



The opening of the Tunnel in 1934 by King George V, accompanied by Queen Mary *with acknowledgements to the "Liverpool Daily Post"*

THE MERSEY TUNNEL LIVERPOOL-BIRKENHEAD

OPENED 1934

BRIAN ROBERTS



Aerial view showing the towers of George's Dock ventilation and control station, and the North John Street ventilation station, respectively

Historic photographs of buildings in a number of cities has been previously covered in a number of CIBSE Heritage Group electronic books on our website www.hevac-heritage.org. These are arranged in five Sections: Buildings, Churches, Cities and Places, Hotels, Movie Theatres. See also the Heritage Revisited Series.

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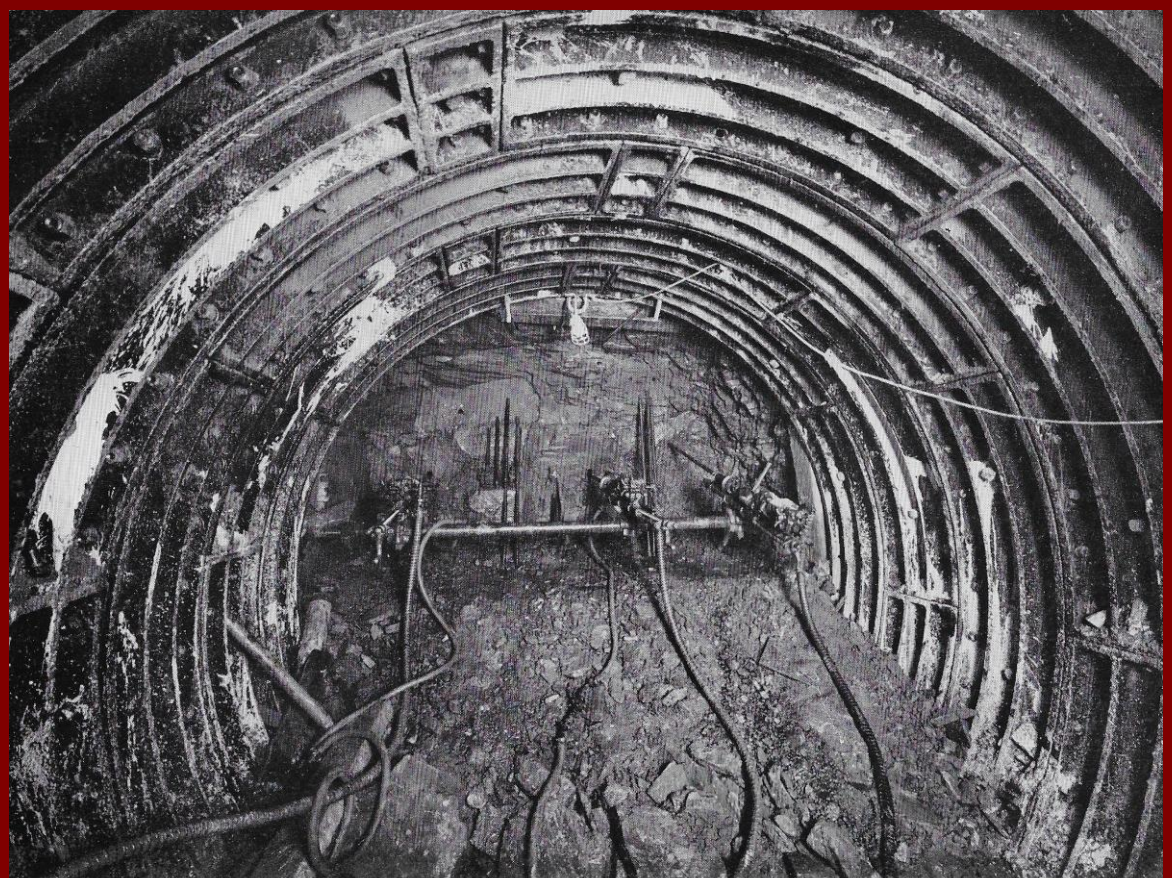
VENTILATION FANS AND EQUIPMENT: System Diagram, Fan Impellers, Blowing Fan-1, Blowing Fan-2, Driving Unit, Pumps-1, Pumps-2, Switchgear, Emergency Control.

TUNNELS AND CONTROL STATIONS: Kingsway-1, Birkenhead, New Quay, North John Street, Sidney Street, Kingsway-2.

