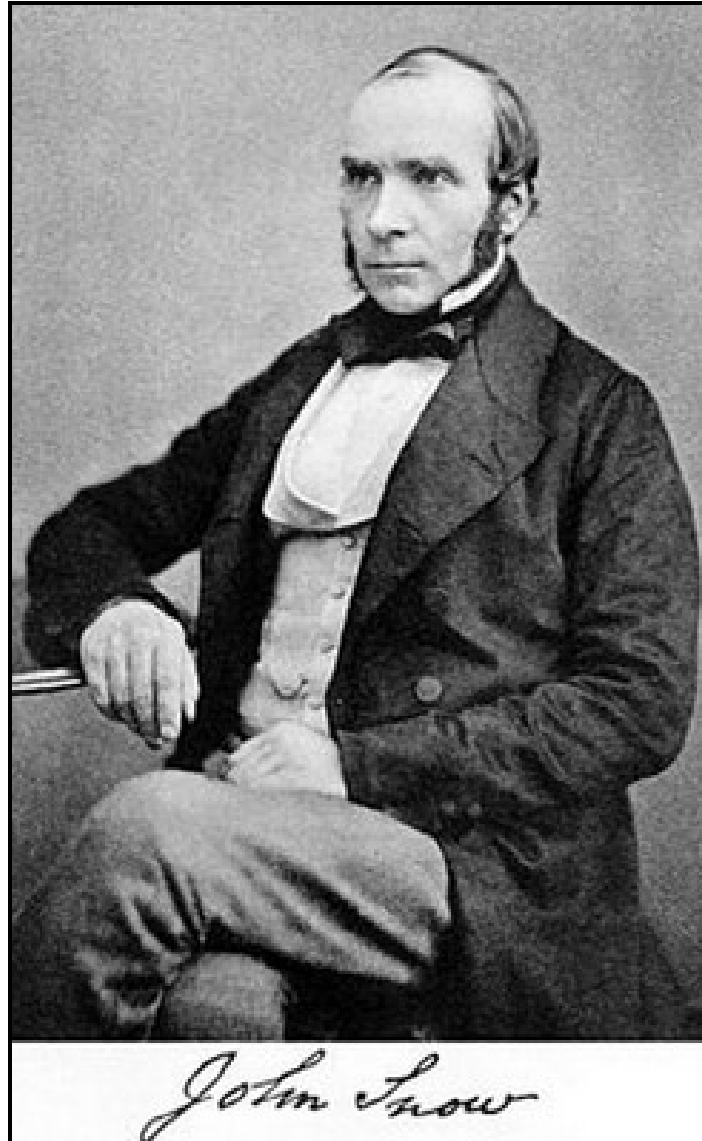


*London's hidden rivers, most still flowing though concealed, (Thames Water plc)*



*The Fleet Sewer c.1830, (Guildhall Library Corporation of London)*

In 1849, Bazalgette was appointed Assistant Surveyor to the Commission, taking over as Engineer after the death of his predecessor. Another cholera epidemic struck in 1853, killing over 10,000 persons. Medical opinion at this time held that cholera was caused by foul air: a so-called *miasma*. However, the Physician Dr John Snow strongly disagreed.



John Snow (1813-58) was a leader in the study of medical hygiene and remembered for his work in tracing the source of a cholera outbreak in Soho, London. In 1854, he identified the problem as the public water pump on the then Broad Street. His studies on the pattern of the disease persuaded the local Council to disable the well pump. Snow used a map to illustrate the cluster of cholera cases around the pump and used statistics to show the connection between the quality of the water sources and cholera cases. He showed that the Southwark & Vauxhall Waterworks Company was taking water from sewage-polluted sections of the Thames. But his evidence was ignored.



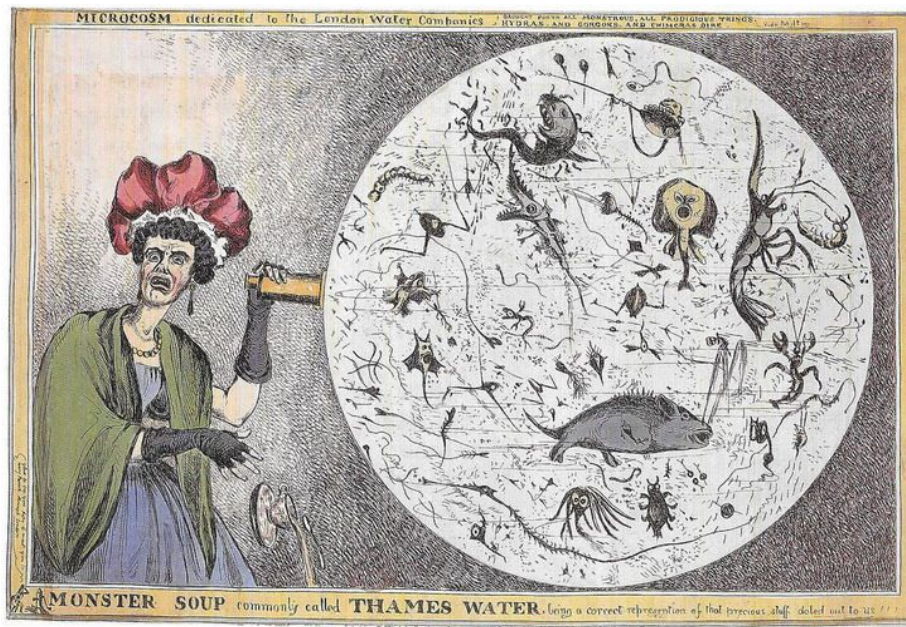
*A water pump dispensing disease 1860 (Punch)*

Meanwhile, Bazalgette (on the recommendations of Kingdom Isambard Brunel) was appointed, in 1856, Chief Engineer to the new Metropolitan Board of Works. At this time, the Thames was little more than an open sewer having grown worse due to the increase in London's population (rising from 1 million to 2 million in the first half of the 19<sup>th</sup> century, though estimates of the numbers vary), and to the introduction of the water-flushing closet, the contents of which now finished up in the Thames.



FARADAY GIVING HIS CARD TO FATHER THAMES;  
And we hope the Dirty Fellow will consult the learned Professor.

1855 (*Punch*)



*Cartoon highlighting the dangerous state of the Thames, July 1858 (Punch)*

The solution proposed by Bazalgette was to construct 1,100 miles of street sewers with 82 miles of underground brick sewers to intercept the raw sewage which until then had freely flowed through the streets of London. These intercepting sewers were to divert the sewage from the street sewers to far downstream where it could be collected and dumped, untreated, into the Thames to be carried away at high tide.



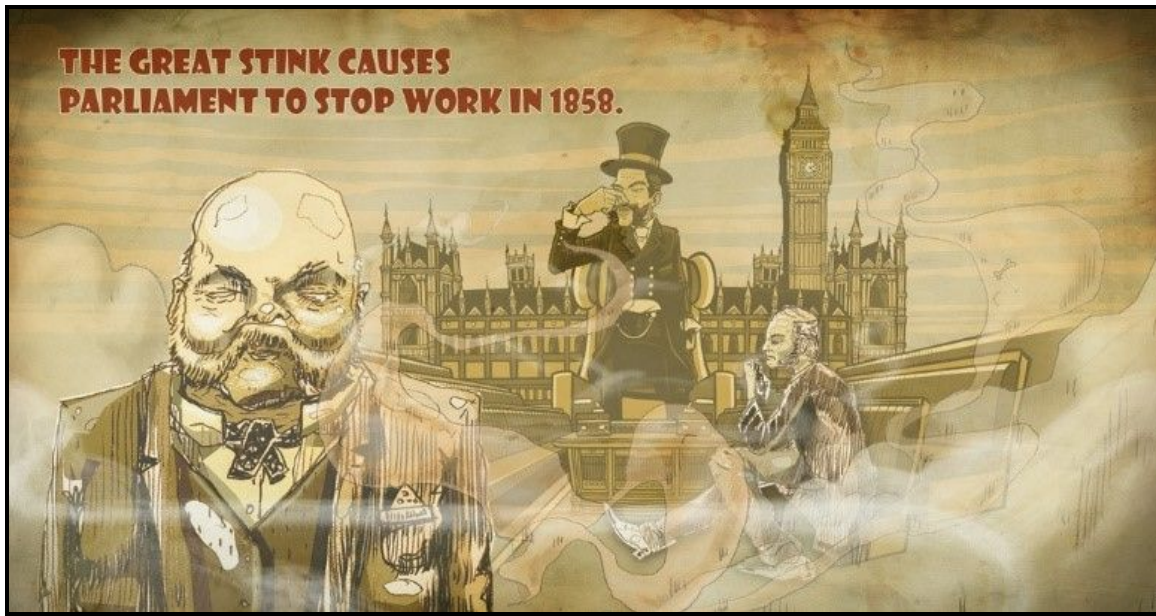
*A Drop of London Water, 1850 (Punch)*



*Horrors at the intake to Southwark Waterworks, c.1830, (cartoon by George Cruickshank)*



Bazalgette's proposals met with fierce resistance and were rejected time and time again, but all this changed in 1858. That year the stench from the Thames was so overpowering that Parliament was unable to function and this became known as the year of the "Great Stink." It prompted politicians into action and the Government gave approval and financial backing to the intercepting sewers proposals, amounting to 3 million pounds.

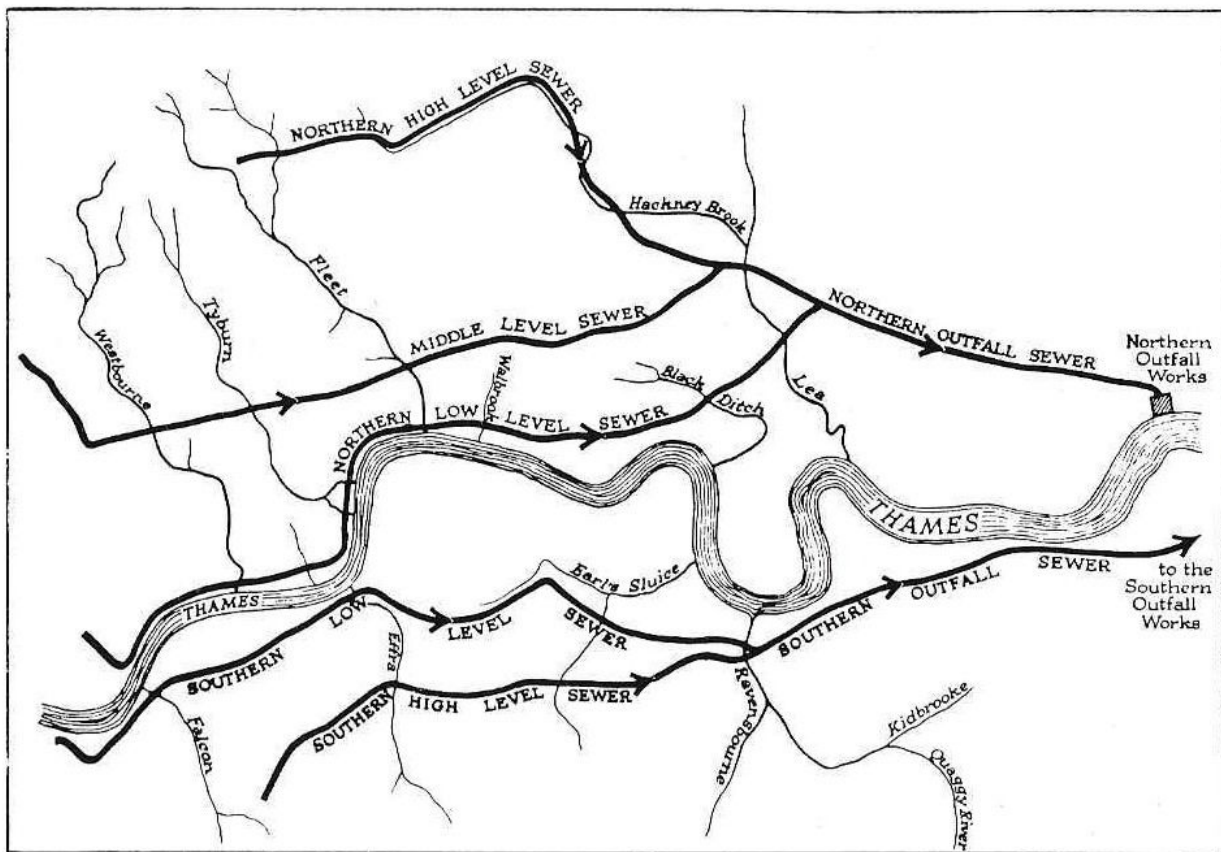


Four volumes of Bazalgette Reports, 1858-1875, (ICE Library)

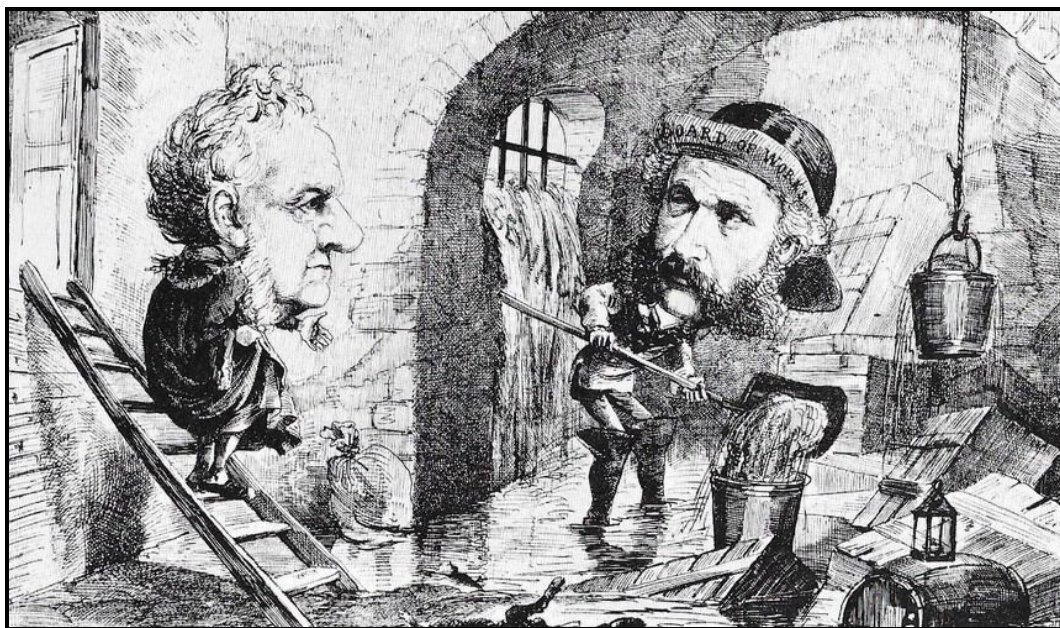
His most important decision was selecting the size, shape and gradients of the principal sewers to cater for growth up to the present day. Having sized the sewers for the then anticipated flow rates, he doubled it. He favoured an egg-shaped sewer, narrow at the bottom, to maintain and provide a suitable velocity and self-scouring action when flow rates were low.



*Sir Joseph Bazalgette*



Bazalgette's plan required building major sewage pumping stations at Deptford (1864) and Crossness (1865) on the Erith marshes, both on the south side of the Thames, and at Abbey Mills (in the River Lea valley, 1868) and on the Chelsea Embankment (1875) north of the river.



*A cartoon of 1870 complained about failure to provide storm outlets from the outset*



*Existing sewers had to be flushed*



*New sewers were constructed using the Cut and Cover method*



*Sewers under construction*

Printed on Thin Paper for  
Foreign Postage.

