



# MARITIME

## SUPERHERO

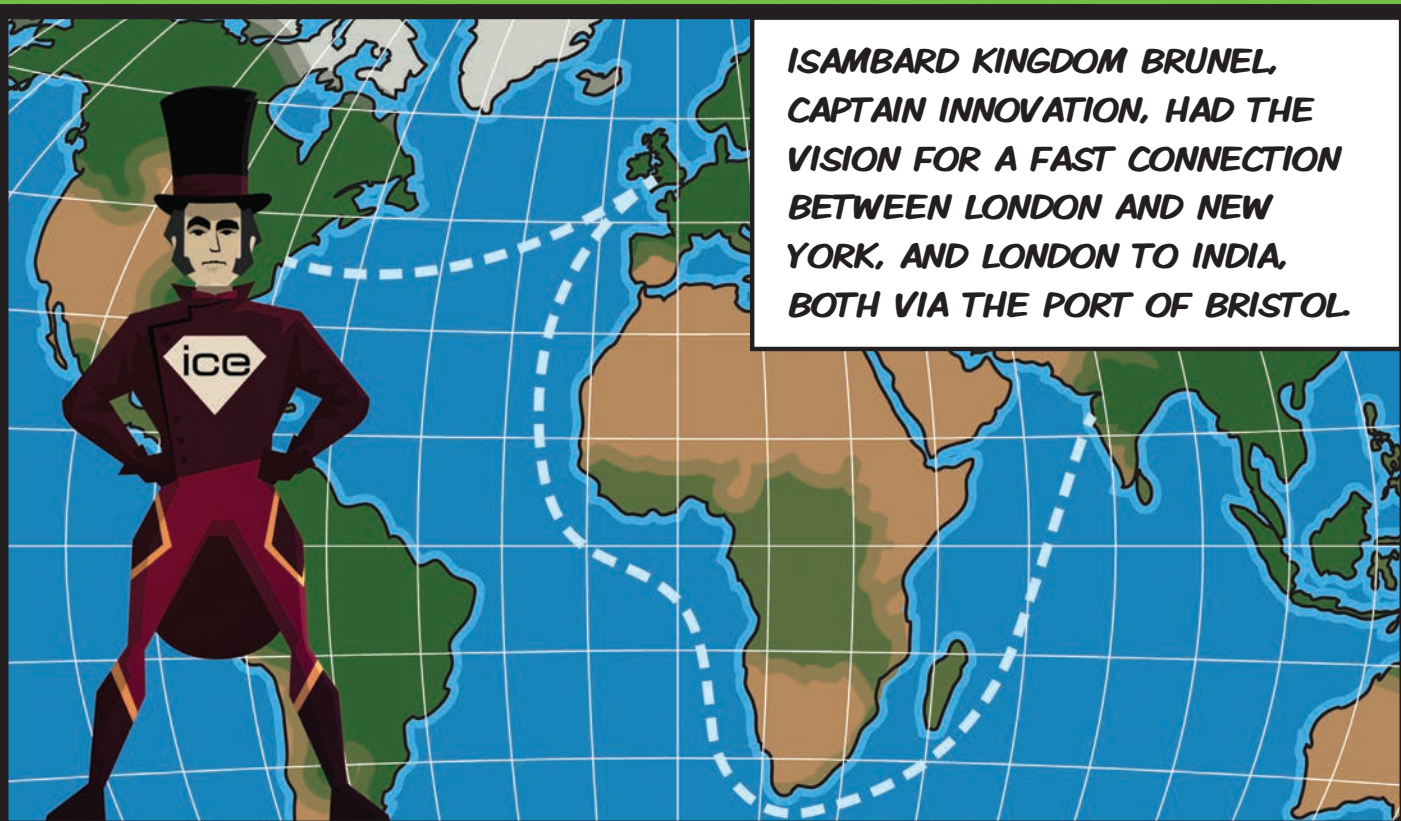
ISAMBARD KINGDOM BRUNEL

'CAPTAIN INNOVATION'

## ARCH ENEMY

OBSTACLES TO EFFECTIVE TRADE

GLOBAL TRADE BETWEEN NORTH AMERICA AND BRITAIN AND BRITAIN AND INDIA INCREASED IN THE 19TH CENTURY.



ISAMBARD KINGDOM BRUNEL, CAPTAIN INNOVATION, HAD THE VISION FOR A FAST CONNECTION BETWEEN LONDON AND NEW YORK, AND LONDON TO INDIA, BOTH VIA THE PORT OF BRISTOL.