MERSEY TUNNEL CONSTRUCTION

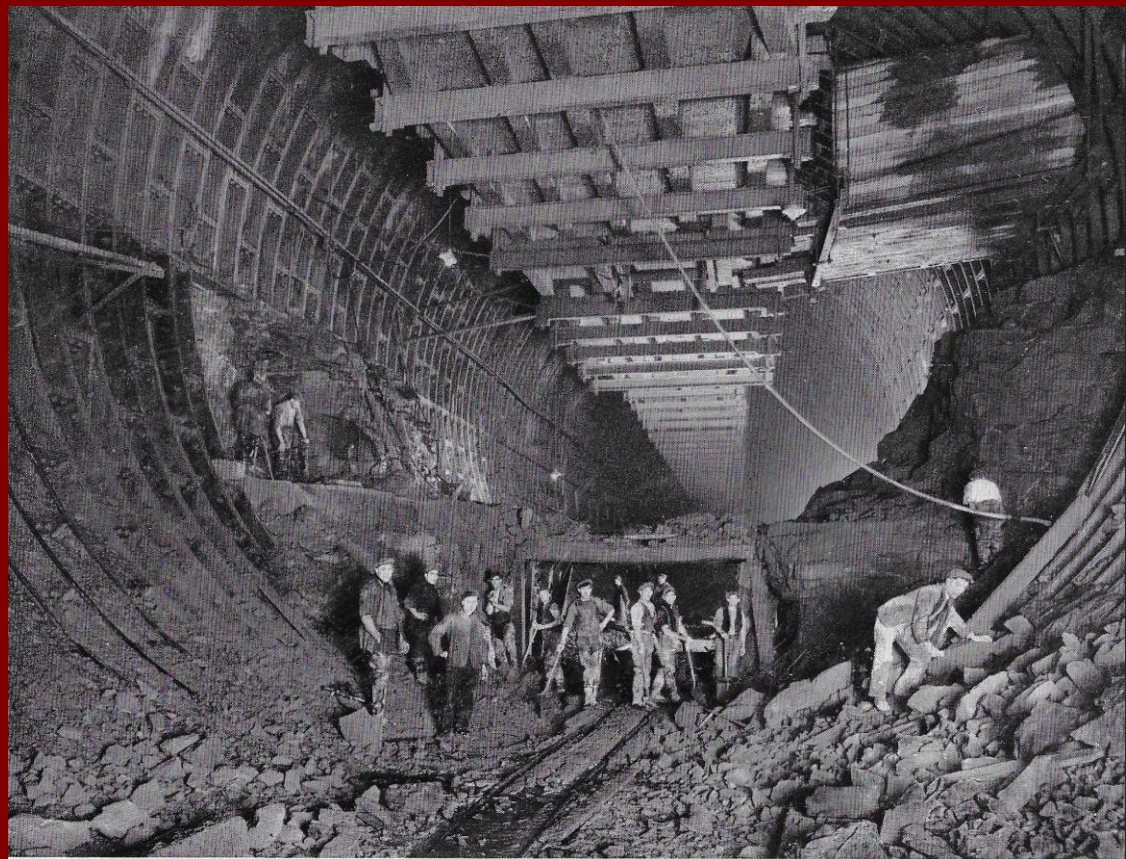


The driving of the pilot headings

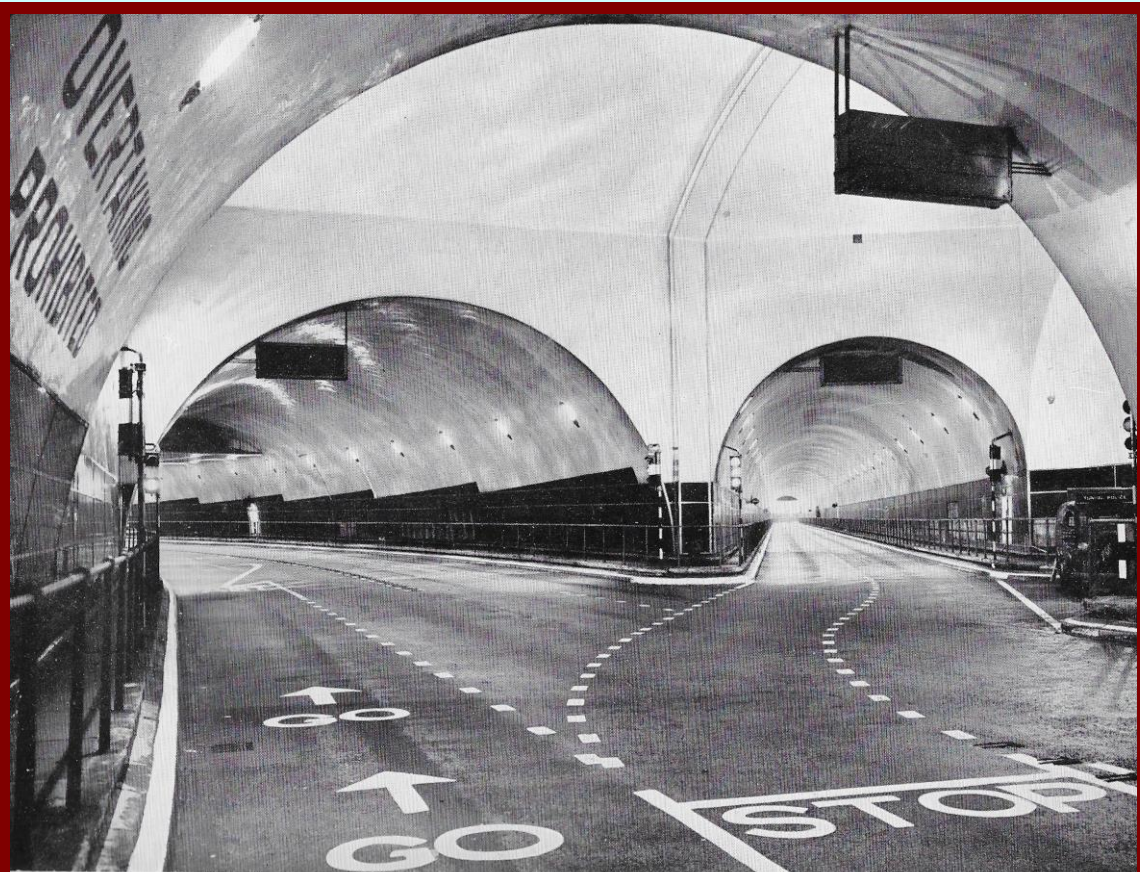


Cast-iron lining used in preliminary tunnels where additional support was necessary