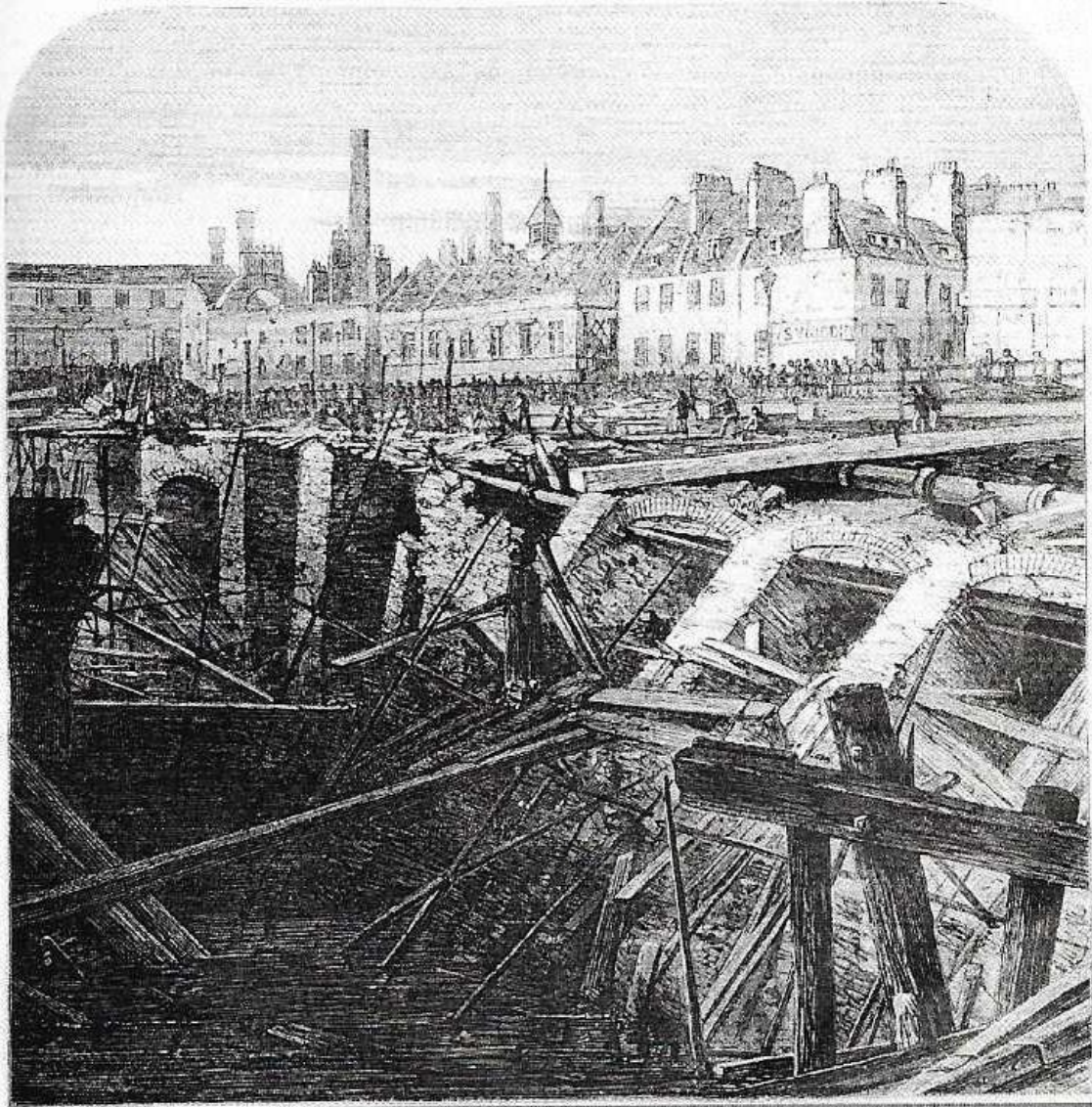
# THE ILLUSTRATED LONDON NEWS.



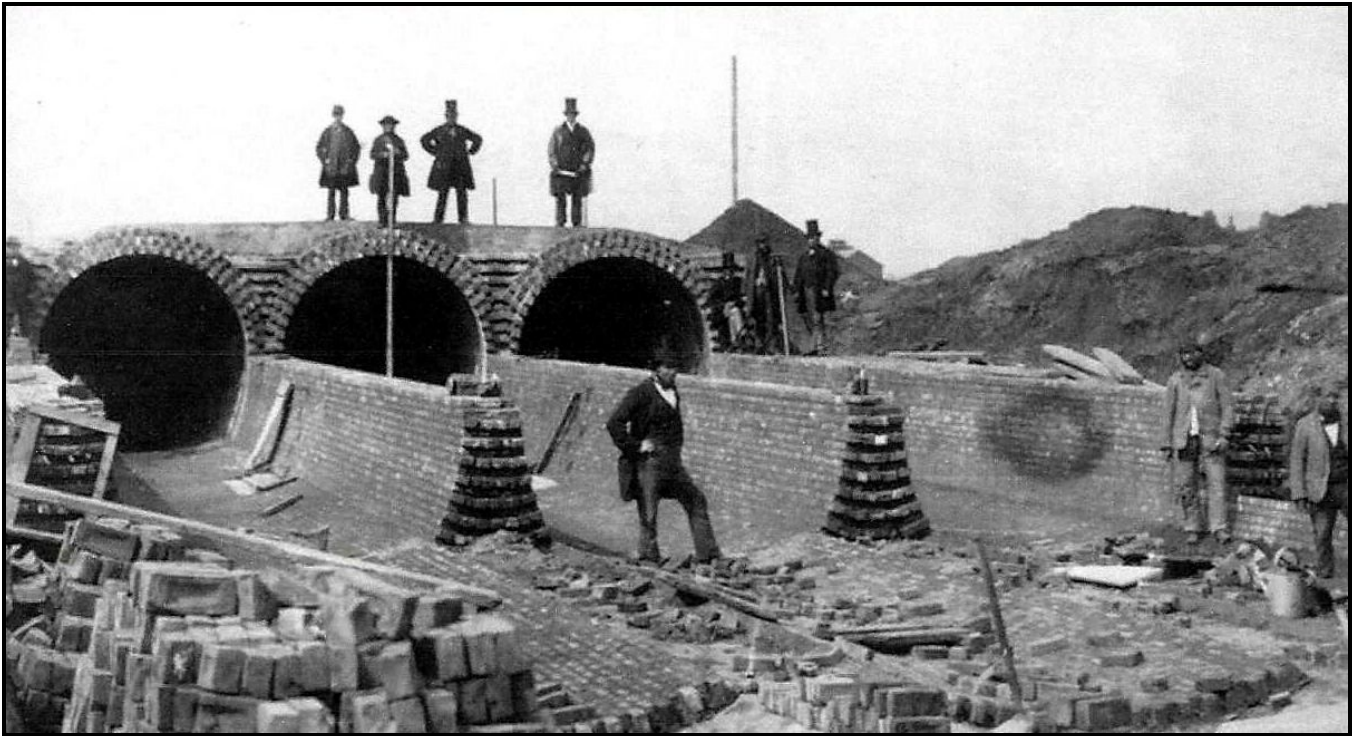
No. 1151. VOL. XL.

SATURDAY, JUNE 28, 1862.

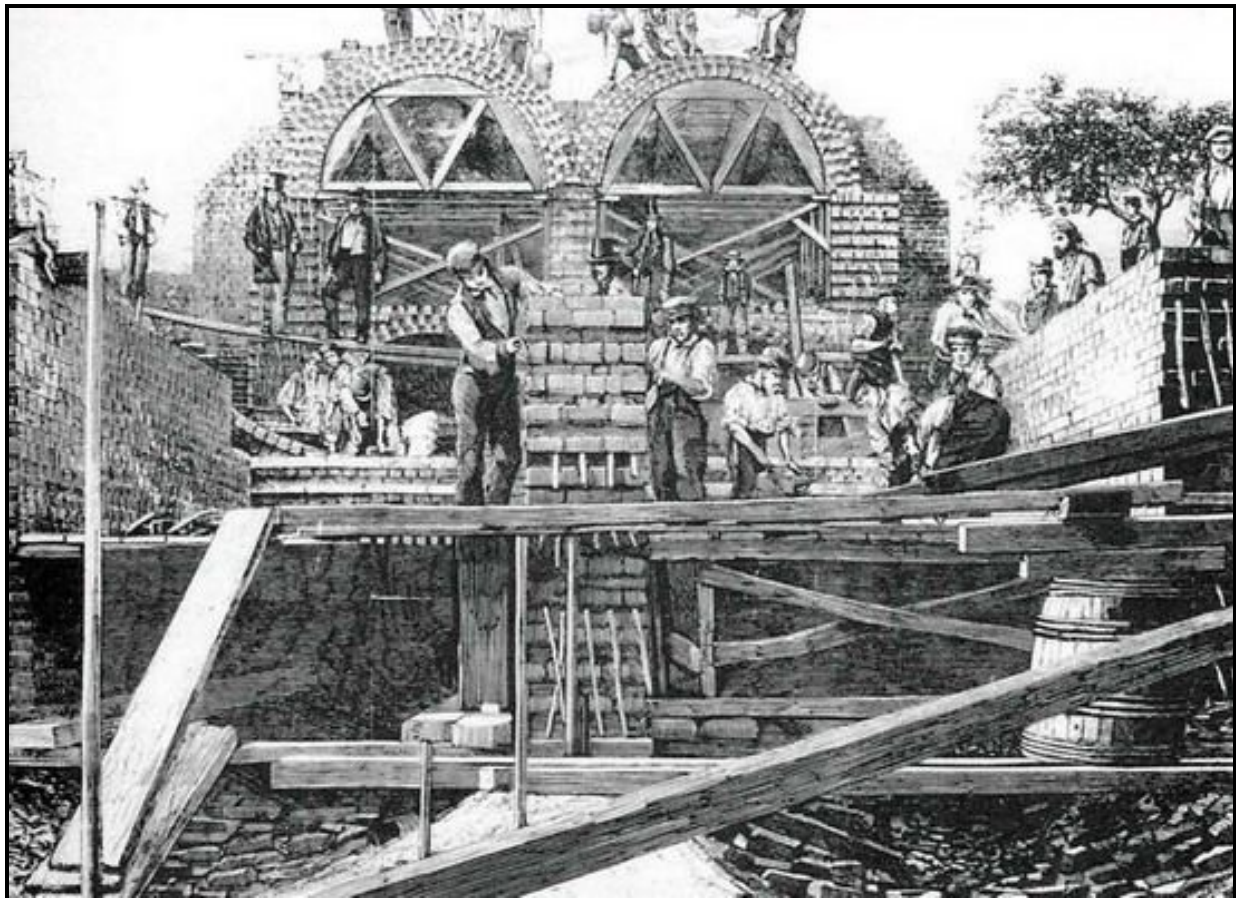
[WITH A SUPPLEMENT, FIVEPENCE]



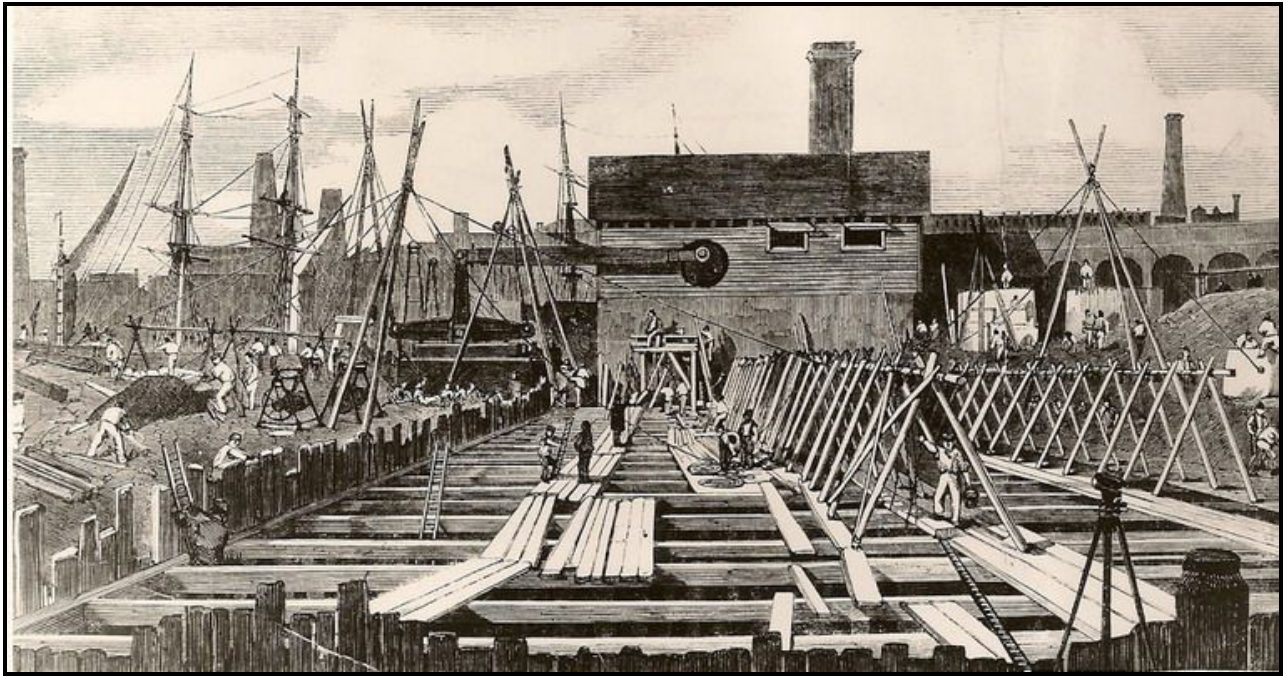
*Constructing sewers could be a dangerous operation as this 1862 sewer collapse illustrates*



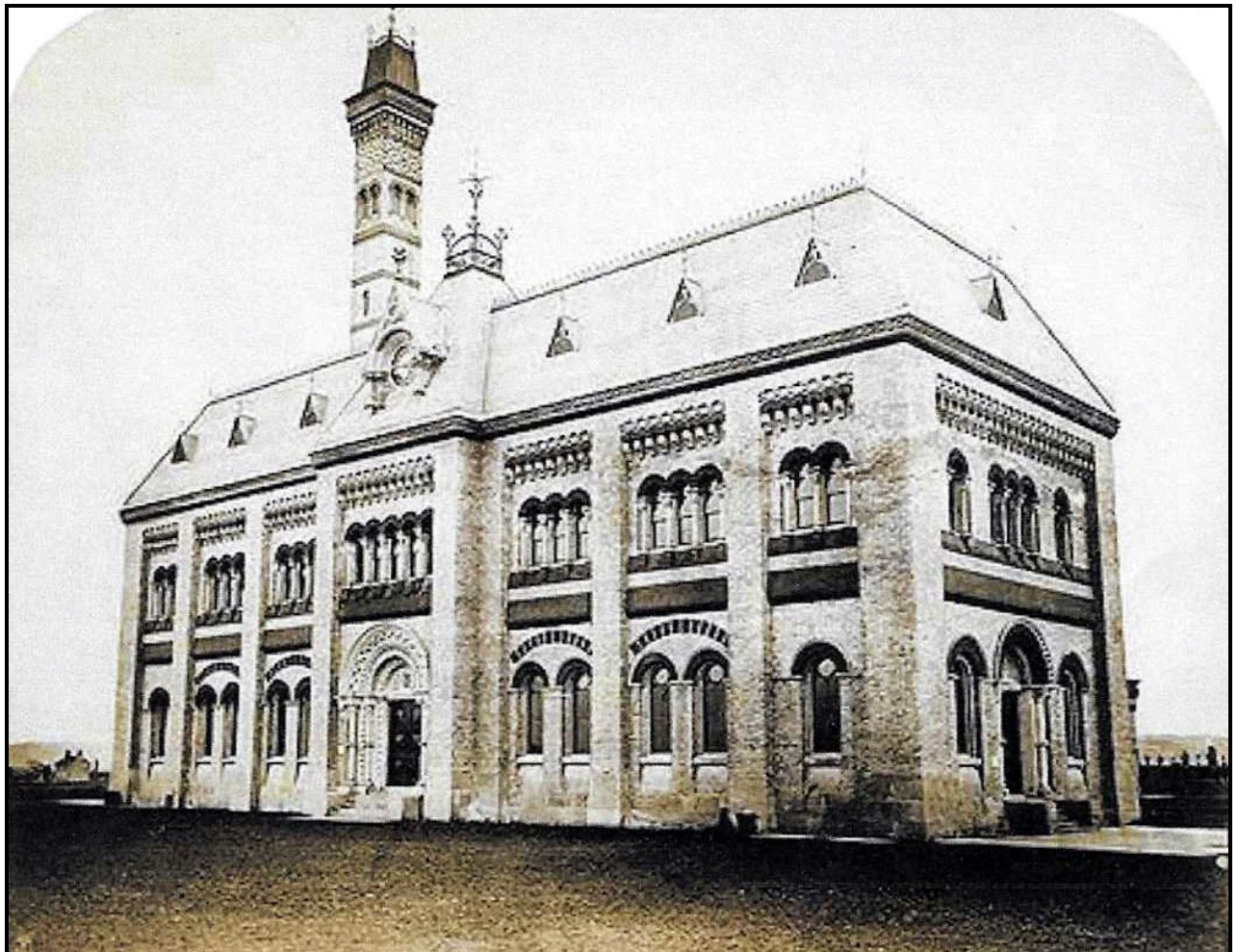
*Construction of the Northern Outfall Sewer near Abbey Mills*



*Tunnels under construction at Wick Lane, near Old Ford, Bow*



*Bazalgette's pumping station at Deptford under construction, 1864*

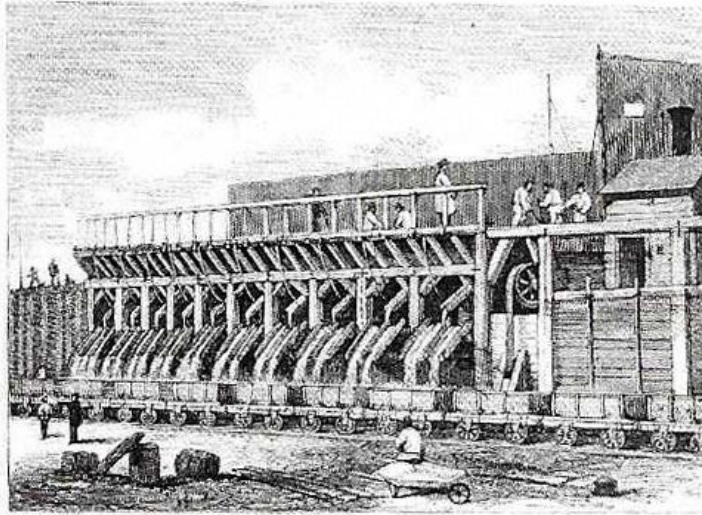


*Crossness Engine House, 1865*



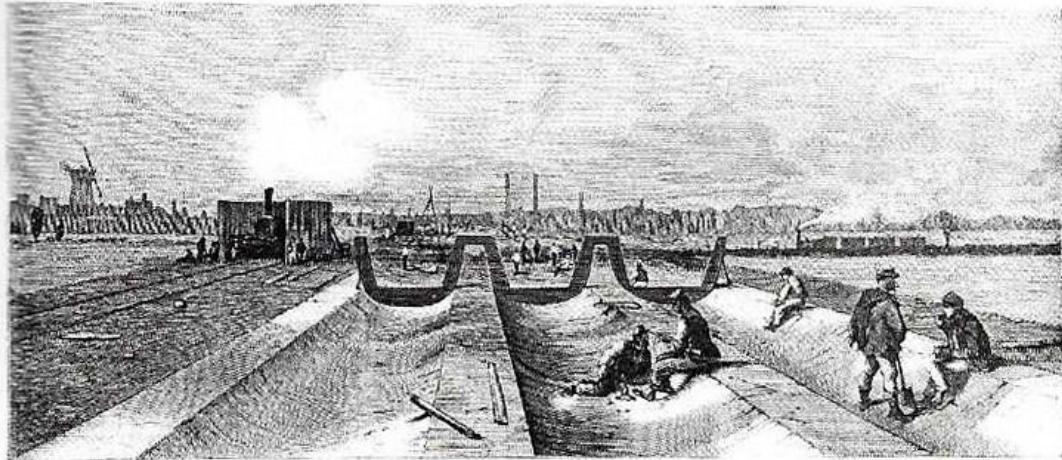
L O N D O N M A I N D R A I N A G E .