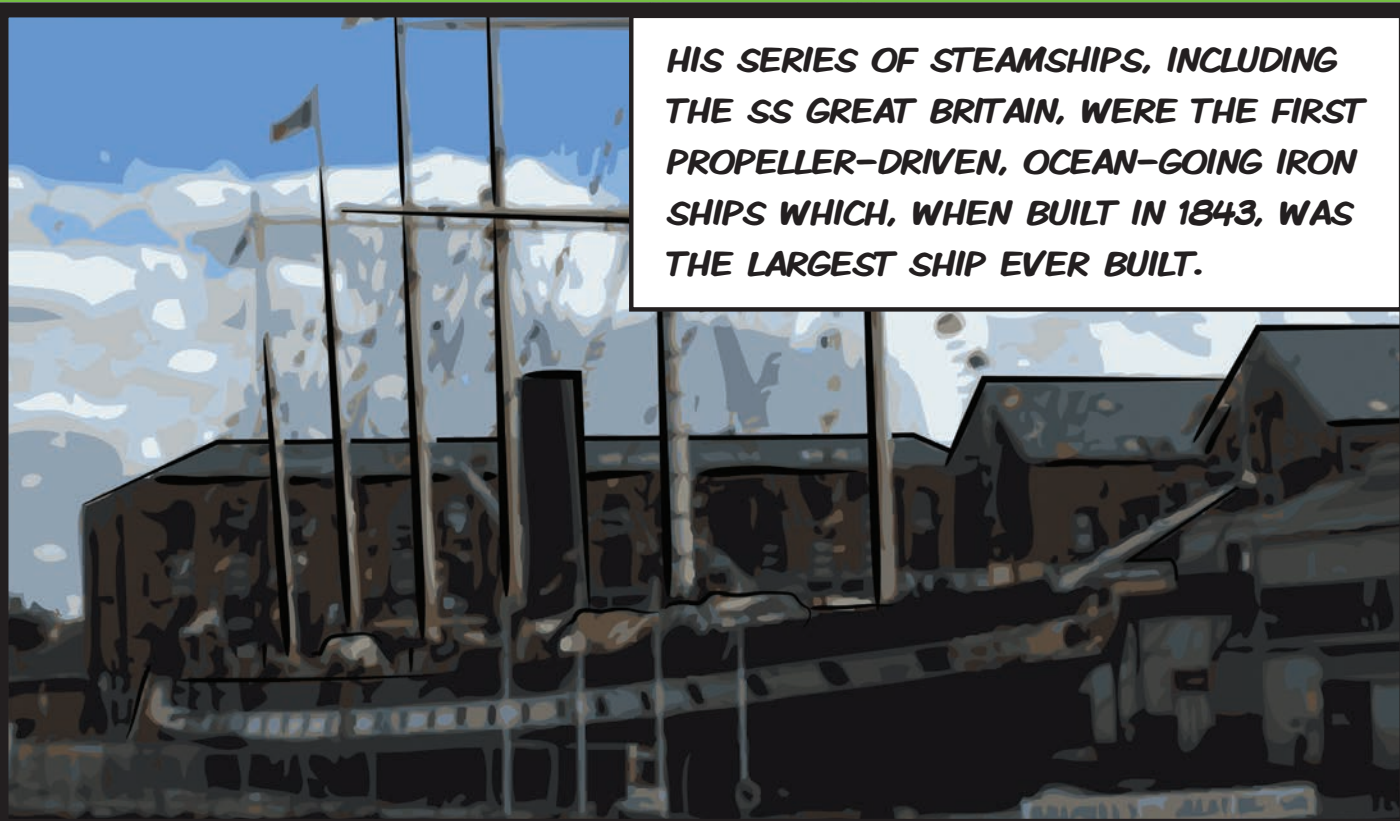
HE BUILT THE GREAT WESTERN RAILWAY FOR BRISTOL MERCHANTS TO CONNECT BRISTOL AND LONDON.



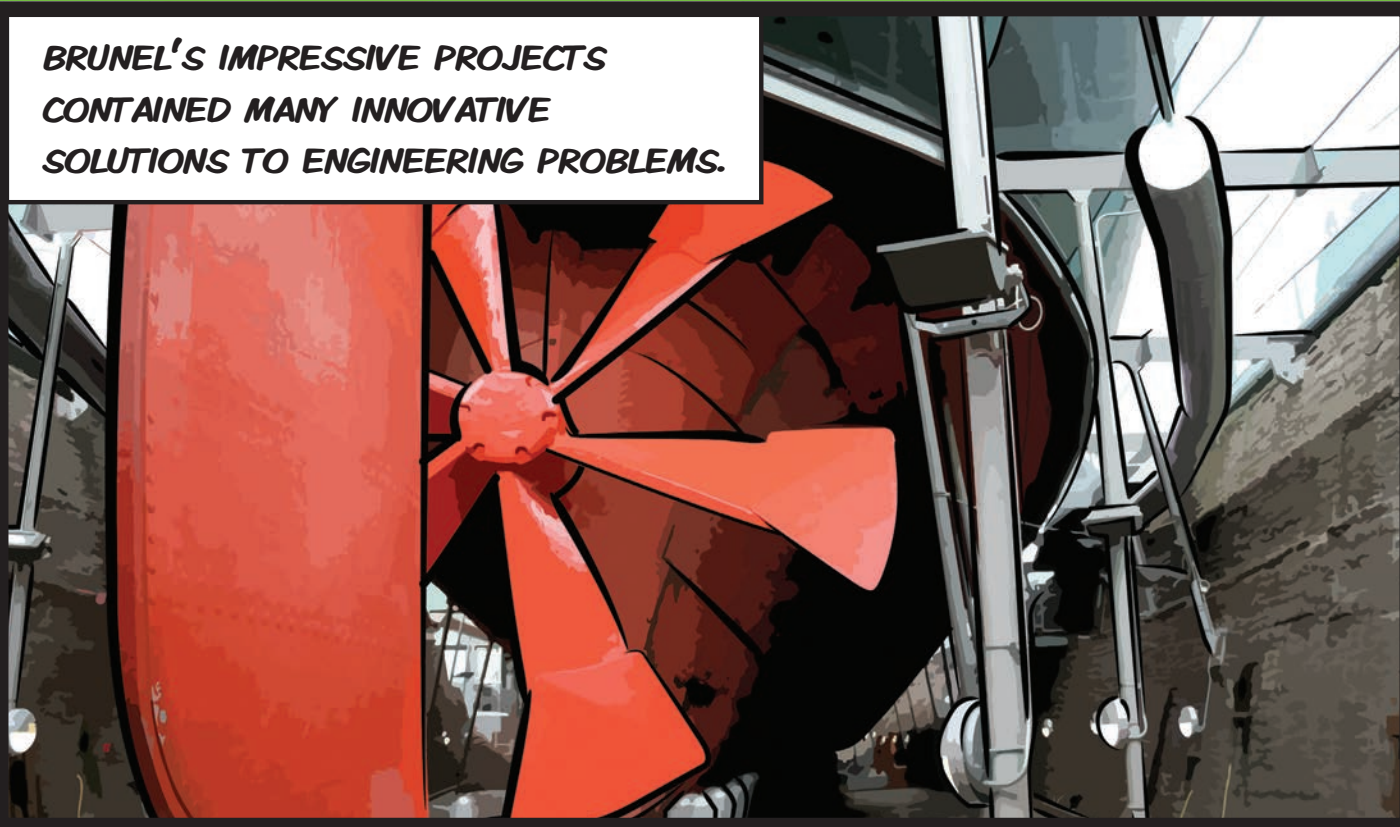
**HE PROPOSED THE EXTENSION OF THE RAILWAY TO NORTH AMERICA BY BUILDING STEAM-POWERED, IRON-HULLED SHIPS.**