MERSEY TUNNEL CONSTRUCTION



Construction of bottom half of cast-iron lining under river

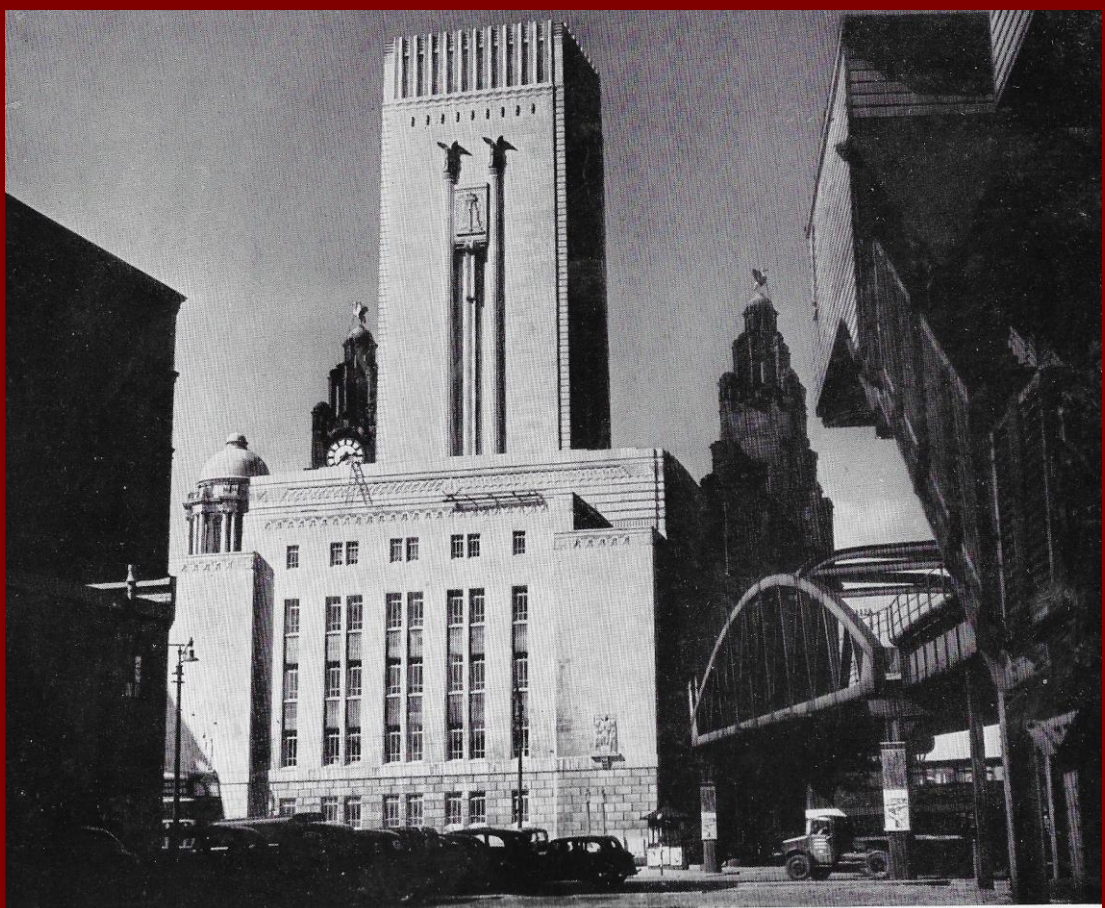


Junction chamber in land tunnels

MERSEY TUNNEL CONSTRUCTION



A curve in the branch tunnel

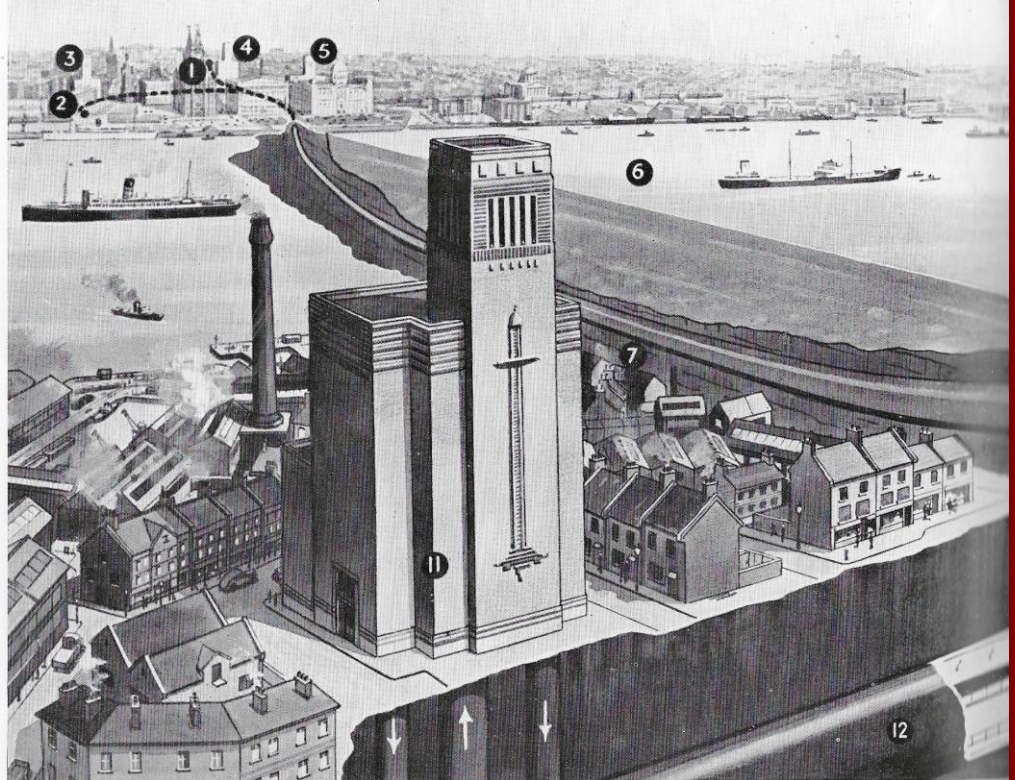


A view of the Ventilation and Control Station at the Pier Head, Liverpool

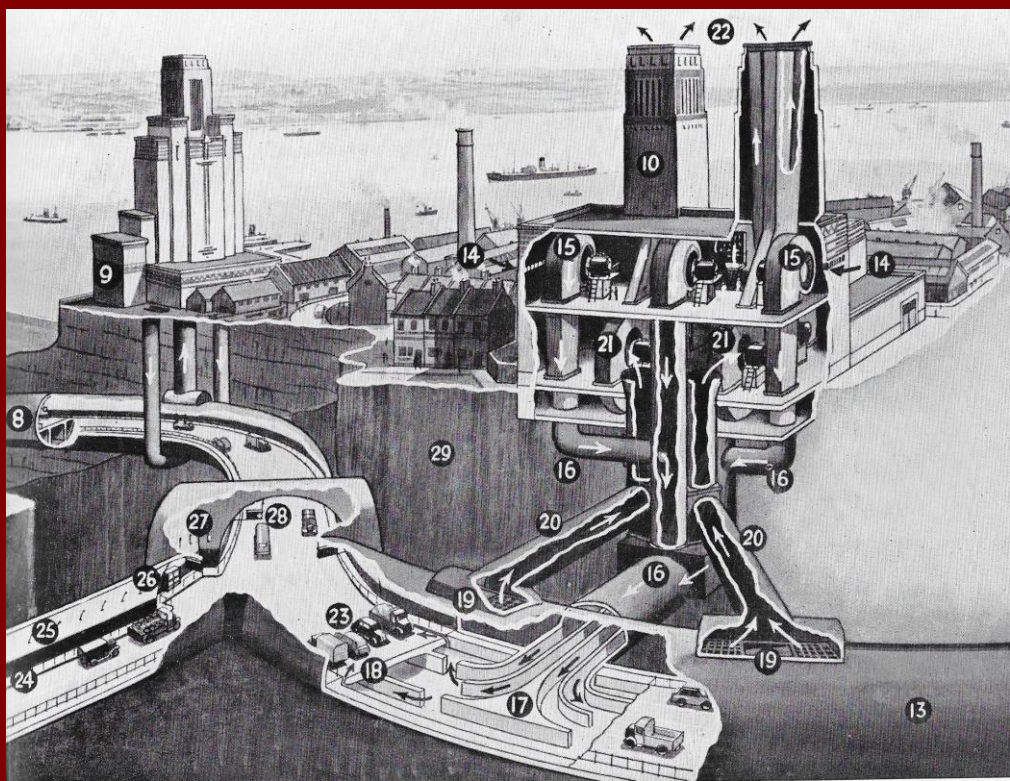
MERSEY TUNNEL VENTILATION

KEY

1. Main entrance at Old Haymarket, Liverpool.
2. Subsidiary entrance at New Quay, Liverpool.
3. New Quay ventilating station, Liverpool.
4. North John Street ventilating station, Liverpool.
5. George's Dock ventilating station, Liverpool. This station is the main control centre.
6. River Mersey.
7. Section of Rock river bed. (Sandstone).
8. Section of circular under-river main tunnel, 44 feet in diameter.
9. Woodside ventilating station, Birkenhead.
10. Sidney Street ventilating station, Birkenhead.
11. Taylor Street ventilating station, Birkenhead.
12. Birkenhead—Dock Branch to Rendel Street, 26 feet diameter.



Sectional view of the ventilating system



KEY

13. Main tunnel to King's Square, Birkenhead.
14. Fresh air intake vents in ventilating station.
15. Fresh air Fans.
16. Fresh air Ducts.
17. Fresh air ducts under roadway.
18. Fresh air entry grills to tunnel.
19. Exhaust air grills in roof.
20. Exhaust air ducts.
21. Exhaust air fans.
22. Exhaust air outlets.
23. Four lines of traffic in 36 feet road.
24. Side walk for maintenance staff only.
25. Electric wall lights.
26. Telephone and Fire Alarm.