There is a great deal of work to be done in the upper reaches of the river, and good part of it will be done between the London and London Bridges, where a building consisting of a series of basins, raised three or four feet above the level of the river, will be constructed. The walls of these basins will be three feet thick, and will be covered with a coating of Portland Cement. The basins will be divided into three parts, each of which will be used for a different purpose. The first will be used for the purpose of receiving the sewage from the houses in the neighbourhood; the second will be used for the purpose of receiving the sewage from the houses in the neighbourhood; and the third will be used for the purpose of receiving the sewage from the houses in the neighbourhood.

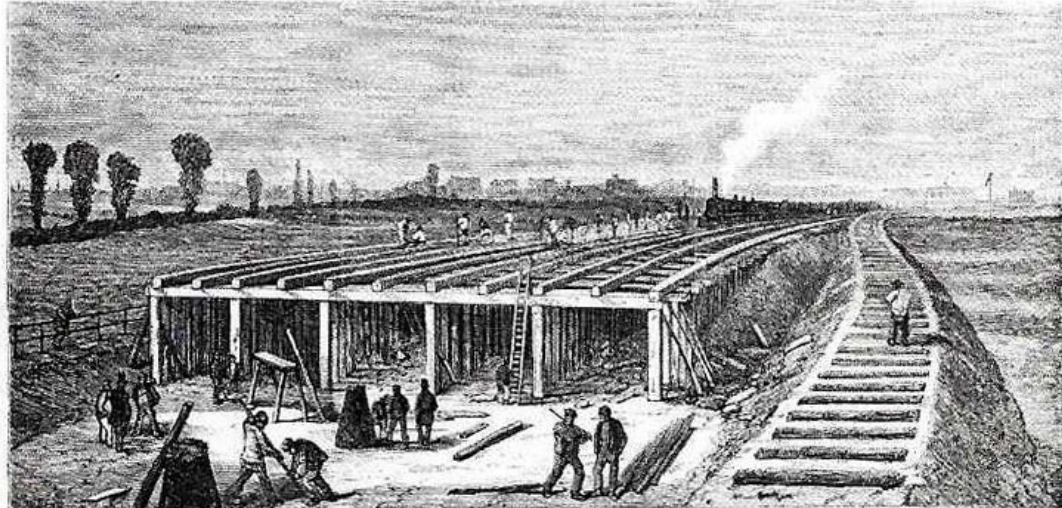


THE CONCRETE MILLS AT DEATHING.

Each of the engines will be supplied with steam, and will be used for the purpose of driving the pumps. The pumps will be used for the purpose of raising the sewage to the level of the river, and will be used for the purpose of raising the sewage to the level of the river. The pumps will be used for the purpose of raising the sewage to the level of the river, and will be used for the purpose of raising the sewage to the level of the river.

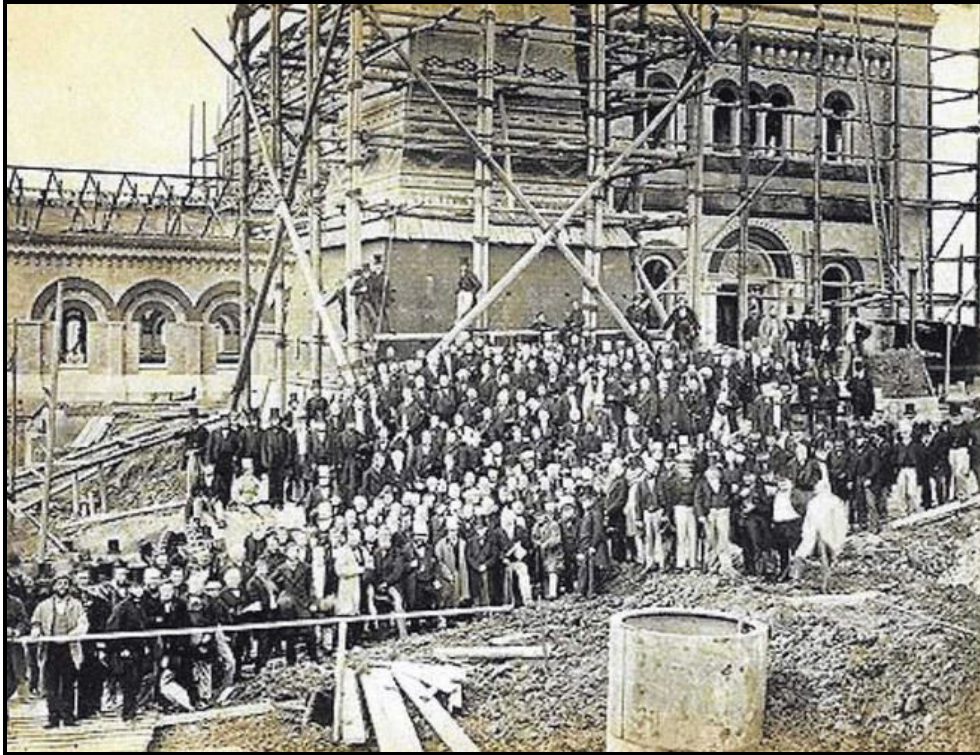


CONCRETE FOUNDATION FOR THE NORTHERN OUTFALL TUNNELS.

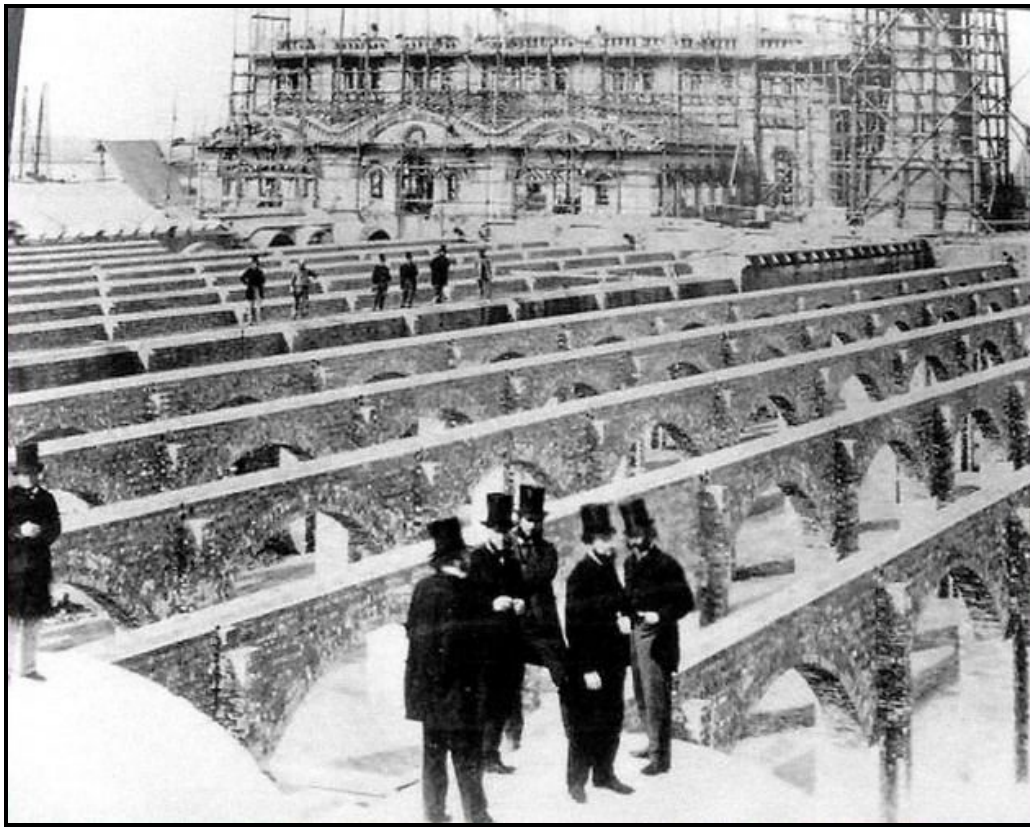


CONSTRUCTING THE CONCRETE BREAKWATER AND THE PLANT FOR RAISING THE SEWAGE.

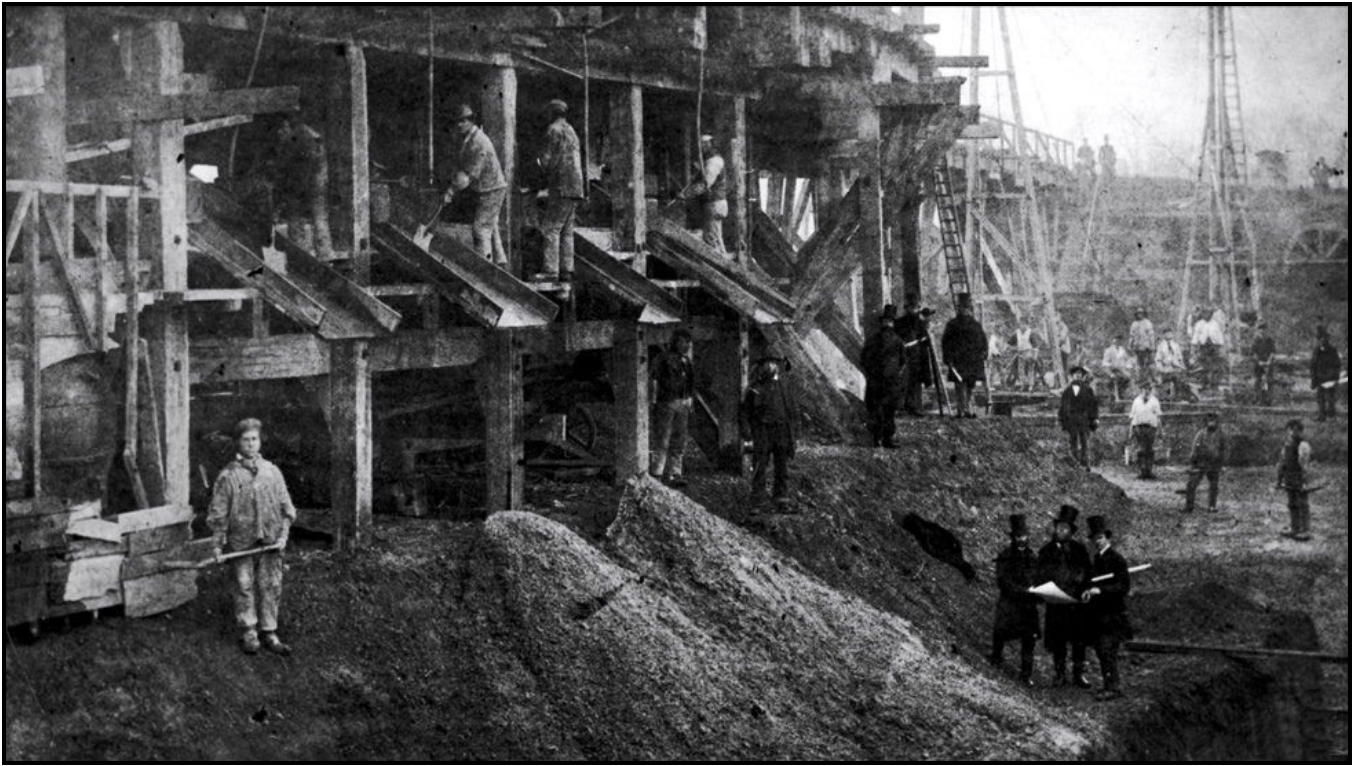
Building London Main Drainage, (Illustrated London News, 30 November, 1861)



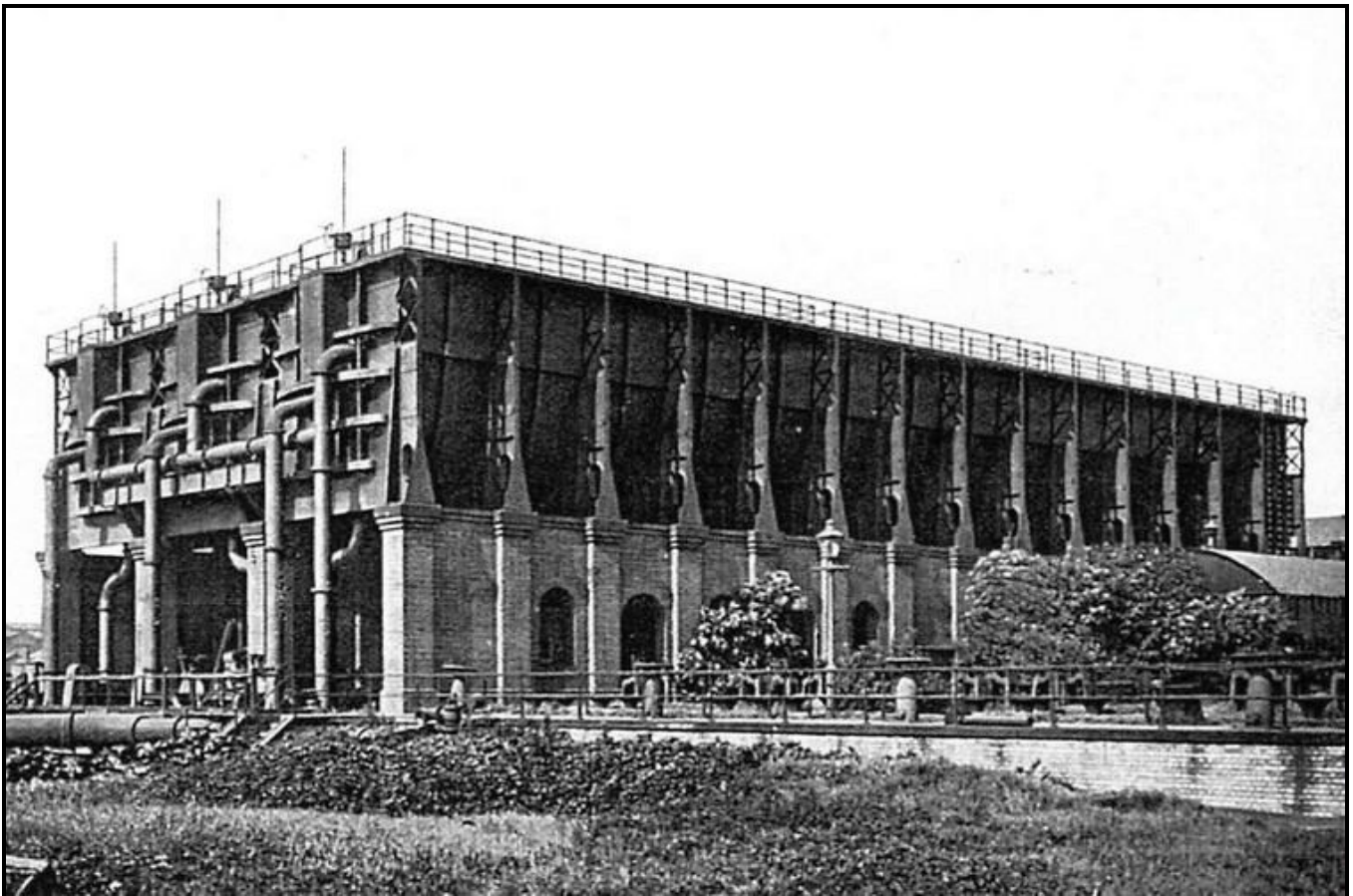
*Construction workers at Crossness, 1864*