**HIS SERIES OF STEAMSHIPS, INCLUDING THE SS GREAT BRITAIN, WERE THE FIRST PROPELLER-DRIVEN, OCEAN-GOING IRON SHIPS WHICH, WHEN BUILT IN 1843, WAS THE LARGEST SHIP EVER BUILT.**



**BRUNEL'S IMPRESSIVE PROJECTS CONTAINED MANY INNOVATIVE SOLUTIONS TO ENGINEERING PROBLEMS.**



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# RAIL

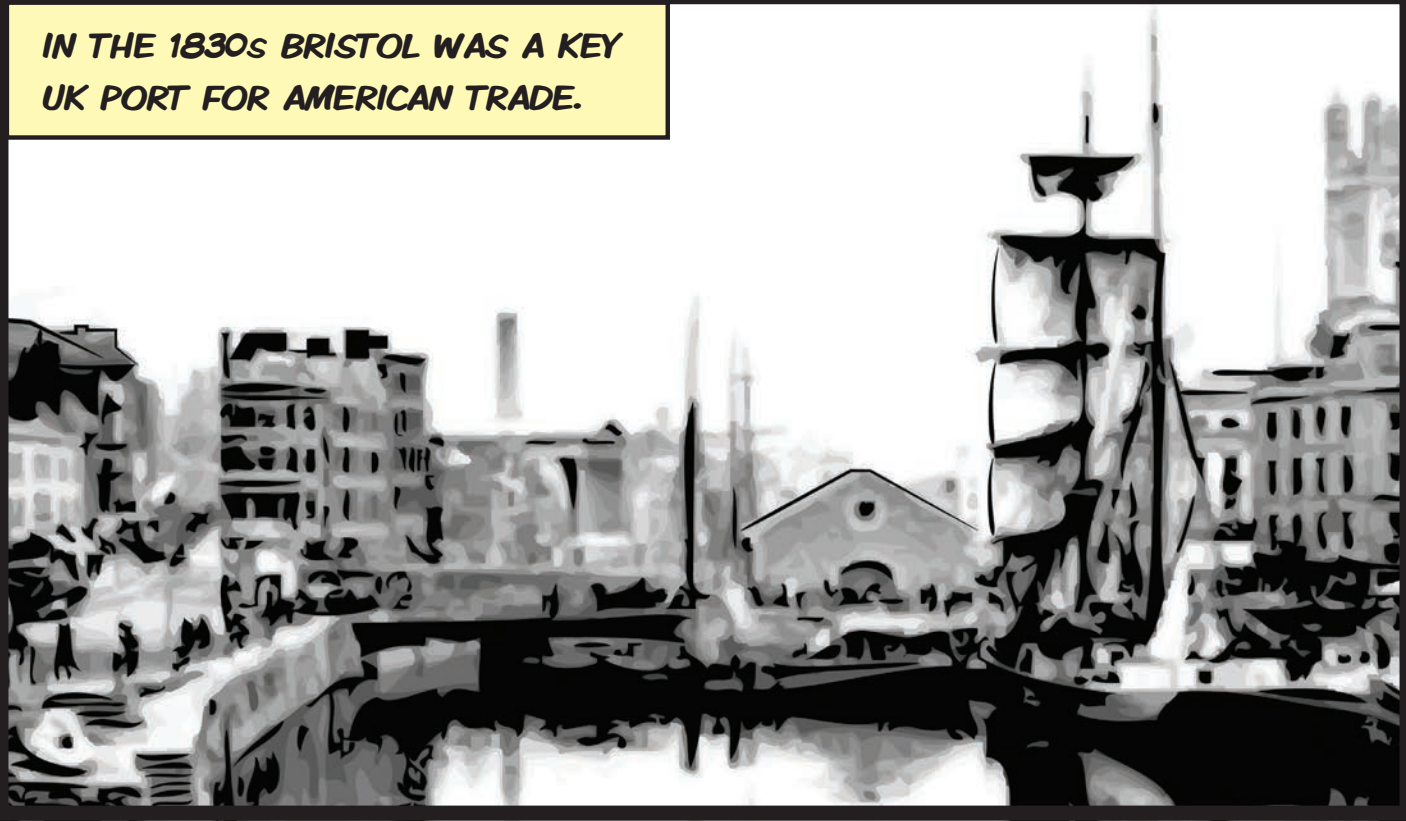
## SUPERHERO

**ISAMBARD KINGDOM BRUNEL**  
**'CAPTAIN INNOVATION'**

## ARCH ENEMY

**COMMUNICATION DIFFICULTIES**

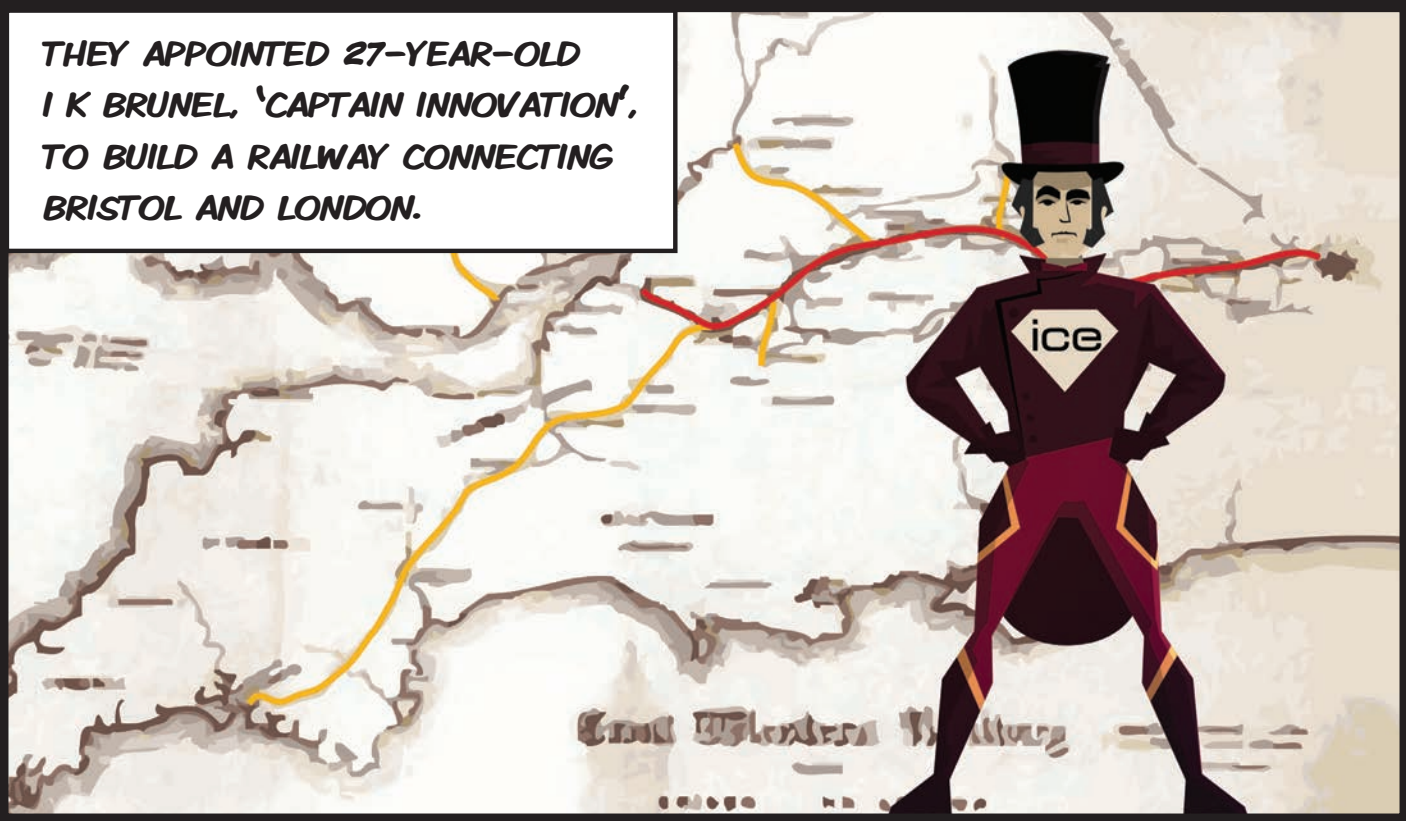
*IN THE 1830s BRISTOL WAS A KEY UK PORT FOR AMERICAN TRADE.*