27. Birkenhead Junction chamber.
28. Traffic lights.
29. Clay subsoil.

With acknowledgements to Hulton Press Ltd.

Woodside Ventilation Station, Birkenhead

MERSEY TUNNEL FACTS AND FIGURES

Facts and Figures in Brief

Length of roadway, Old Haymarket, Liverpool, to Chester Street, Birkenhead, through-traffic route—3,751 yards = 2.13 miles.

Length of roadway, New Quay, Liverpool, to Rendel Street, Birkenhead, dock-side traffic route—3,670 yards = 2.08 miles.

Total length of roadway, through and dockside routes, including open approaches—5,064 yards = 2.87 miles.

Total length of tunnels—2.62 miles.

Total area of roadway surface—487,300 square feet = 11 acres.

Ruling gradient is 1 in 30, with 1,670 feet of 1 in 300 gradient under middle of river.

* * * * *

Width between kerbs in through traffic tunnel is 36 feet, for four lines of traffic.

Width between kerbs in dockside branch tunnels

is 19 feet, for two lines of traffic.

Time required to pass through tunnel at 20 miles per hour is 6½ minutes.

Capacity of tunnel is 4,150 cars per hour with four lines of cars, spaced at 100 feet apart and moving at 20 miles per hour.

Distance from shaft at George's Dock, Liverpool, to shaft at Morpeth Branch Dock, Birkenhead, is 1,735 yards = 0.99 mile.

Internal diameter of tunnel under river is 44 feet ; external diameter is 46 feet 3 inches.

* * * * *

Cross-sectional area of under-river tunnel is 1,680 square feet ; more than double that of any previous subaqueous tunnel.

Total surface area of lining of tunnel is 1,773,000 square feet, or 41 acres.