*Inspecting the Crossness Works which included a 27 million gallon reservoir into which raw sewage was pumped and stored before release into the Thames estuary at high tide, 1865 (Thames Water plc)*



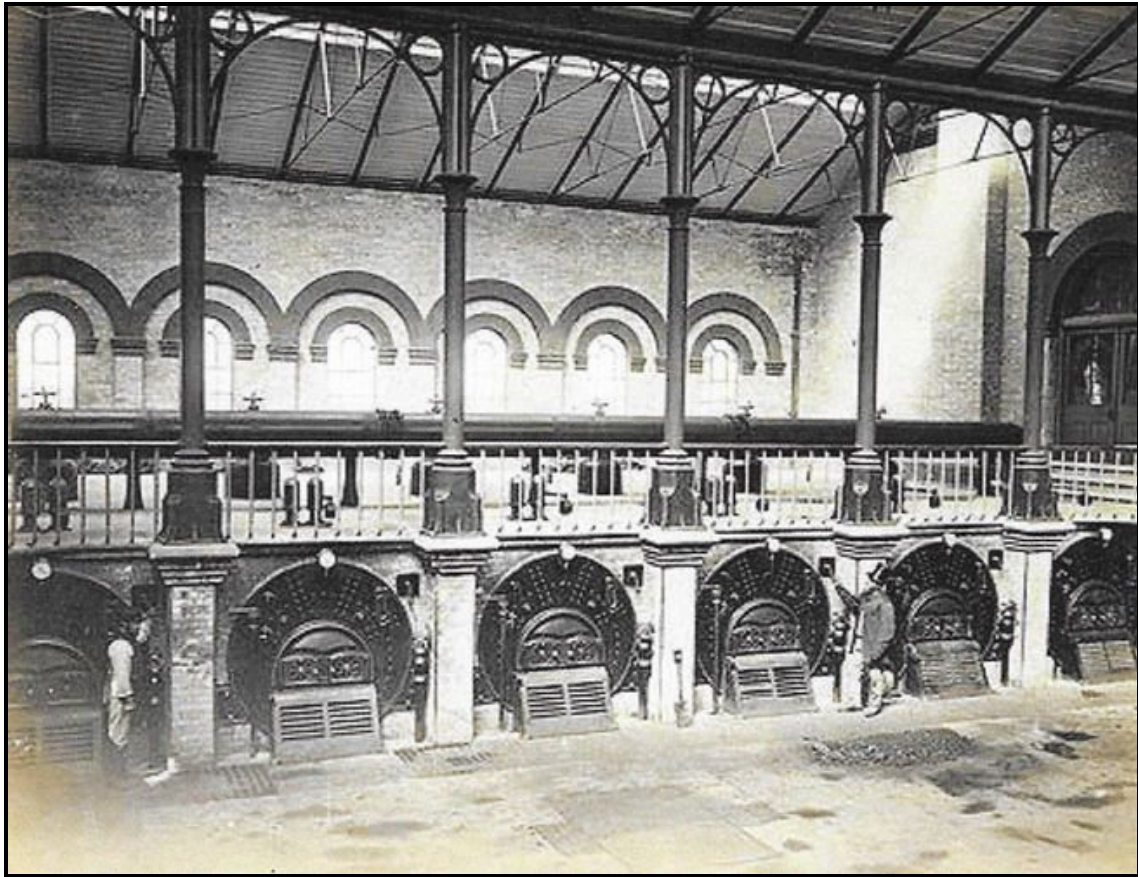
*The concrete works at Beckton in 1865 (Thames Water plc)*



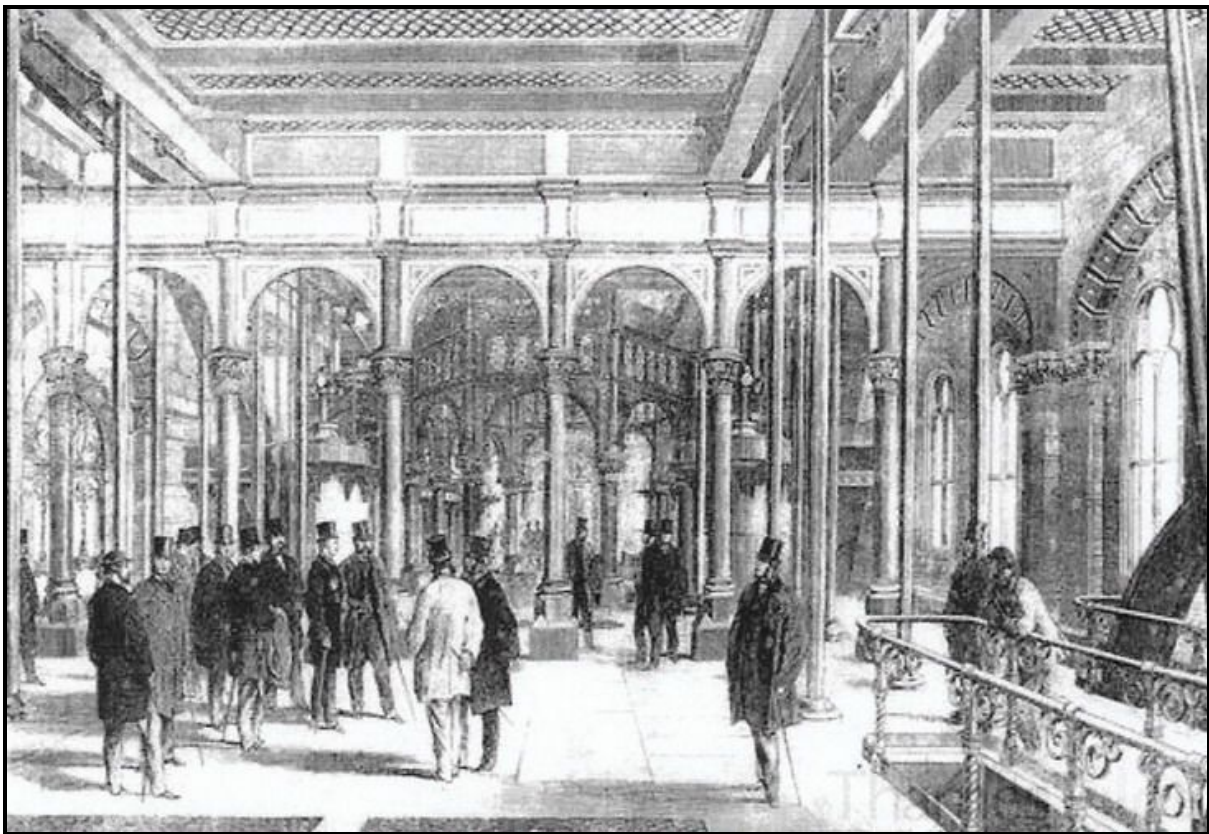
*The overhead sludge tanks, Northern Outfall Works at Beckton, 1894-95*



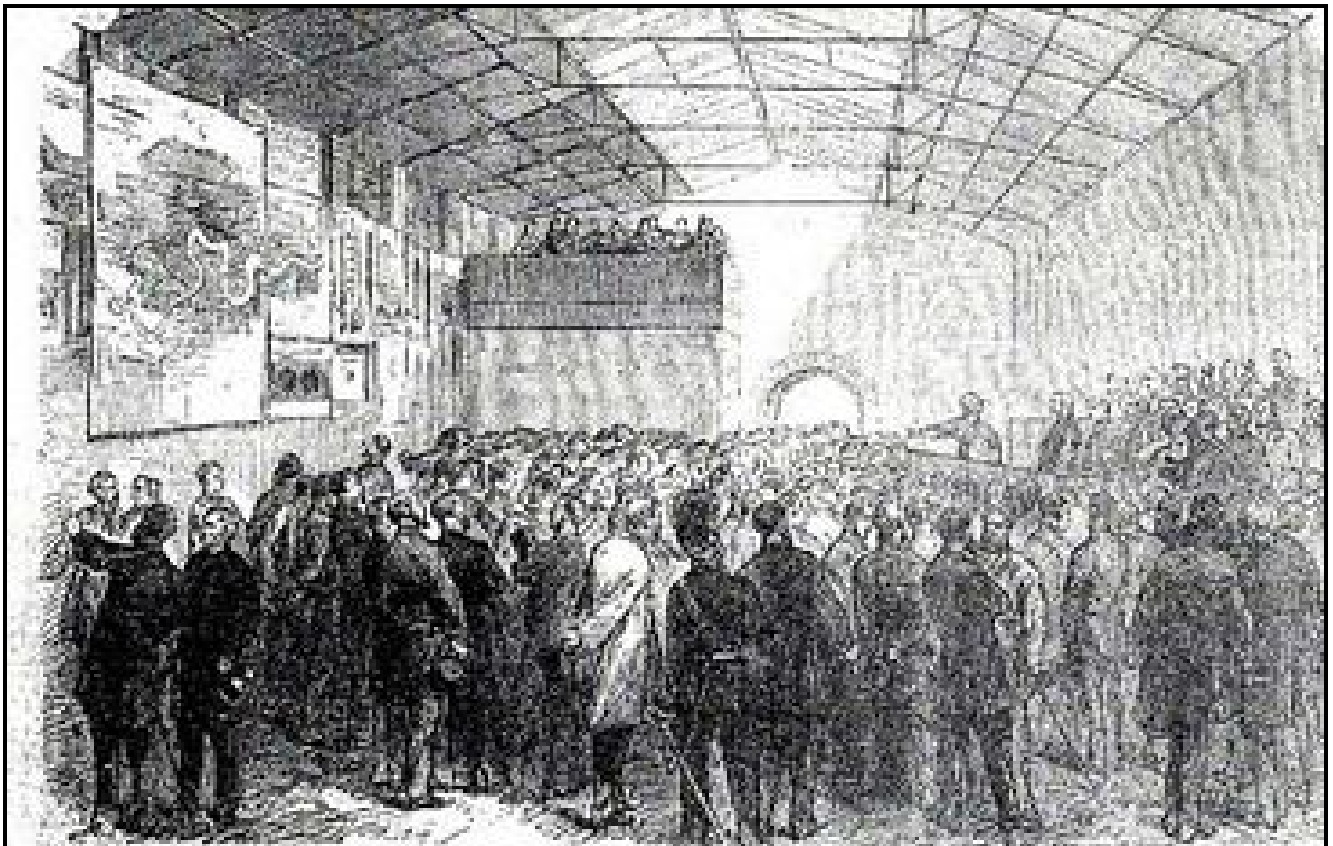
*Victorian visitors to Crossness*



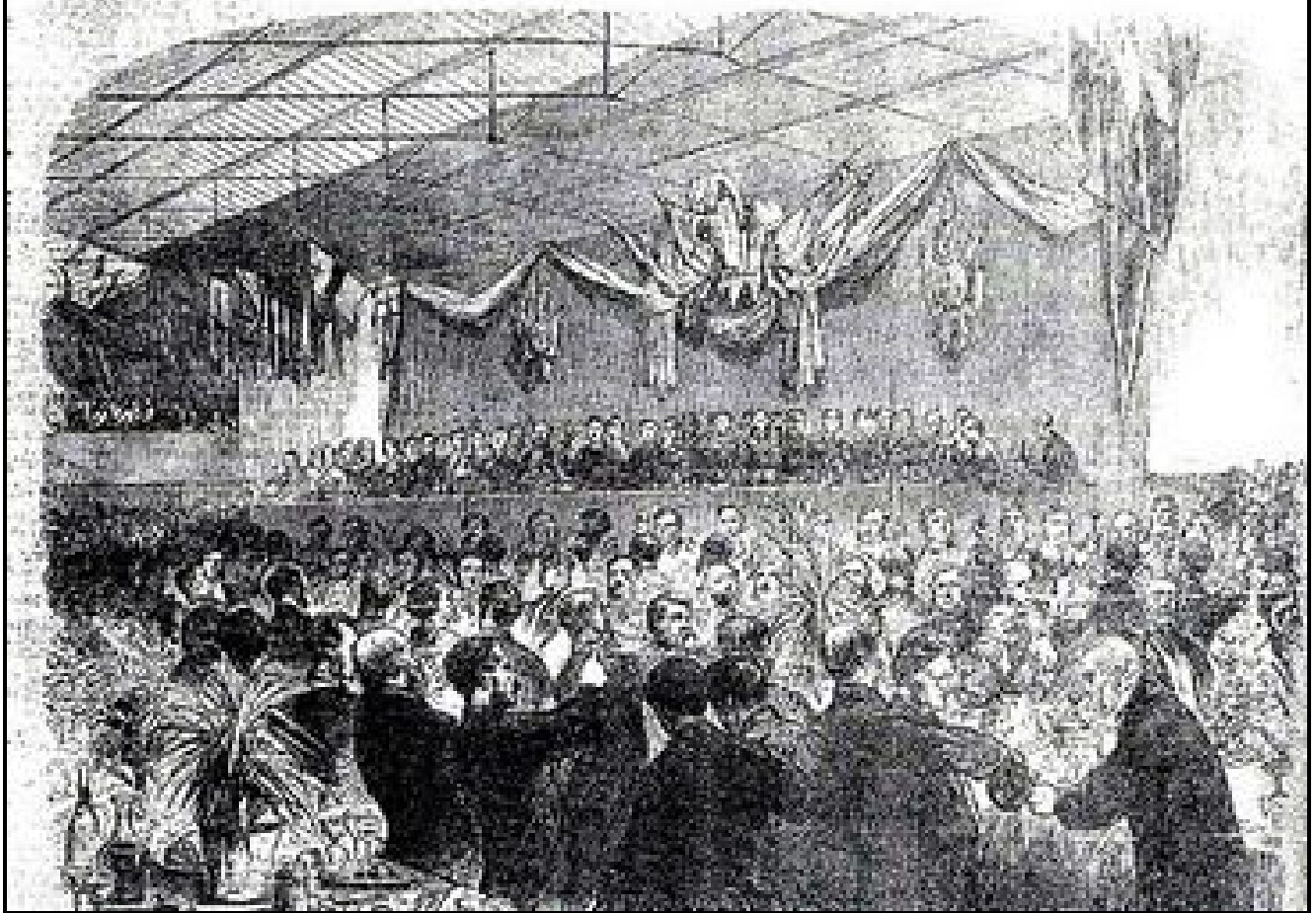
*The boiler plant at Crossness in the 1860's, complete with attendant in top hat*