*BRISTOLIAN MERCHANTS WERE KEEN TO MAINTAIN THEIR CITY'S POSITION BY SPEEDING UP COMMUNICATIONS WITH LONDON.*



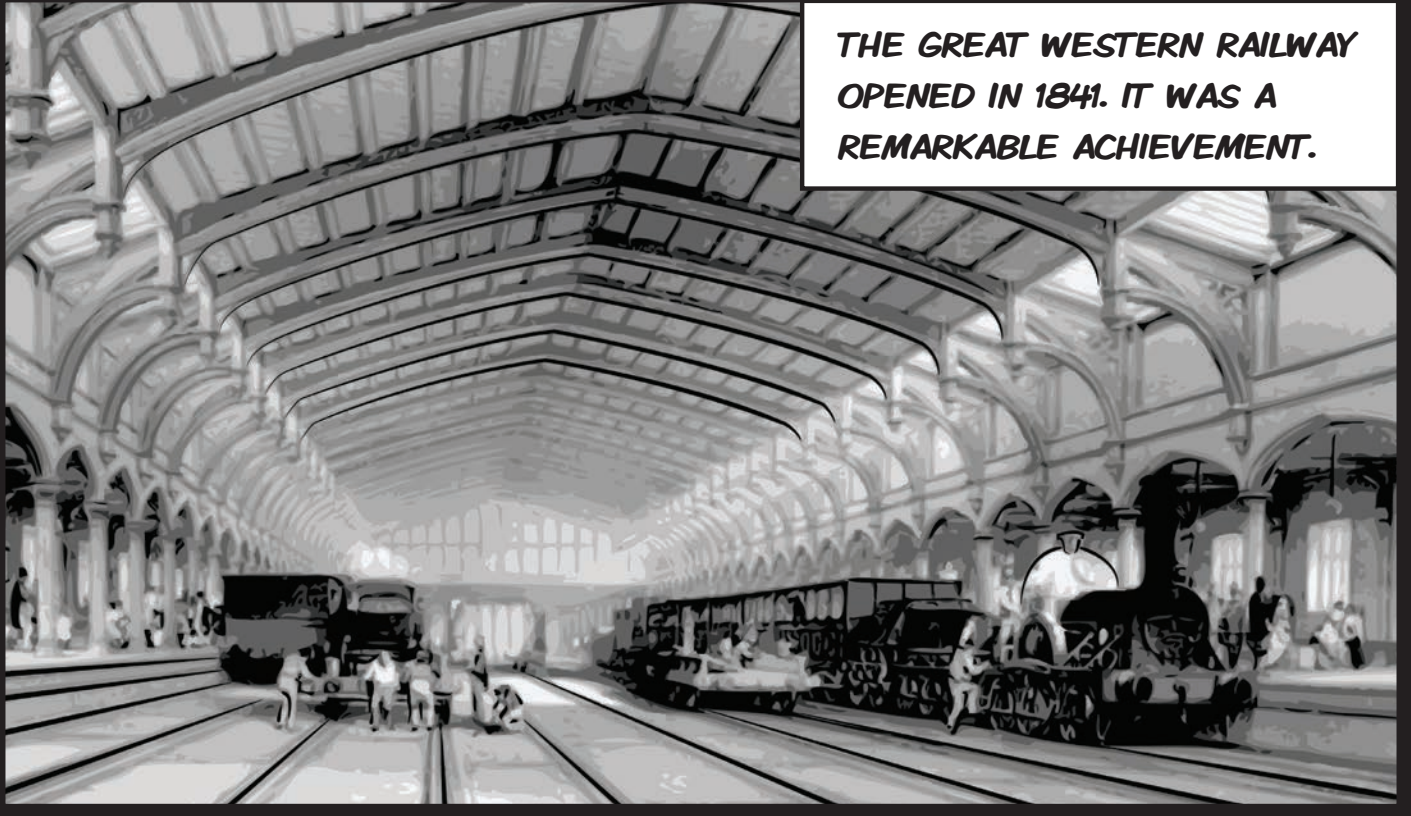
*THEY APPOINTED 27-YEAR-OLD I K BRUNEL, 'CAPTAIN INNOVATION', TO BUILD A RAILWAY CONNECTING BRISTOL AND LONDON.*



*BRUNEL CARRIED OUT A DETAILED SURVEY OF THE LAND AND BUILT NUMEROUS BRIDGES, VIADUCTS AND TUNNELS ALONG THE ROUTE, INCLUDING THE 2-MILE-LONG BOX TUNNEL.*



*THE GREAT WESTERN RAILWAY OPENED IN 1841. IT WAS A REMARKABLE ACHIEVEMENT.*



*IT HELPED ESTABLISH BRUNEL AS ONE OF THE WORLD'S LEADING ENGINEERS.*



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# ROADS

**SUPERHERO**  
**THOMAS TELFORD**  
**'COLOSSUS'**

**ARCH ENEMIES**  
**INADEQUATE ROAD NETWORKS**  
**LENGTHY TRAVEL TIMES**

*IN THE EARLY 19TH CENTURY THE MAIN ROADS OF BRITAIN FOLLOWED THE COURSE OF OLD ROMAN AND ANGLO-SAXON ROADS.*



*THE MAIL COACHES TRAVELLED THE COUNTRY ON THESE TURNPIKE (TOLL) ROADS WHICH WERE OFTEN FULL OF POTHOLES.*



*'COLOSSUS', THOMAS TELFORD SURVEYED THE ROUTE FROM CARLISLE TO GLASGOW, ONE OF THE MOST IMPORTANT SCOTTISH ROADS, AND STATED THAT: "THE EXISTING ROAD IS IN SUCH A RUINOUS STATE AS TO OCCASION MUCH DELAY."*