The bottom of the under-river tunnel at its deepest point is 170 feet below high water.

THE MERSEY TUNNEL

FACTS AND FIGURES

Average cover of rock over top of tunnel under river is 20 feet ; minimum cover of rock under river is 3 ft. 6 inches.

Above the rock is usually 5 to 10 feet of gravel ; above the gravel is clay, forming the immediate bed of the river at the place where the tunnel crosses.

* * * * *

The average total cover of rock, gravel and clay above the top of the tunnel under the river is 30 to 35 feet.

Total excavation—800,000 cubic yards—1,200,000 tons.

The weight of explosives used was 560,000 lbs.

Total weight of cast-iron used to line the tunnel is 82,000 tons.

Total concrete in work is 150,000 cubic yards—270,000 tons.

Maximum rate at which water was pumped during construction was 4,300 gallons per minute.

The total amount of water pumped from the workings during tunnel excavation to October, 1932, was 7,482,000,000 gallons—33,400,000 tons.

For each ton of rock raised to the surface, 26 tons of water have had to be pumped to a height of some 200 feet.

The average rate of excavation during the period of tunnel driving was over one ton of rock every two minutes from June, 1926 to August, 1931.

The total number of bolts in cast-iron lining is one million.

Total length of caulked joints between segments of cast-iron lining is 140 miles.

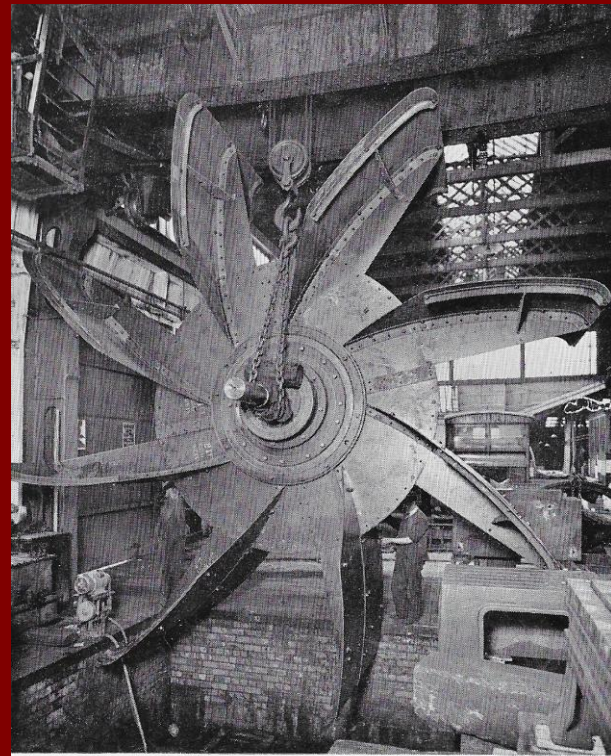
The lengths of electric cabling for the tunnel are—lighting cables, 78 miles ; power cables 4.5 miles ; control cables (length of actual conductor) 300 miles ; telephone and signal cables 201 miles—total 583.5 miles.

Maximum delivery of fresh air to the tunnel : 2,500,000 cubic feet per minute. Equal volume exhausted.

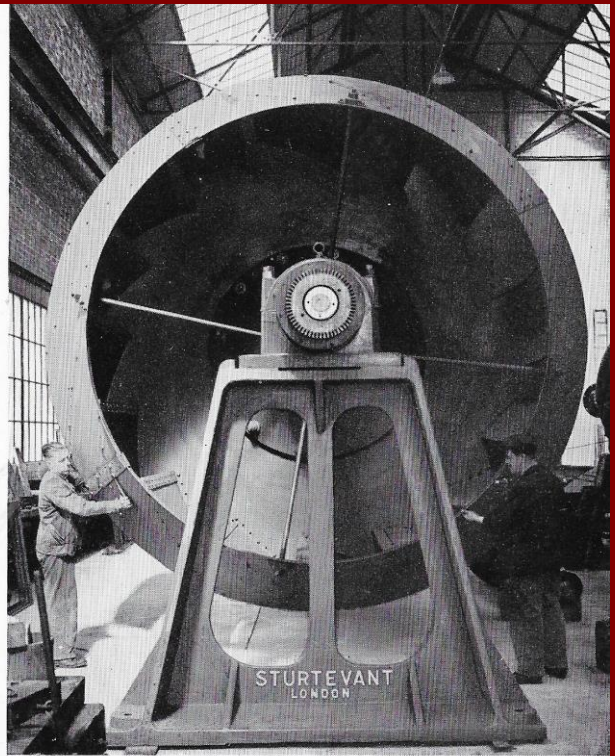
Total capacity of all ventilating fans : 10,000,000 cubic feet per minute.

Total number of men employed directly on the tunnel during the height of the construction period was 1,700.