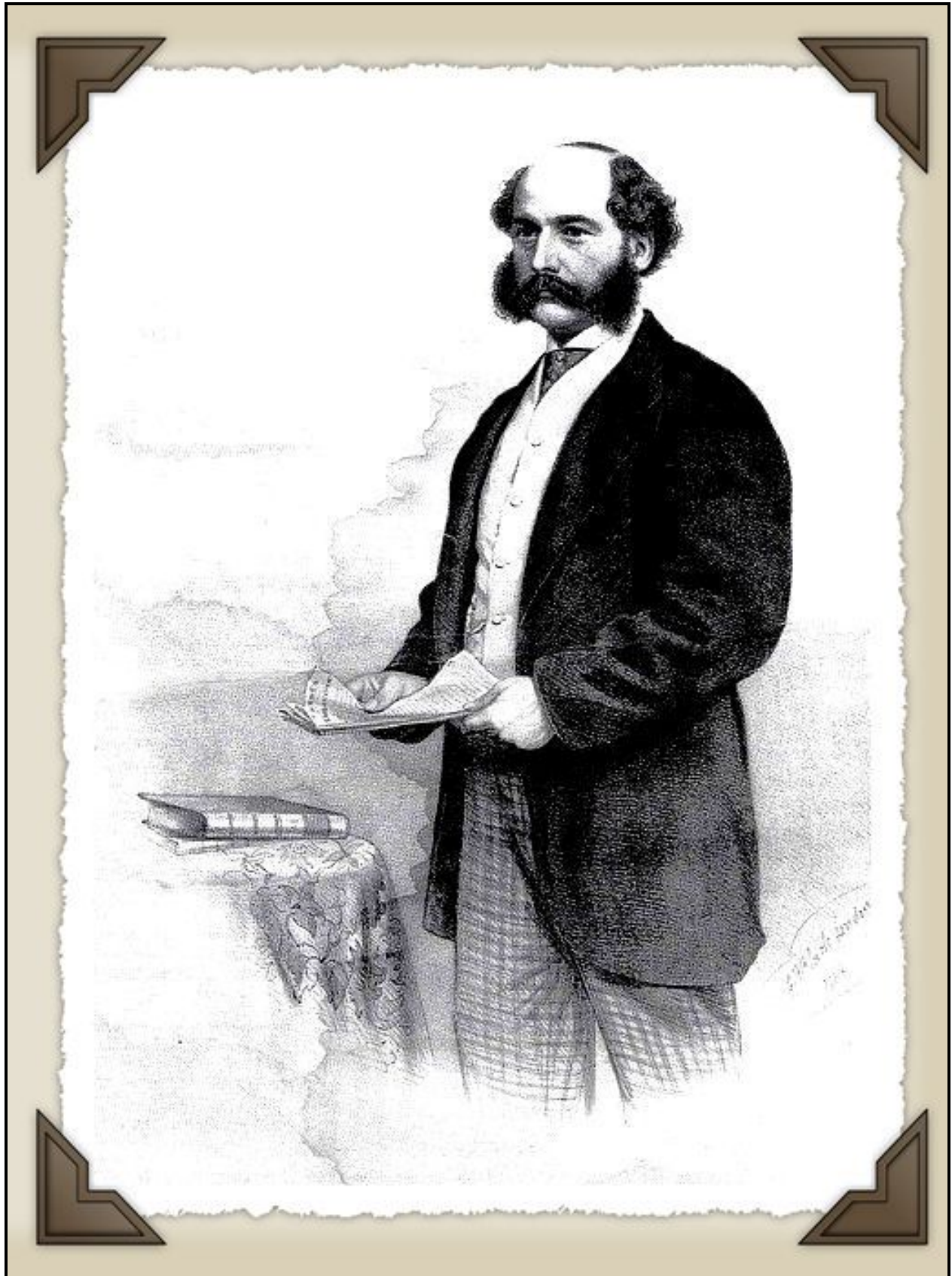
*The opening of Crossness by the Prince of Wales, April 1865 (Illustrated London News)*



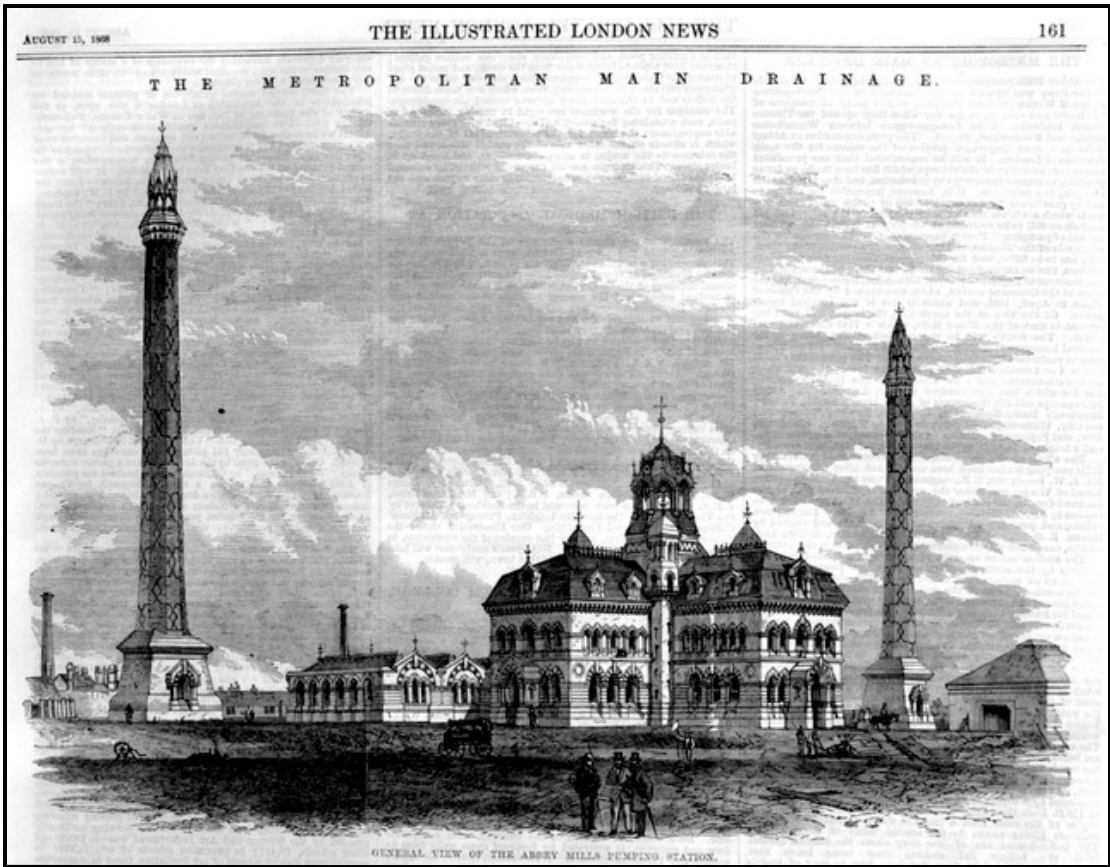
MR. BARRINGTON'S DEPOSITARY AND PHOTO-ALBUMS.



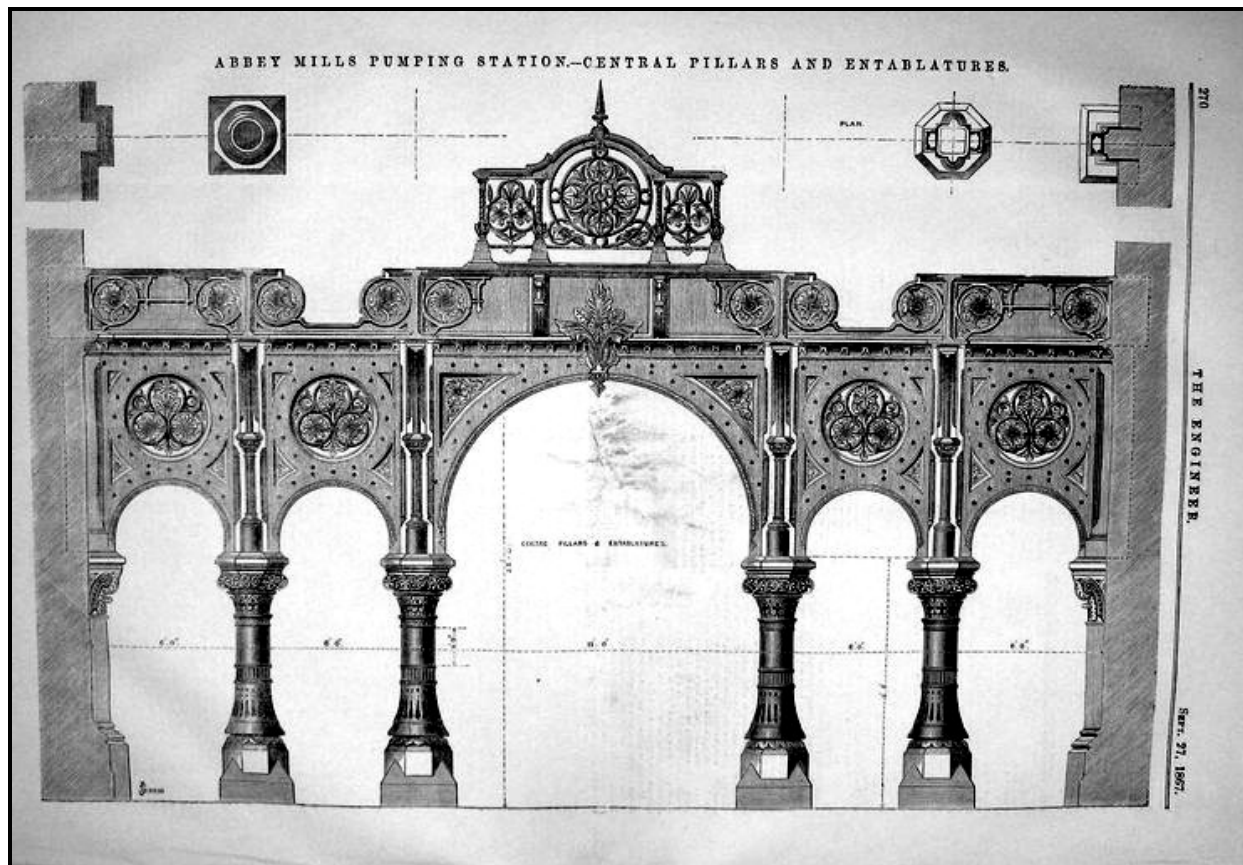
*The Prince of Wales opens Crossness, April 1865 (Illustrated London News)*



*Bazalgette as Chief Engineer to the Metropolitan Board of Works, about 1865  
(Thames Water plc)*

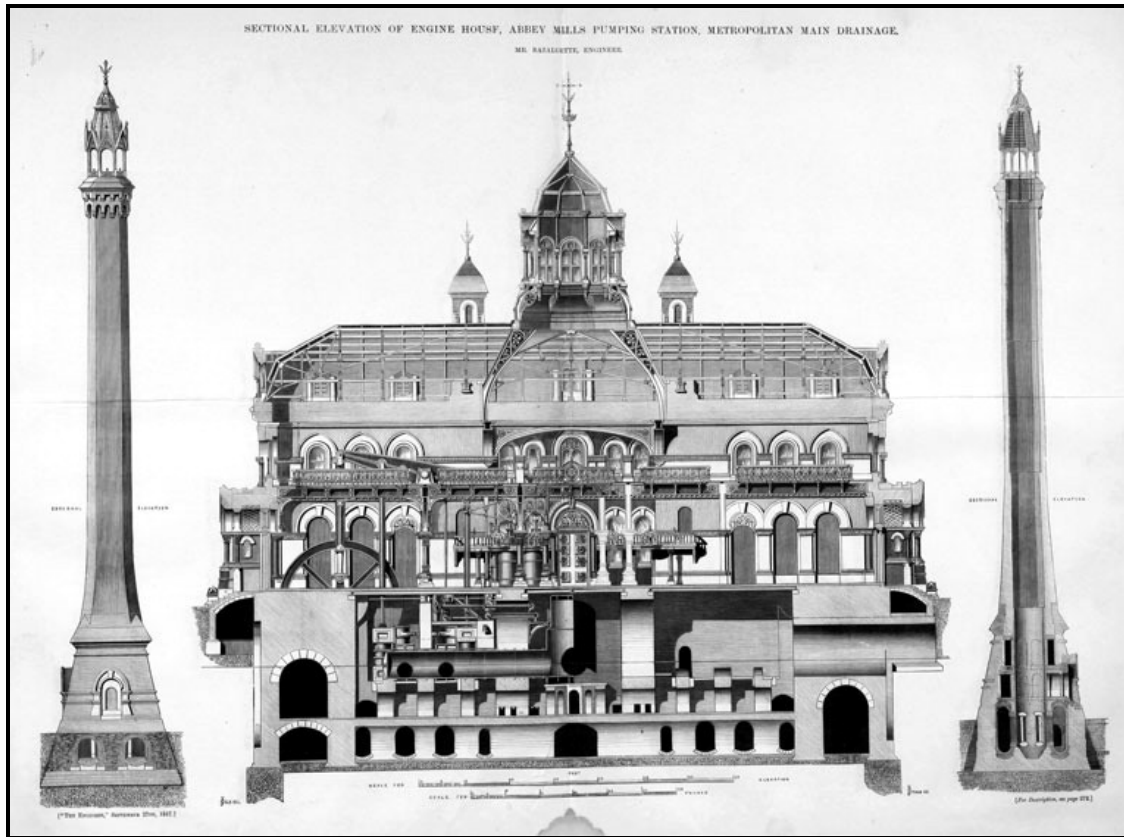


Abbey Mills pumping station, built in the "Victorian Gothic" style, 1868 (*Illustrated London News*)