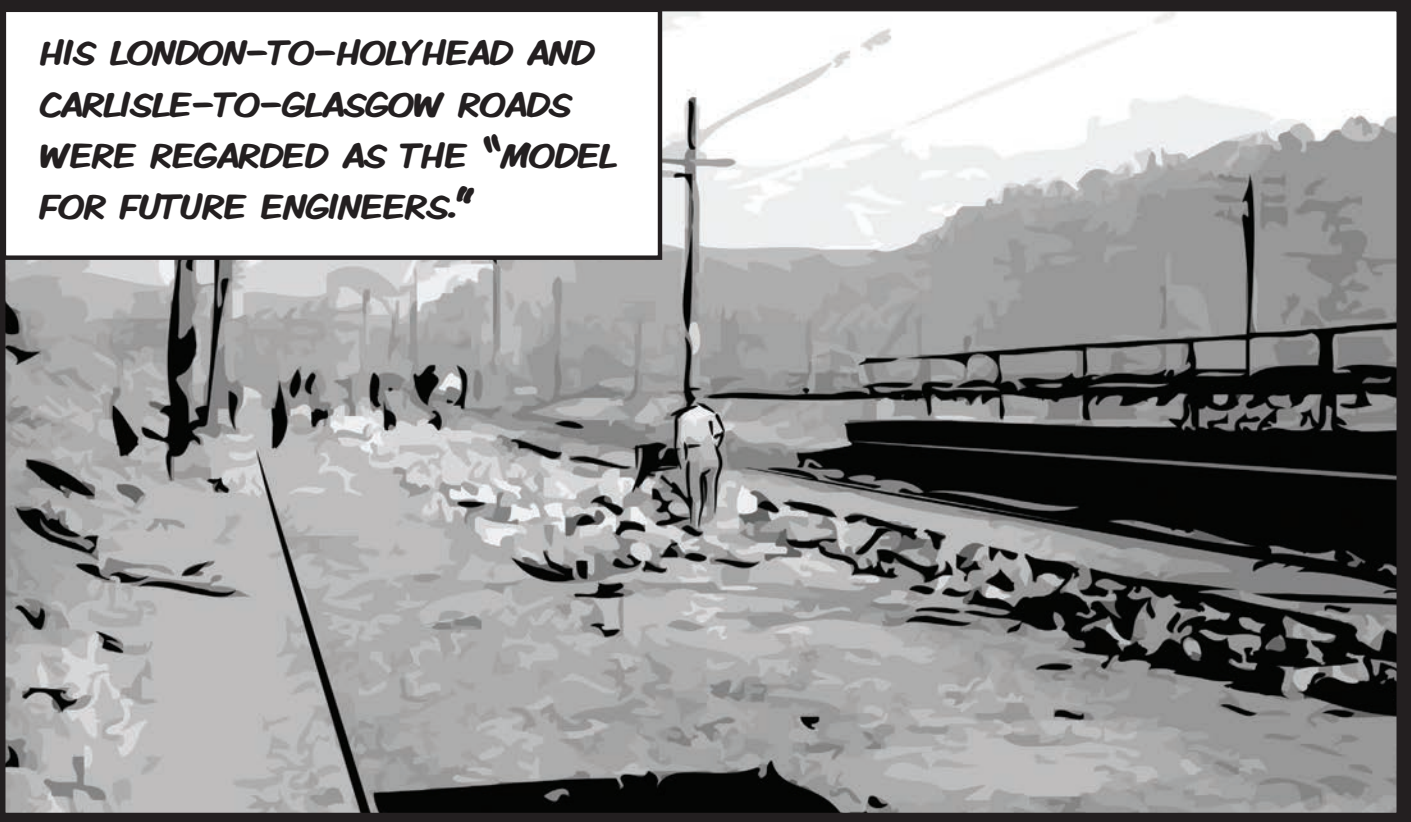
HE MANAGED TO OBTAIN GRANTS TO DESIGN ENGINEERING IMPROVEMENTS TO THIS ROUTE AND MANY OTHERS IN SCOTLAND, ENGLAND AND WALES.



TELFORD WAS PARTICULARLY CONCERNED ABOUT REDUCING GRADIENTS, BUILDING BRIDGES AND IMPROVING DRAINAGE ON ROADS TO CONNECT COMMUNITIES AND ENABLE REDUCED TRAVELLING TIME.



HIS LONDON-TO-HOLYHEAD AND CARLISLE-TO-GLASGOW ROADS WERE REGARDED AS THE "MODEL FOR FUTURE ENGINEERS."