MERSEY TUNNEL VENTILATION



The impeller of one of the Walker fans

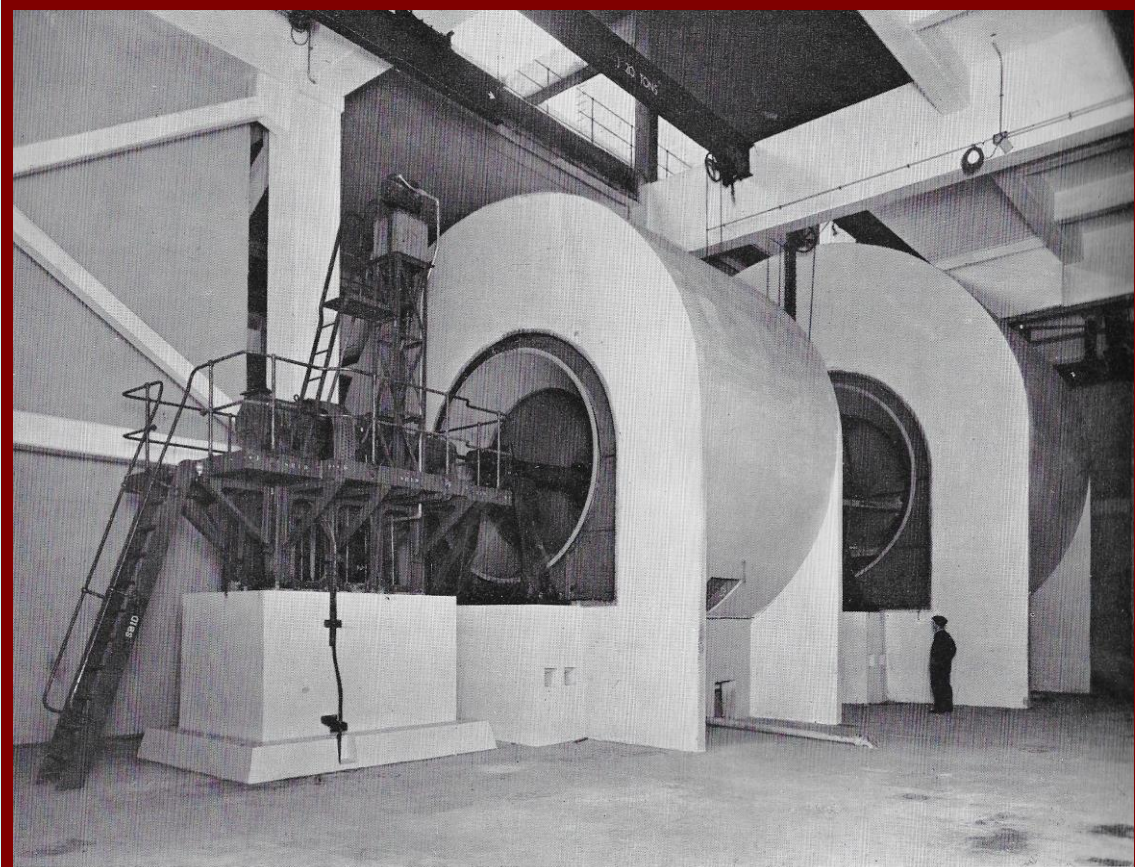


The impeller of a Sturtevant fan

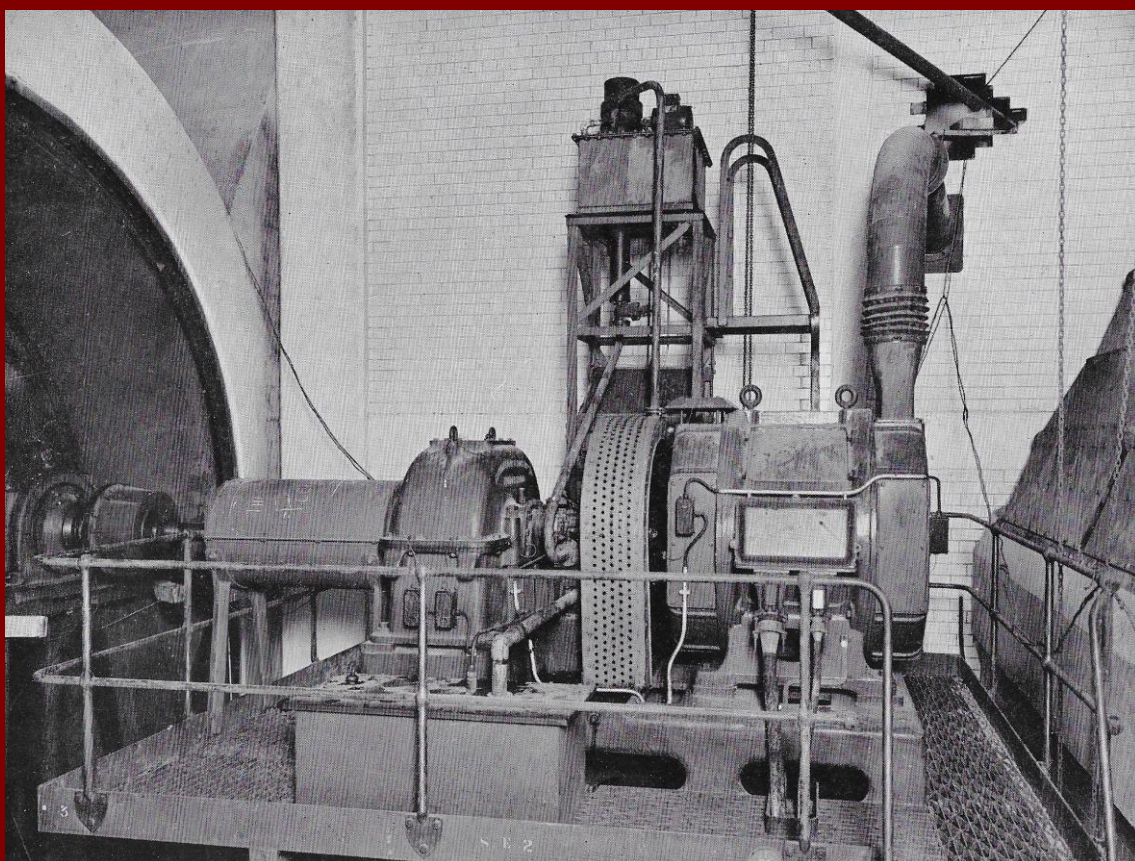


Blowing fan and casing at George's Dock ventilation station, Liverpool

MERSEY TUNNEL VENTILATION

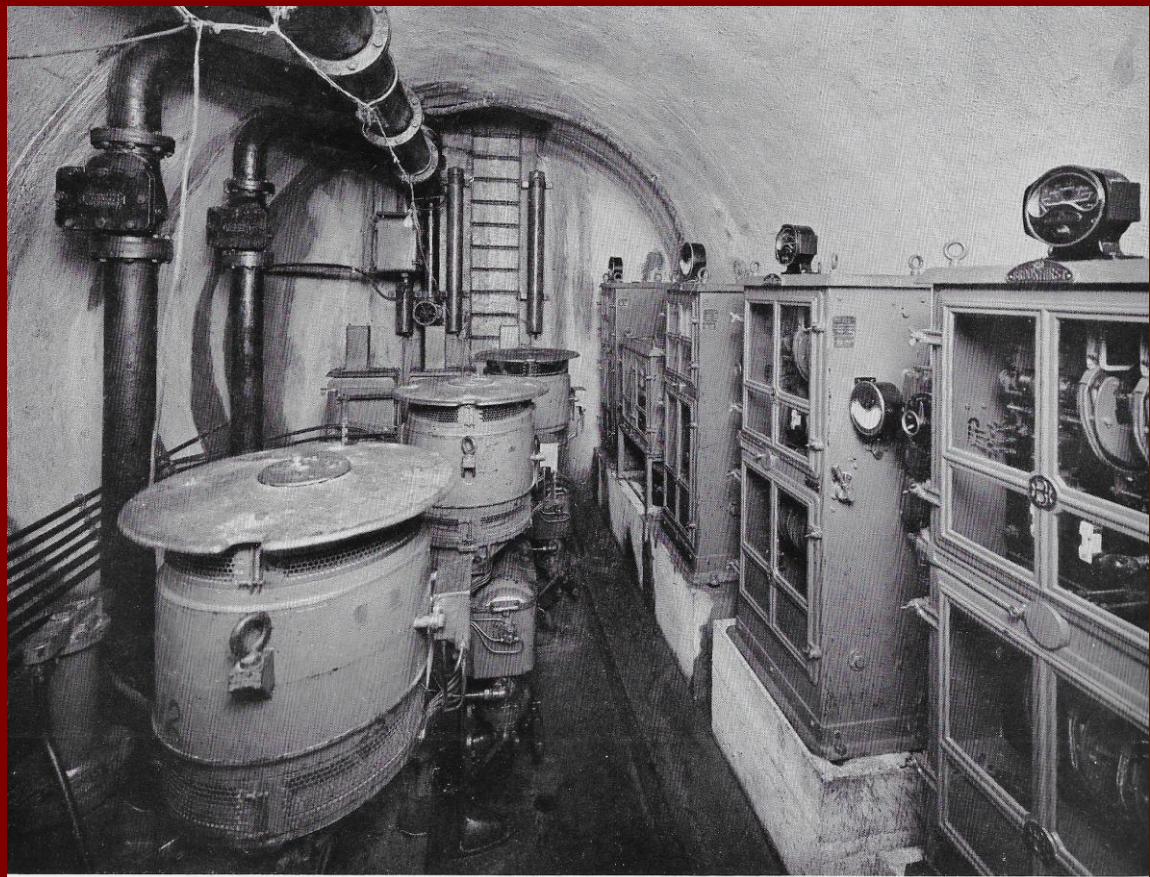


Blowing fans at Sidney Street ventilation station, Birkenhead

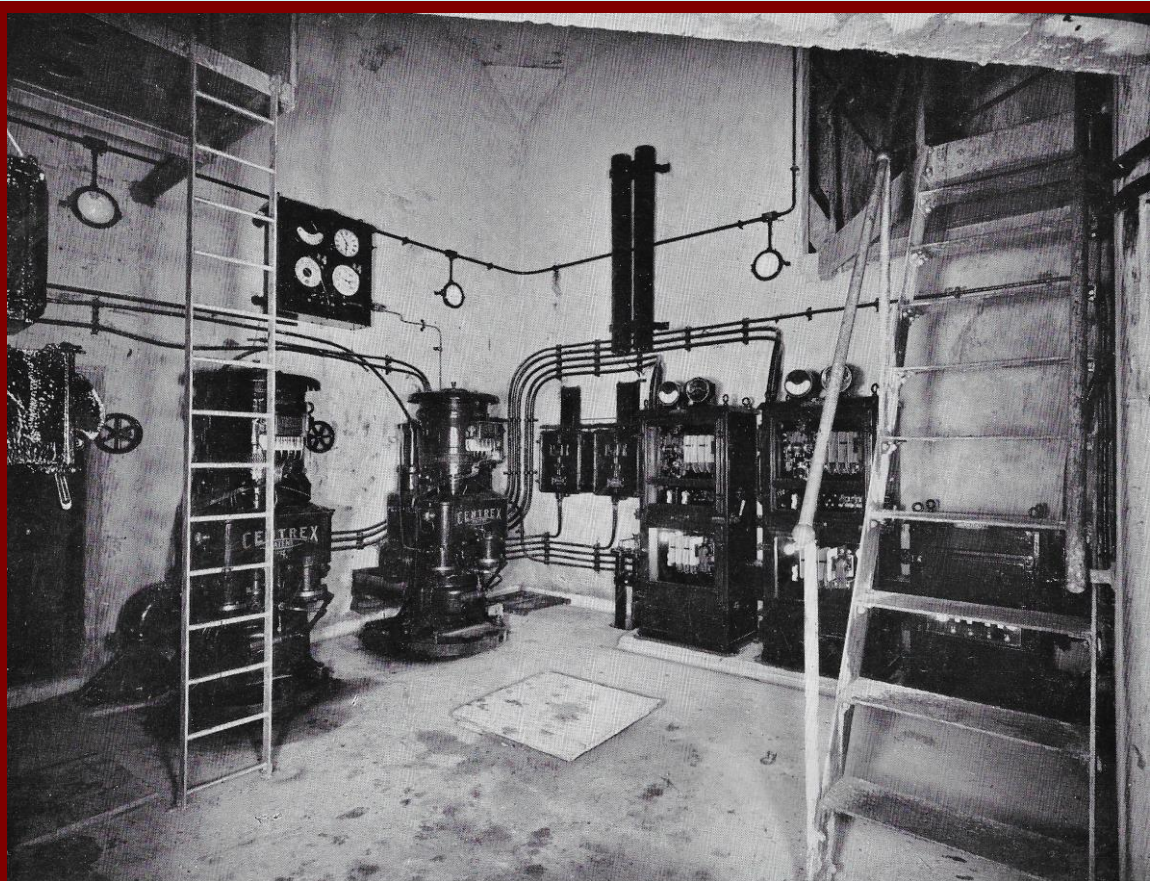


The driving unit of the fans

MERSEY TUNNEL PUMPS



The mid-river pump room

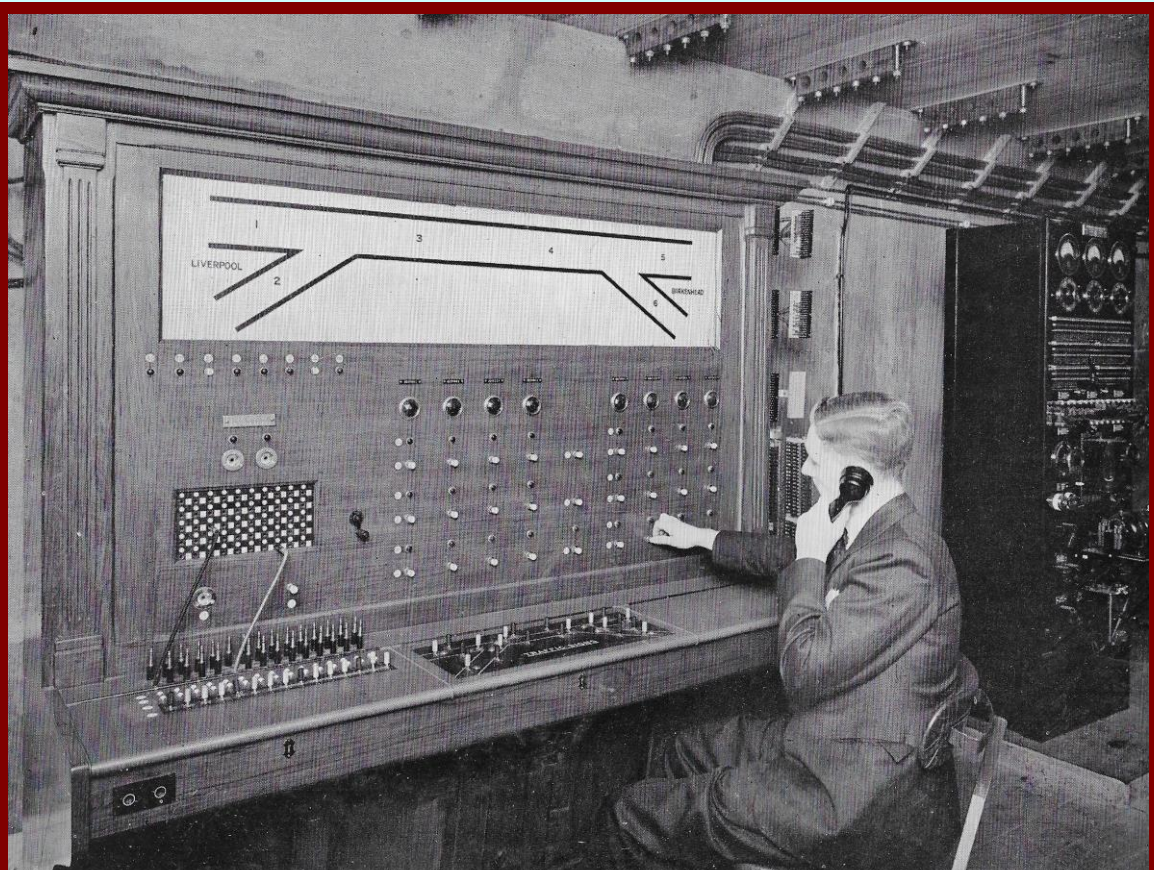


The pump room at Morpeth Dock, Birkenhead

MERSEY TUNNEL ELECTRICAL SERVICES



The switchgear room at Sidney Street ventilation station, Birkenhead



Control board for telephone, fire and emergency systems

MERSEY TUNNEL



The Kingsway Tunnel Entrance at the Old Haymarket, Liverpool *from a water colour by Gordon Hemm*



King's Square, Birkenhead's Main Tunnel Entrance *from a water colour by Gordon Hemm*

MERSEY TUNNEL



The New Quay Tunnel Entrance, Pier Head, Liverpool

from a water colour by Gordon Hemm



The Ventilation Station at Woodside, Birkenhead, as seen from the river

from a water colour by Gordon Hemm

MERSEY TUNNEL



The Ventilation Station at North John Street, Liverpool

from a water colour by Gordon Hemm



Sidney Street, Birkenhead, Ventilation Station

from a water colour by Gordon Hemm

THE MERSEY TUNNEL HISTORIC PHOTOGRAPHS AND DRAWINGS



A striking view of the Kingsway entrance looking toward St. George's Hall

REFERENCES AND FURTHER READING

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CIBSE Heritage Group: www.hevac-heritage.org
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/Organisations: Merseyside & North Wales Region, Chapter 10.