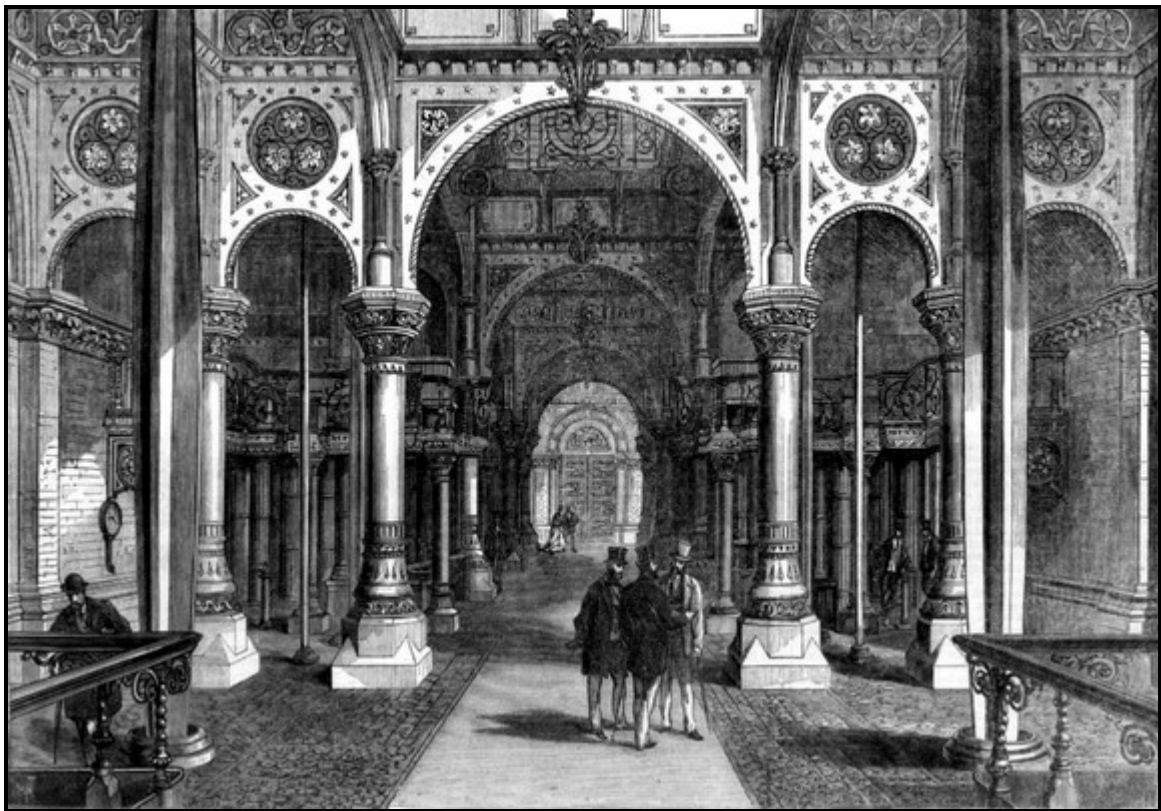


Design for the ornamental ironwork at Abbey Mills pumping station

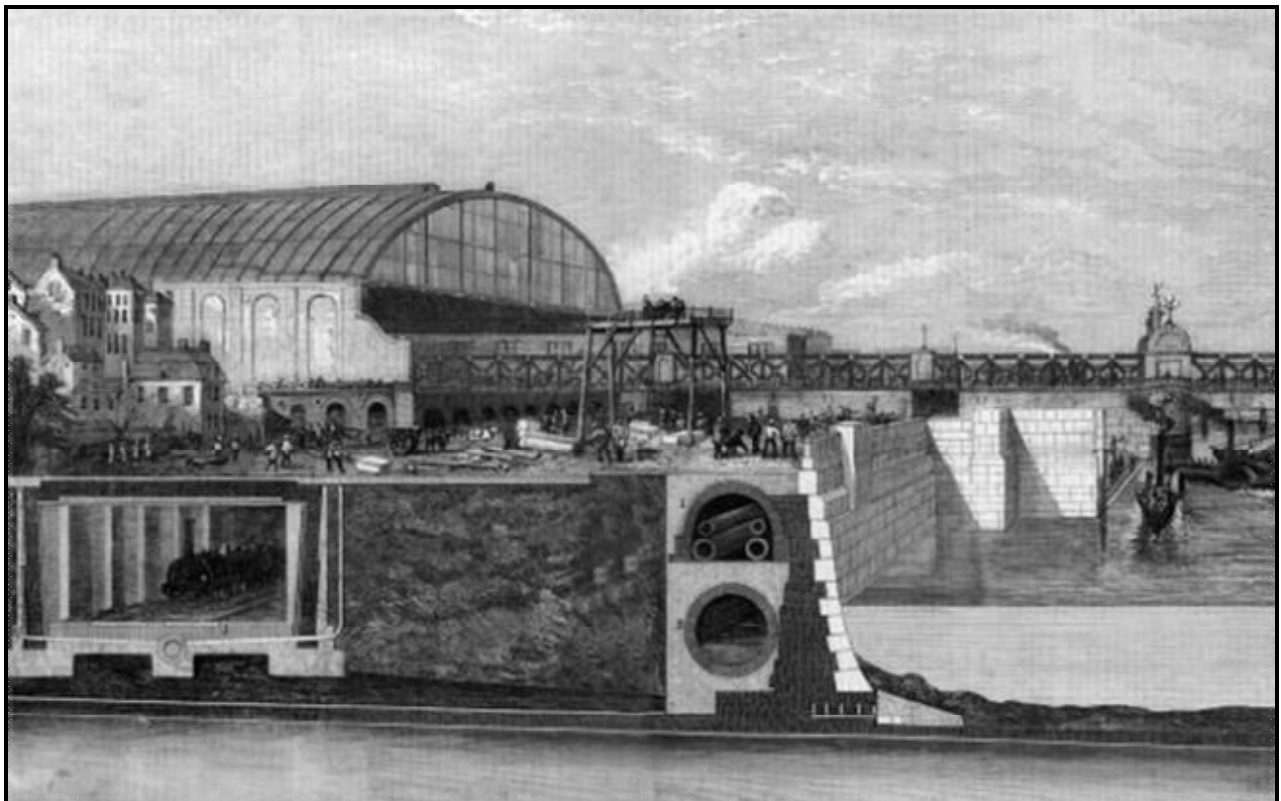
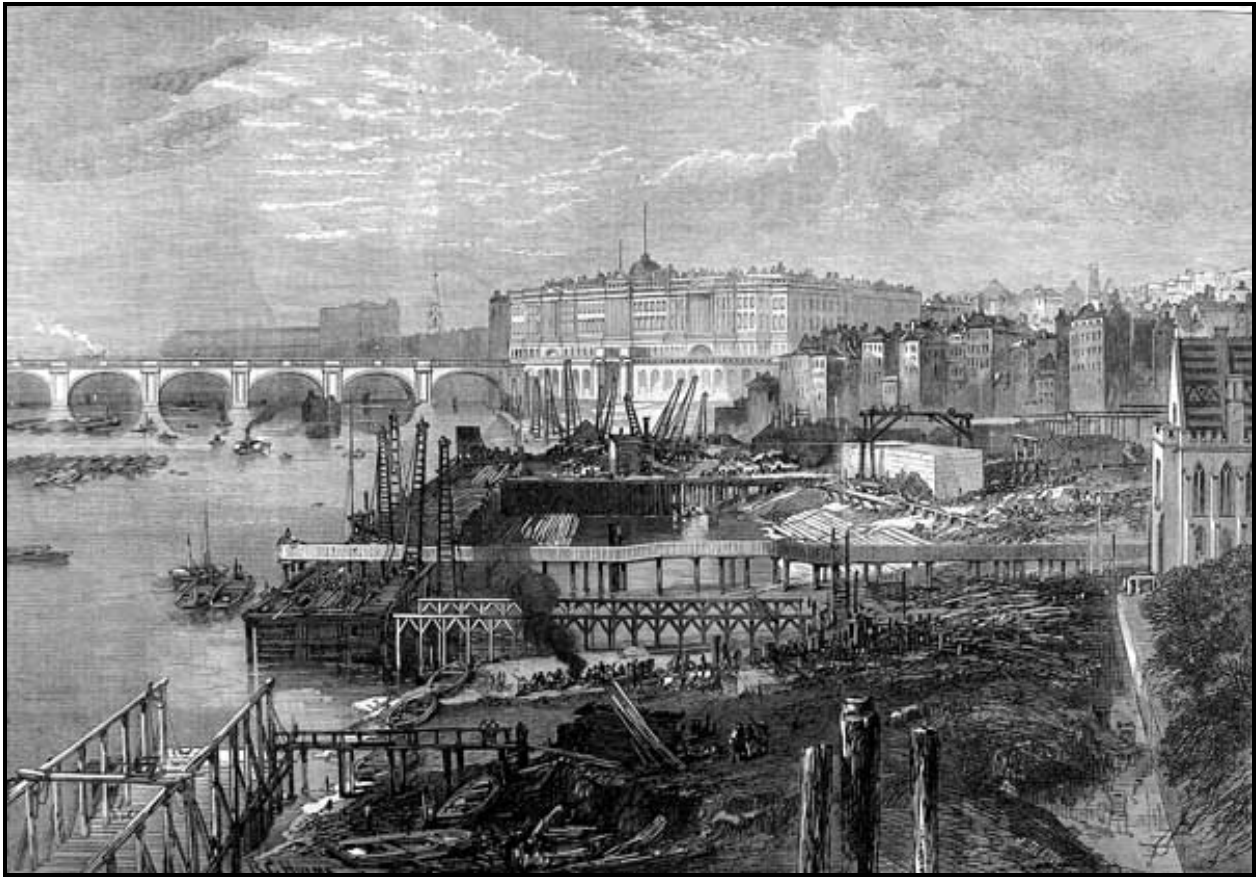




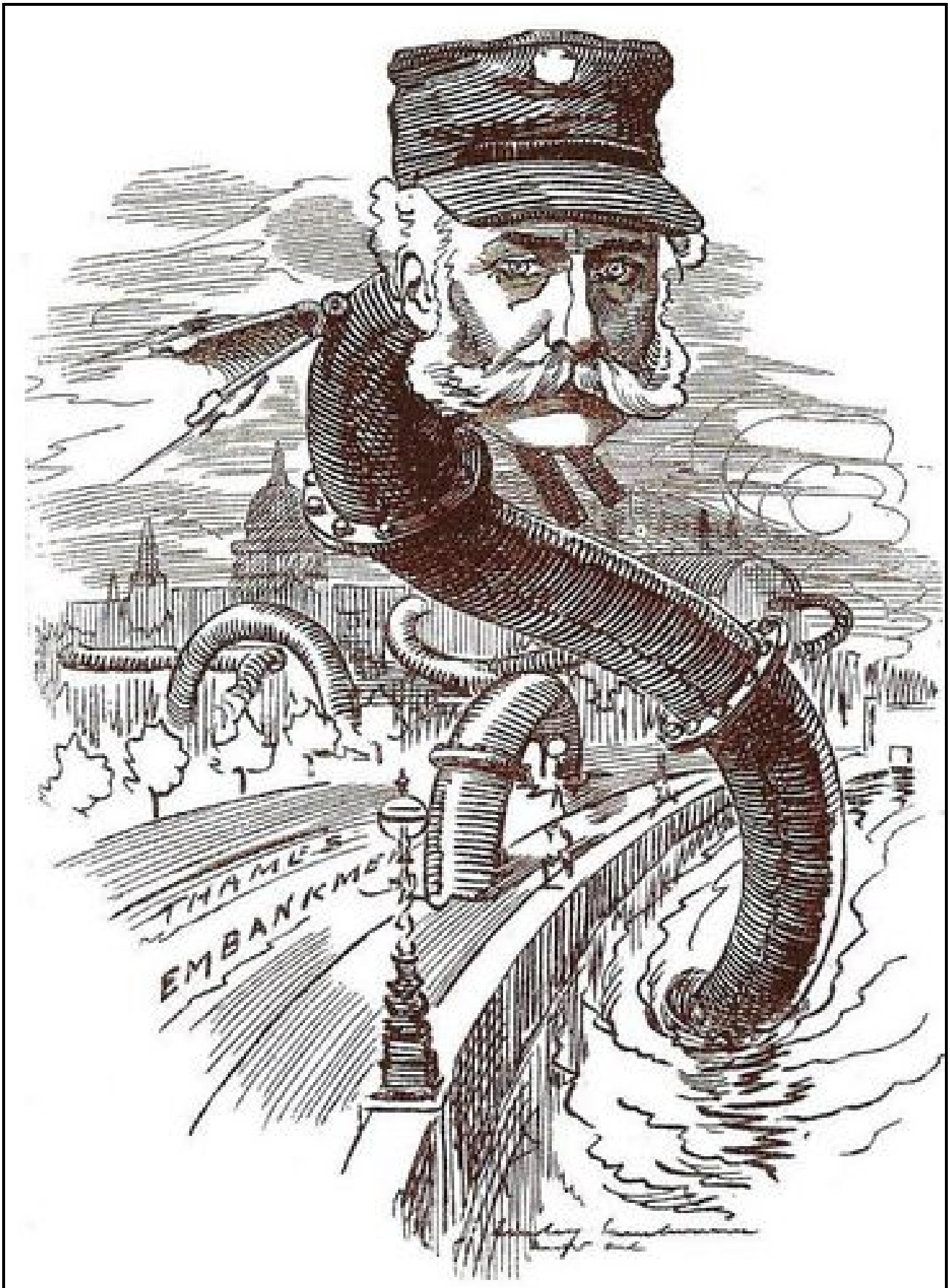
*Abbey Mills Engine House*



*Visiting Abbey Mills in 1868 (Illustrated London News)*



*Over the period 1865-1876, Bazalgette also arranged the construction of London's Victoria Embankment which incorporated his sewers (Illustrated London News)*

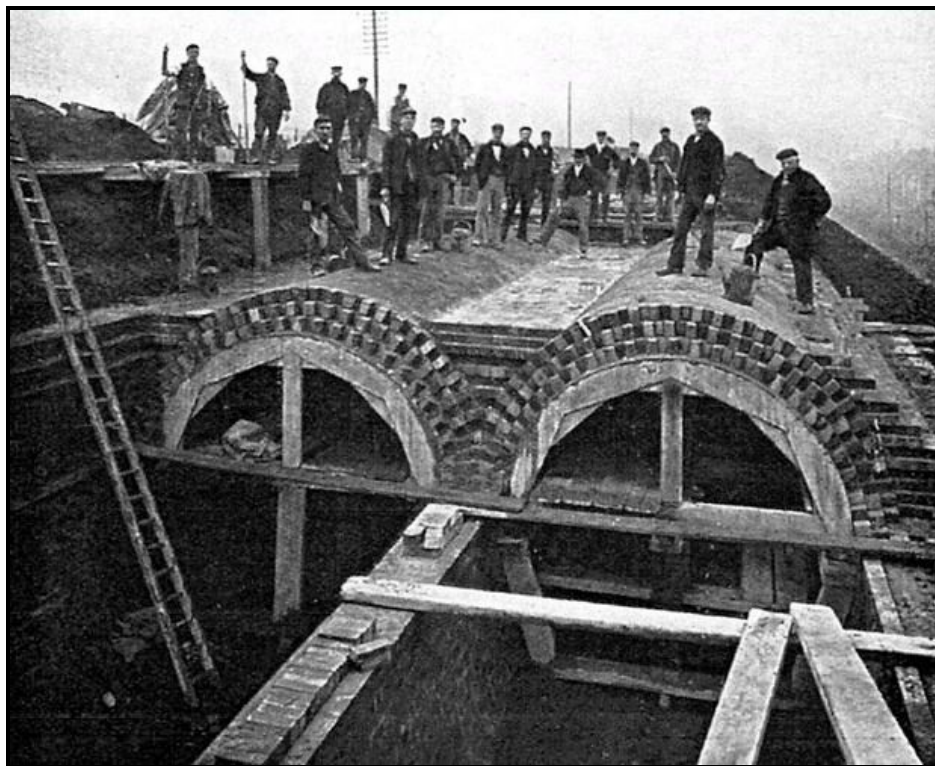


*Bazalgette depicted as a nautical figure at the end of a drainpipe out of the Thames Embankment, 1883 (Punch)*

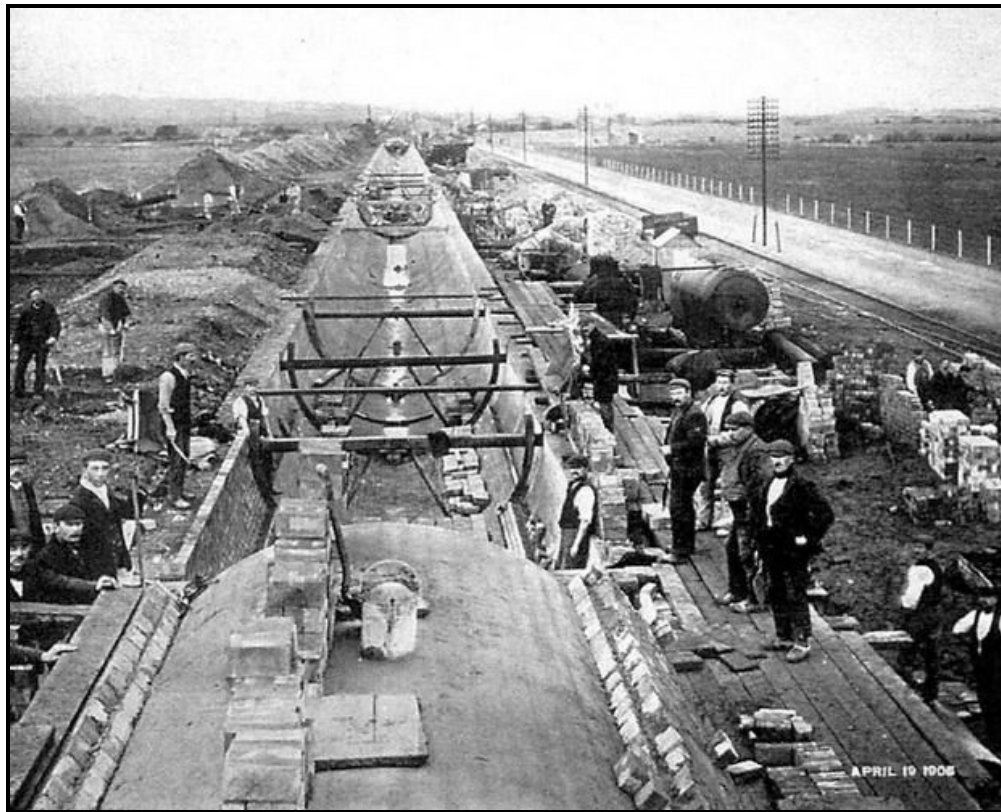


*Sir Joseph & Lady Bazalgette with their children & grandchildren (David Bazalgette)*

Bazalgette's sewer system continued to be extended after his death in 1891 and on into the early 20<sup>th</sup> century.



*Northern Outfall Sewer in course of construction, 1906-07*



*Southern high-level sewer, Crossness to Cufford, under construction, 1904-06*



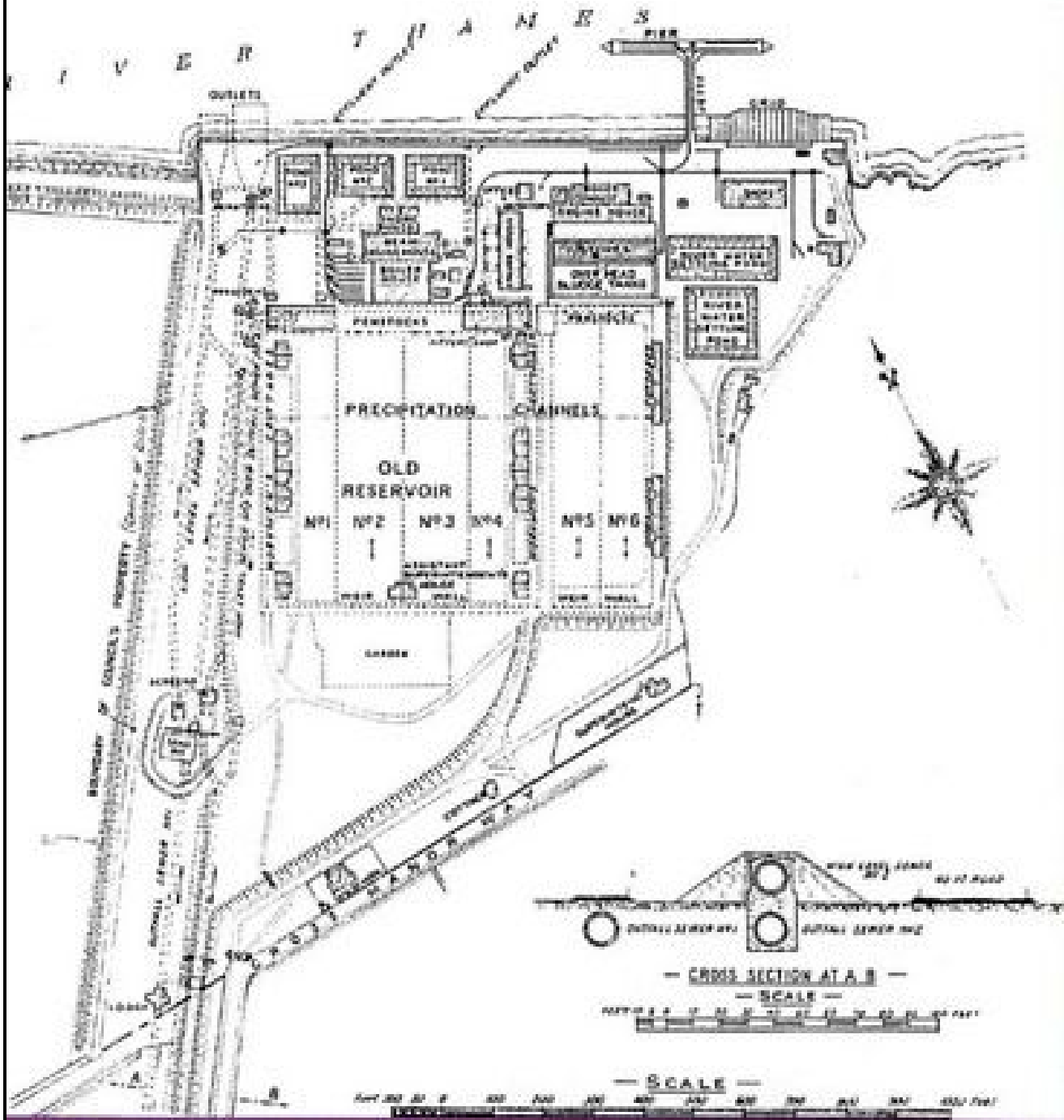
*Aerial view of Crossness sewage treatment works (Thames Water plc)*

LONDON COUNTY COUNCIL.