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# BRIDGES

## SUPERHERO

**DR ROBIN SHAM**  
**'CAPTAIN CONNECTOR'**

## ARCH ENEMY

**LONG AND TORTUOUS**  
**WATERWAY ROUTES**

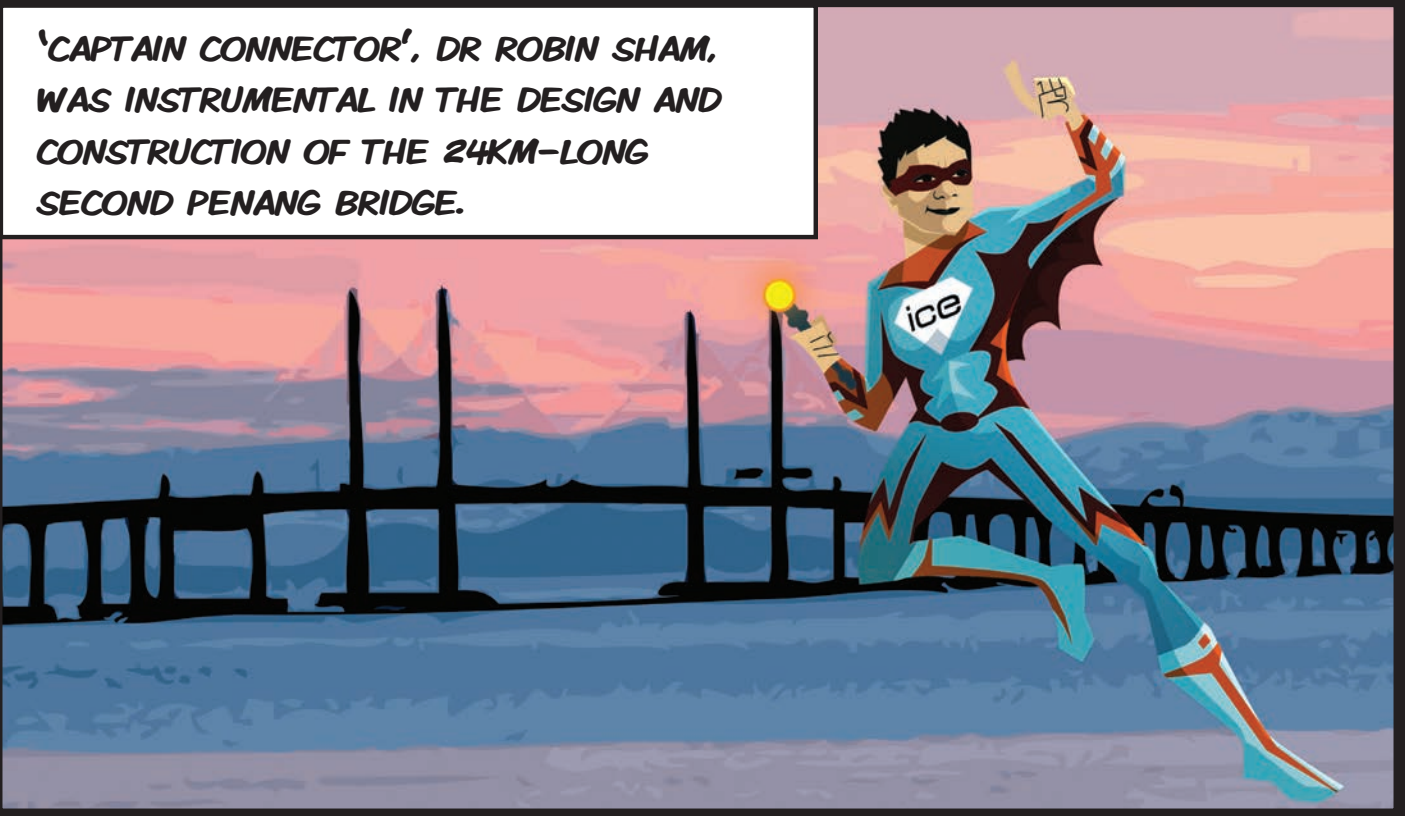
*THE FIRST PENANG BRIDGE LINKS THE MAINLAND OF MALAYSIA WITH PENANG ISLAND. SINCE 1985 IT HAS CONTRIBUTED SIGNIFICANTLY TO THE DEVELOPMENT OF PENANG AS A TOURIST AND INDUSTRIAL CENTRE.*



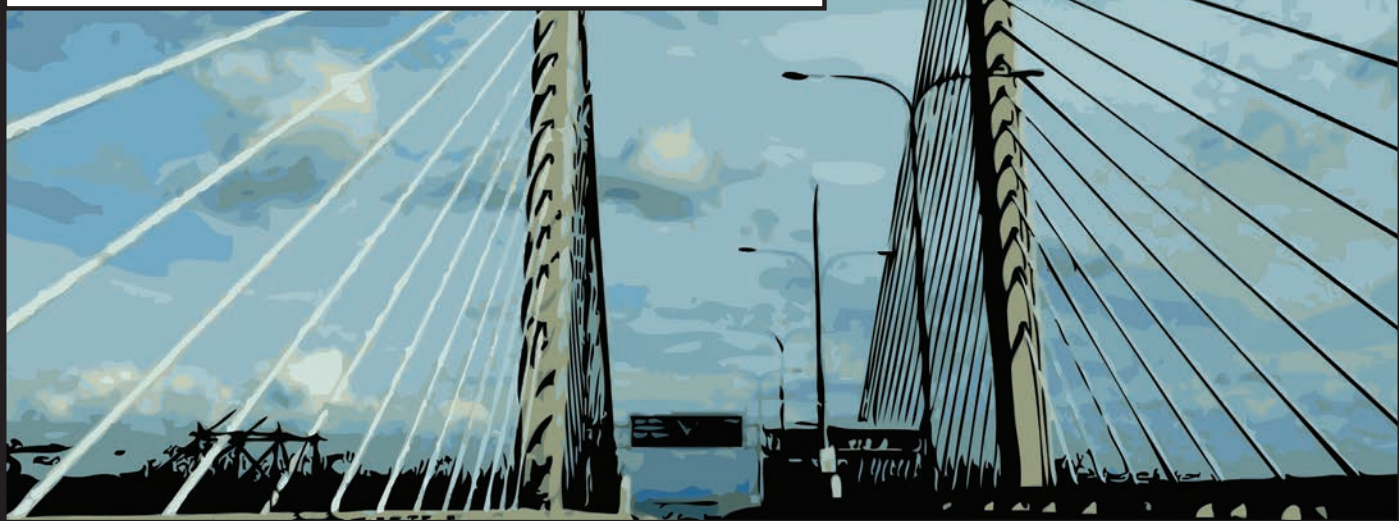
*10,000 VEHICLES A DAY WERE CROSSING THE BRIDGE, CAUSING CONGESTION, NECESSITATING THE BUILDING OF A SECOND BRIDGE.*