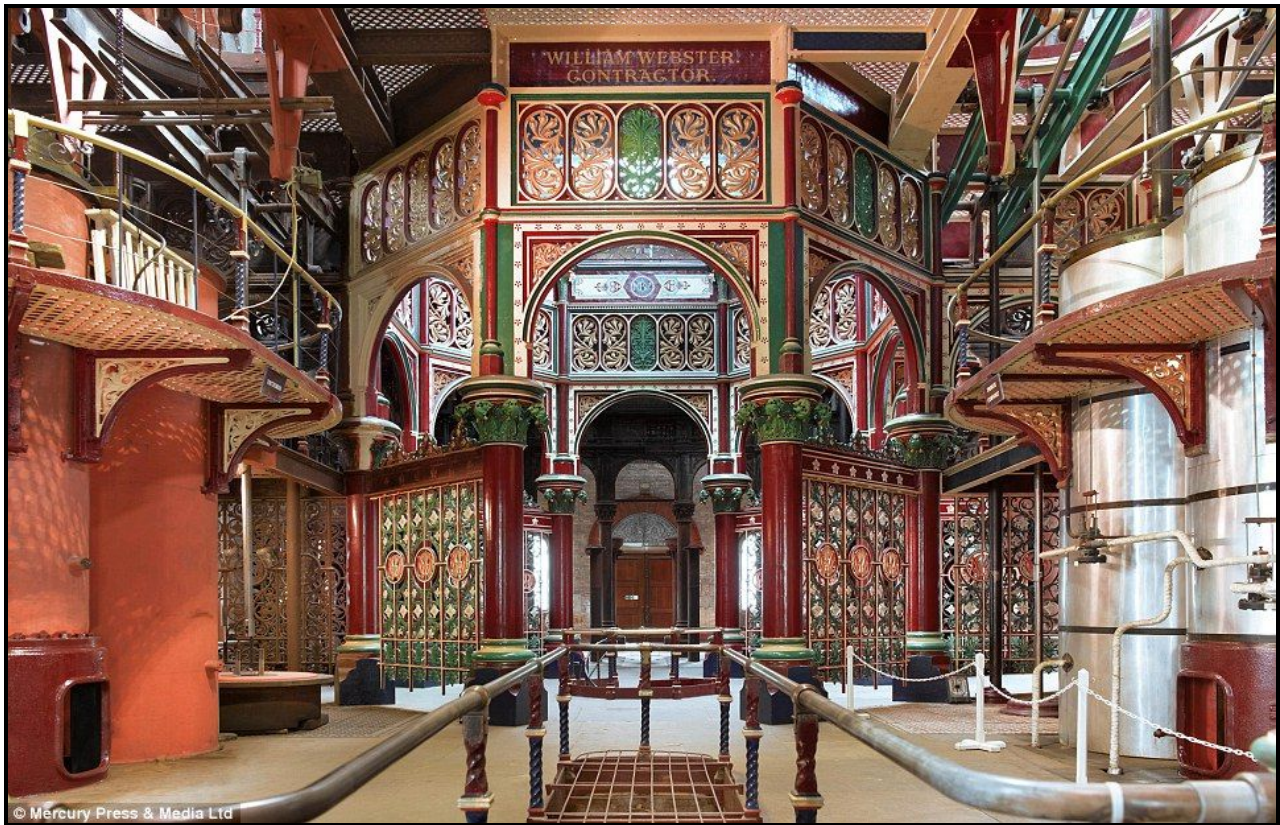
PLAN 115.

MAIN DRAINAGE.

SOUTHERN OUTFALL WORKS, CROSSNESS



Drawing from "Main Drainage of London," 1930 (London County Council)



*The Crossness pumping station remains an incredible tribute to Victorian engineering*



*The sewage was pumped by four steam-driven rotative beam engines:  
Prince Consort, Victoria, Albert Edward & Alexandra*



*The Prince Consort pumping engine at Crossness*

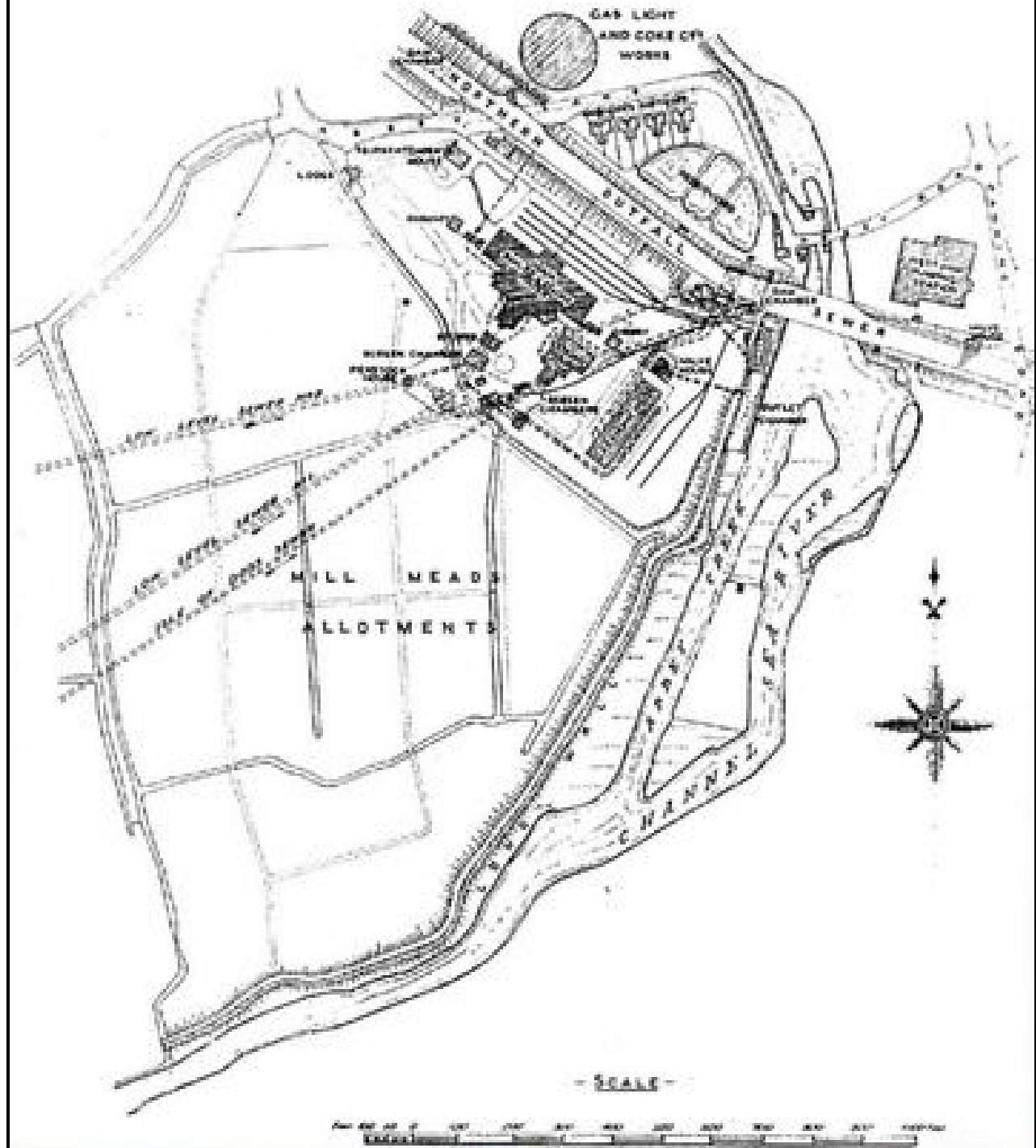




*Each beam engine had 52 ton flywheels and 47 ton beams*

MAIN DRAINAGE.

ABBNEY MILLS PUMPING STATION



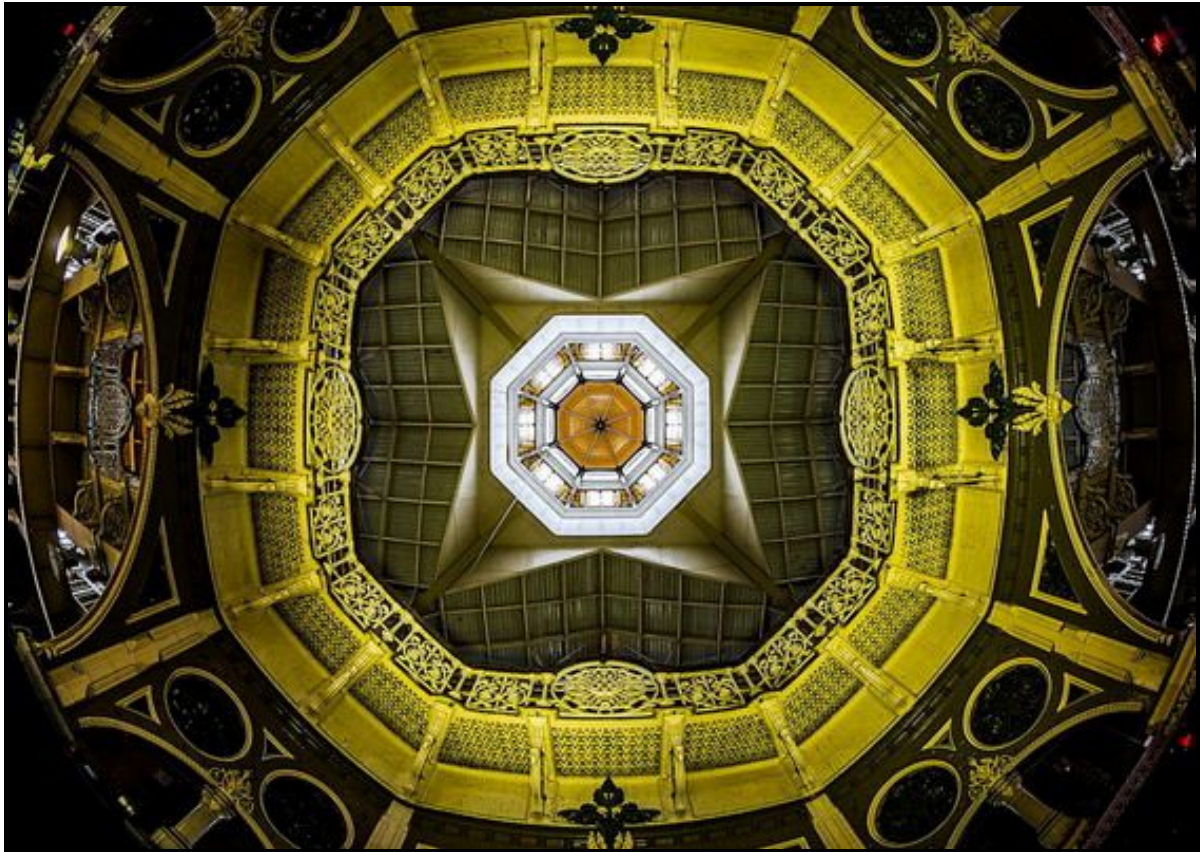
*Drawing from "Main Drainage of London," 1930 (London County Council)*



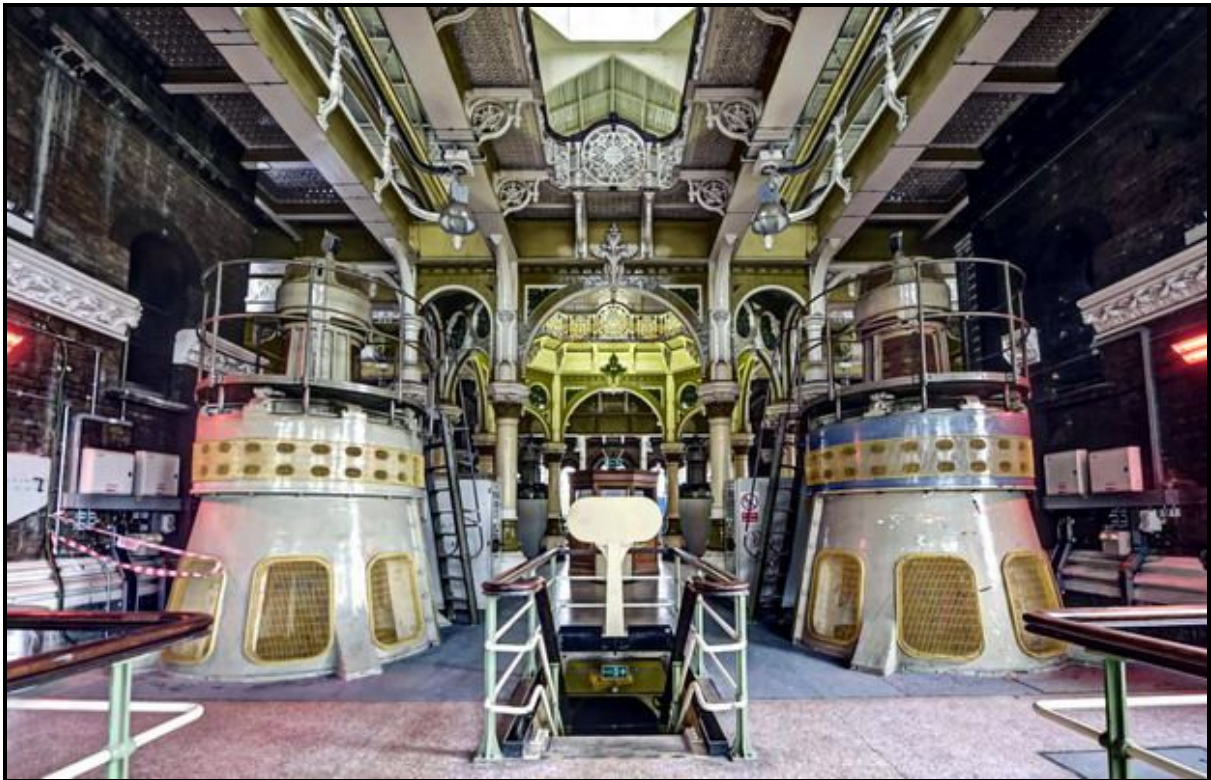
*Abbey Mills pumping station (leepellingphotography)*



*Interior of Abbey Mills*



*The decorative roof interior of Abbey Mills (leepellingphotography)*



*Abbey Mills, as later equipped with electrically-driven pumps*



*Modern photographs inside of London's main sewers*

# APPENDIX I: BAZALGETTE'S CIVIL ENGINEERING WORKS

In addition to London's Intercepting Sewer System, Bazalgette's other works include:

1869 Albert Embankment

1870 Victoria Embankment

1874 Chelsea Embankment

1879 Maidstone Bridge

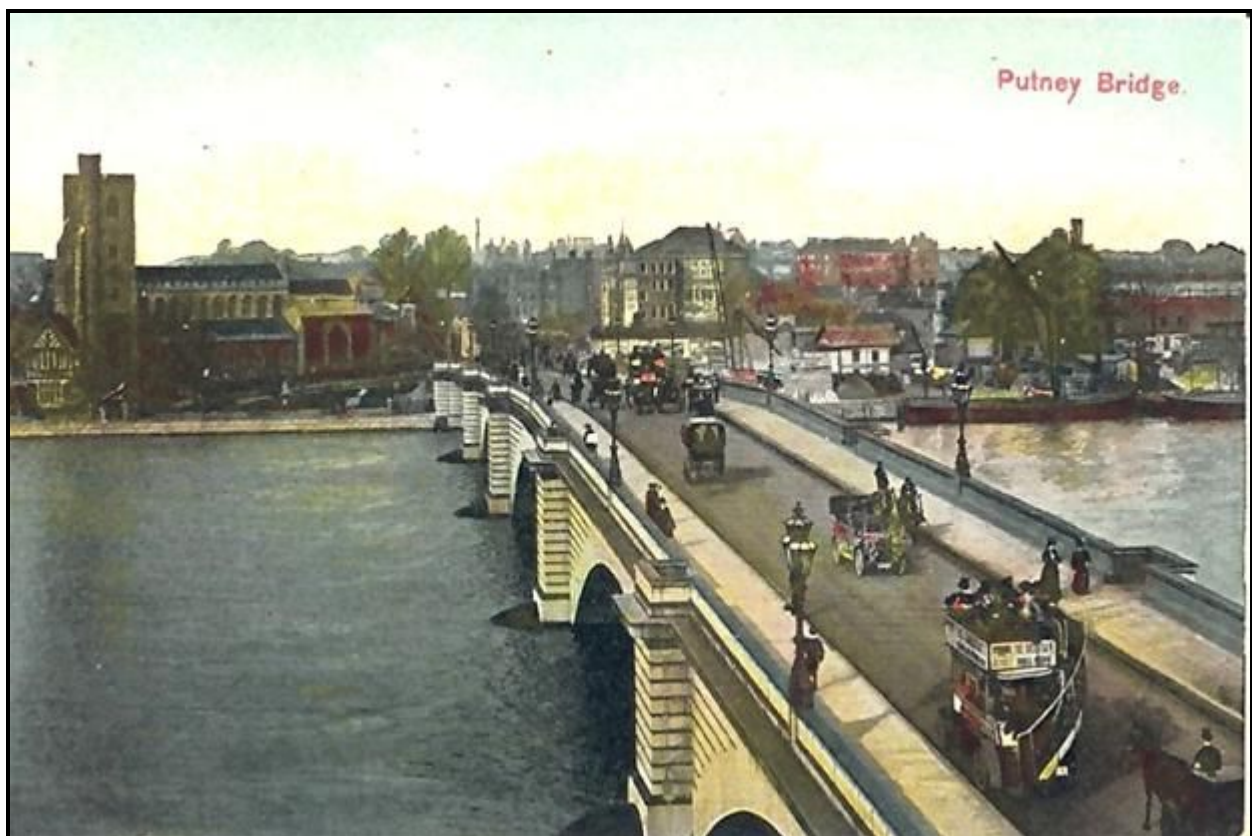
1884 Albert Bridge (modifications)

1886 Putney Bridge

1887 Hammersmith Bridge

1889 Woolwich Free Ferry

1890 Battersea Bridge



*Putney Bridge in 1910,*

## BIBLIOGRAPHY

- 1930 *Main Drainage of London*, Sir George W Humphreys, London County Council
- 1960 *Clean and Decent: The Fascinating History of the Bathroom and the WC*, Lawrence Wright, Routledge & Keegan Paul, London
- 1974 *London: 2000 Years of a City and its People*, Felix Barker & Peter Jackson, Cassell, London
- 1984 *London under London: A Subterranean Guide*, Richard Trench & Ellis Hillman, John Murray, London
- 1986 *100 Years; 1886-1986: The London District Council of the Institute of Plumbing*
- 1990 *The History of London in Maps*, Felix Barker & Peter Jackson, Barrie & Jenkins, London
- 1990 *London River: The Thames Story*, Gavin Weightman, Collins & Brown, London
- 1993 *Victorian Science and Engineering portrayed in "The Illustrated London News,"* Kenneth Chew & Anthony Wilson, Science Museum/Alan Sutton
- 1997 *Temples of Convenience and Chambers of Delight*, Lucinda Lambton, Pavilion Books, London
- 1999 *The Great Stink of London: Sir Joseph Bazalgette and the Cleansing of the Victorian Metropolis*, Stephen Halliday, Sutton Publishing \*
- 2004 *Victorian London*, Lee Jackson, photography by Eric Nathan,, New Holland, London
- 2011 *London Under*, Peter Ackroyd, Vintage Books, London
- 2014 *London's Sewers*, Paul Dobraszczyk, Shire Publications, Oxford
- 2004 *The Sewer King (Sir Joseph Bazalgette)*, from *Seven Wonders of the Industrial World*, a DVD by Acorn media
- *Joseph Bazalgette*, Wikipedia
- *Sewage Pumping* (6 ebooks), CIBSE Heritage Group website/Electronic Books

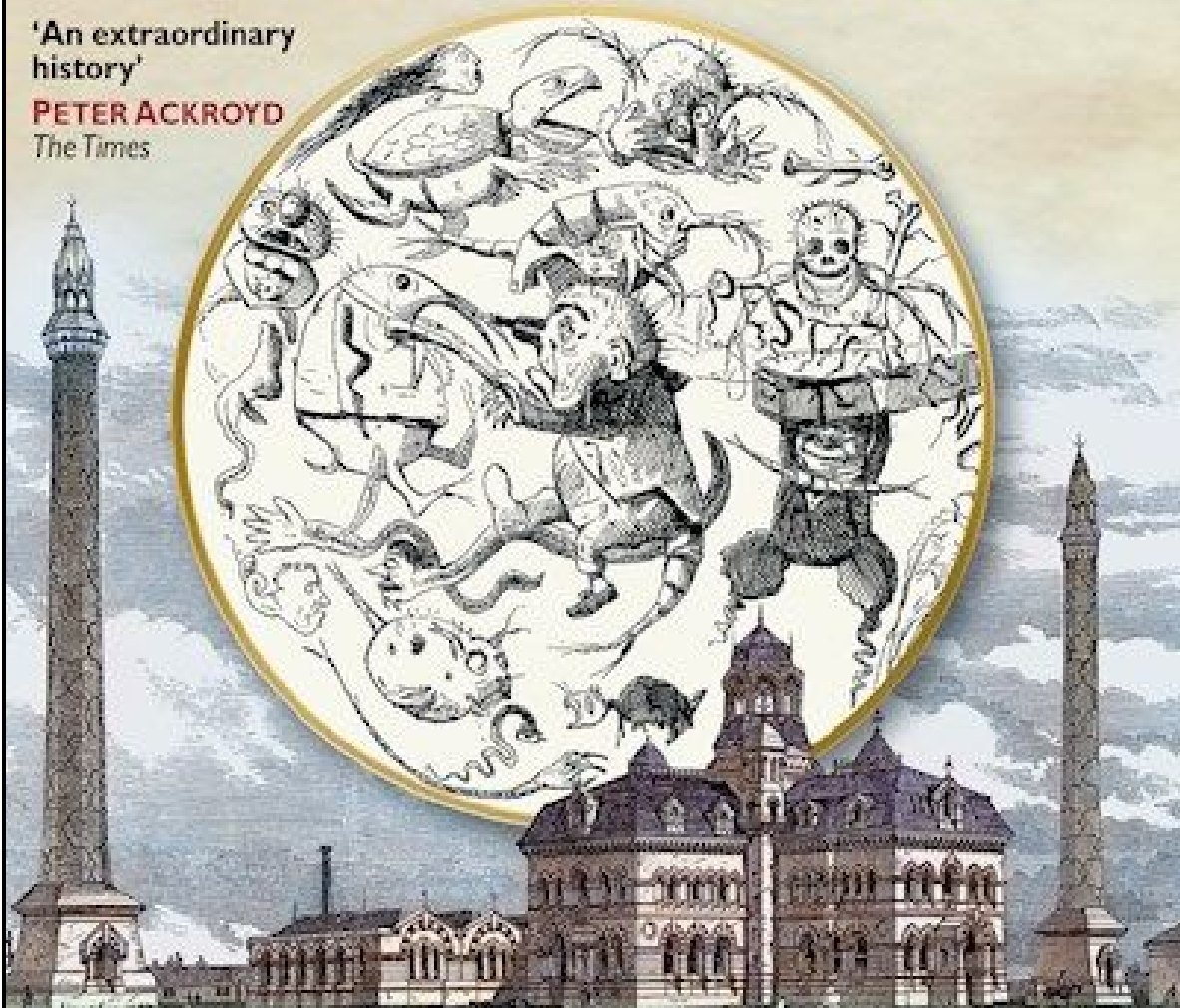
\* *Stephen Halliday's book on "The Great Stink" is recommended to researchers looking for comprehensive information on Bazalgette and his accomplishments.*

*THE GREAT STINK of*  
**LONDON**

SIR JOSEPH BAZALGETTE  
AND THE CLEANSING OF THE  
VICTORIAN METROPOLIS

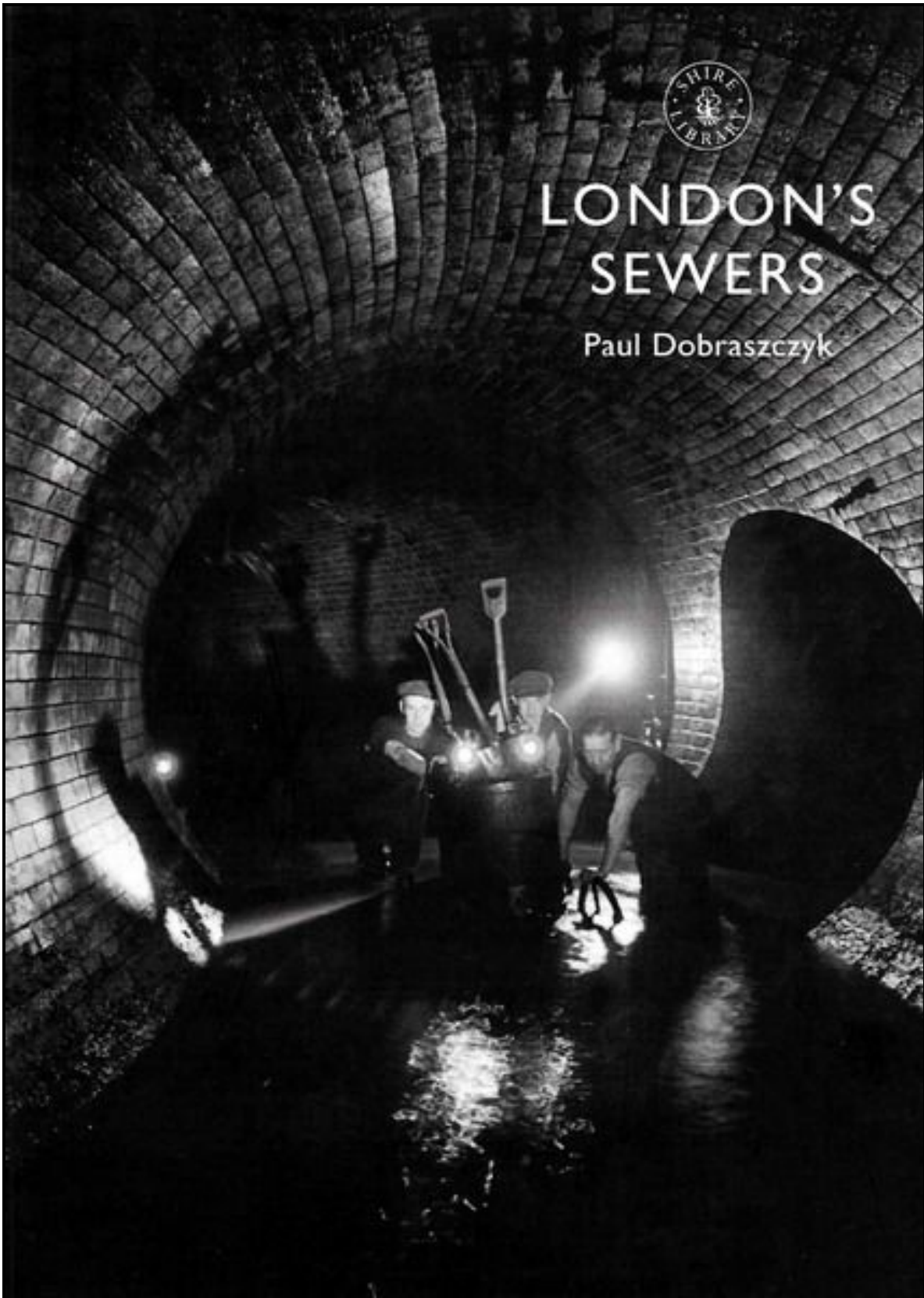
'An extraordinary  
history'

**PETER ACKROYD**  
*The Times*



**STEPHEN HALLIDAY**  
FOREWORD BY ADAM HART-DAVIS





# LONDON'S SEWERS

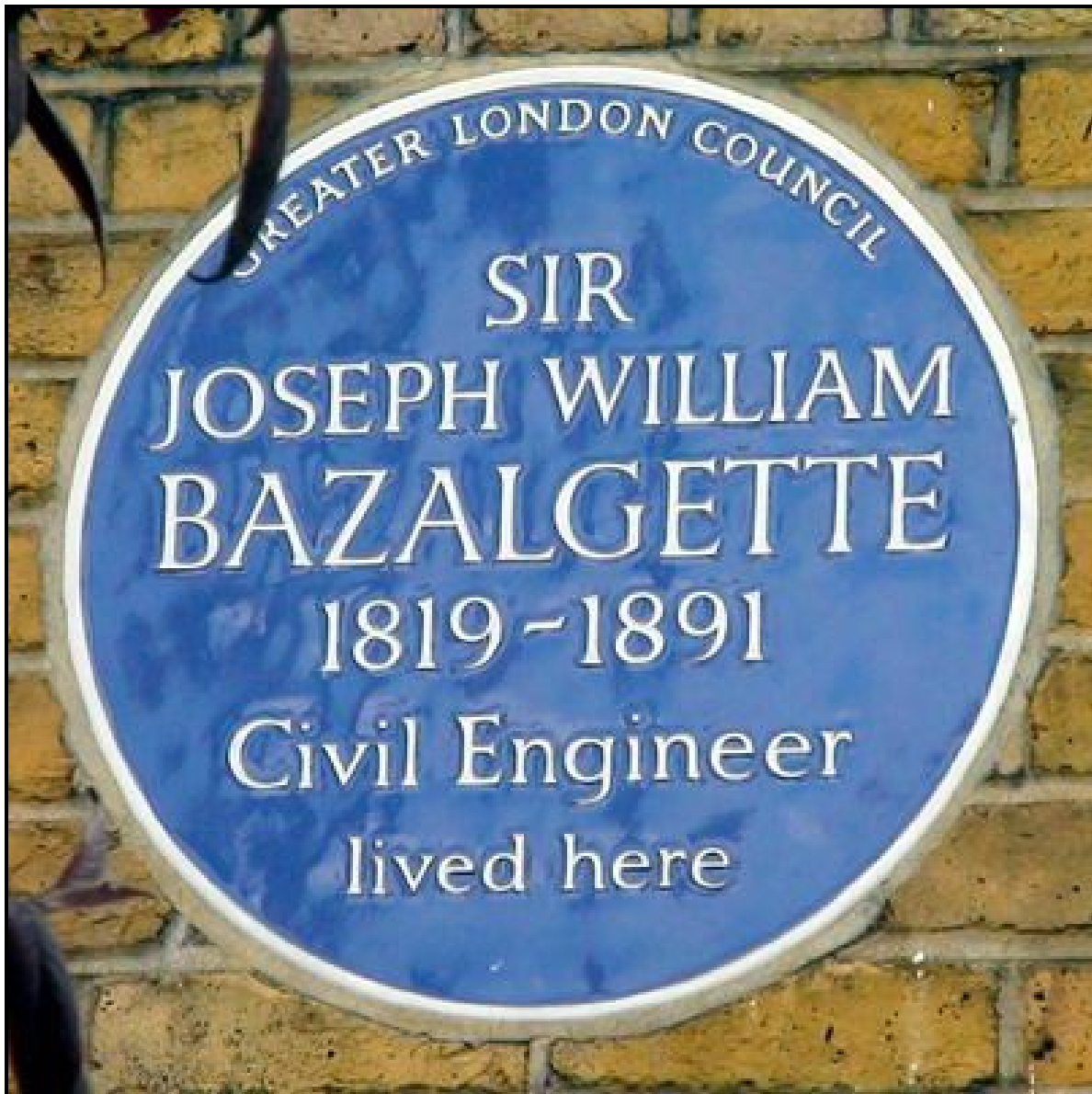
Paul Dobraszczyk

## EPILOGUE

Before 1851, Sir Joseph Bazalgette moved to Morden in South London, then in 1873 to Arthur Road in Wimbledon where he died in 1891, and was buried in the nearby churchyard at St Mary's Church. Lady Bazalgette died in 1902. They had 11 children between 1846 and 1861. Bazalgette was knighted in 1875 and elected President of the Institution of Civil Engineers in 1883.



*Memorial to Sir Joseph Bazalgette on London's Victoria Embankment*



A Greater London Blue Plaque commemorates Bazalgette at 11 Hamilton Terrace in St John's Wood in North London