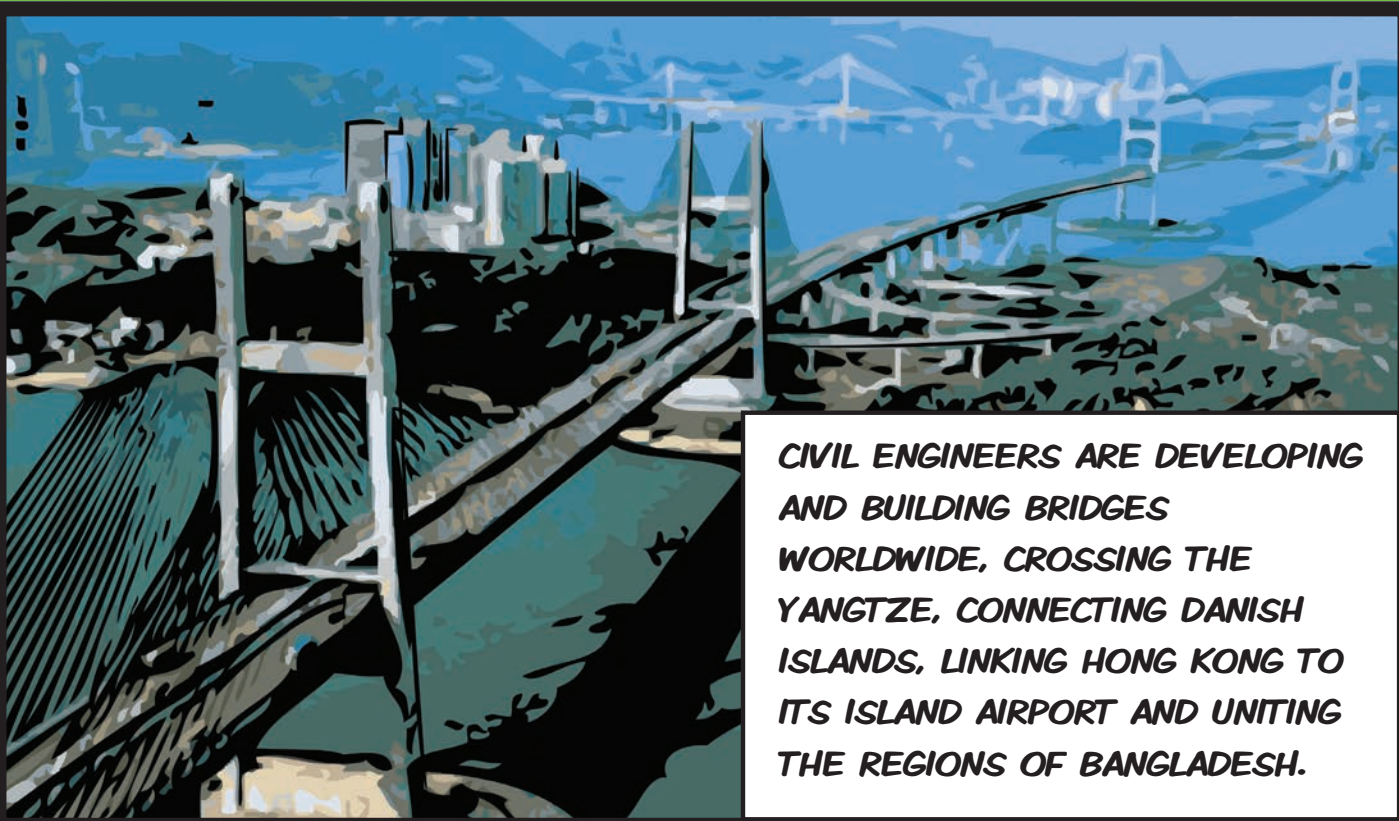
*'CAPTAIN CONNECTOR', DR ROBIN SHAM, WAS INSTRUMENTAL IN THE DESIGN AND CONSTRUCTION OF THE 24KM-LONG SECOND PENANG BRIDGE.*



*KNOWN OFFICIALLY AS THE SULTAN ABDUL HALIM MUADZAM SHAH BRIDGE, IT HAS 533 SPANS AND INCORPORATES DAMPING TECHNOLOGY TO RESIST THE FORCES OF EARTHQUAKES.*



*PENANG IS FULLY CONNECTED AND HAS BECOME ONE OF THE MOST VITAL ECONOMIC POWERHOUSES IN MALAYSIA.*



*CIVIL ENGINEERS ARE DEVELOPING AND BUILDING BRIDGES WORLDWIDE, CROSSING THE YANGTZE, CONNECTING DANISH ISLANDS, LINKING HONG KONG TO ITS ISLAND AIRPORT AND UNITING THE REGIONS OF BANGLADESH.*

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# RAIL

## SUPERHERO

**ISAMBARD KINGDOM BRUNEL**

**'CAPTAIN INNOVATION'**

## ARCH ENEMIES

**IMPATIENT PASSENGERS**

**LONG DISTANCES**

*THE INDUSTRIAL REVOLUTION WAS CHANGING BRITAIN FROM A LAND OF FARMS AND VILLAGES TO ONE OF BIG CITIES AND FACTORIES.*



*IT WAS A TIME OF GREAT INNOVATIONS INCLUDING THE STEAM-ENGINE BY TREVITHICK AND GEORGE STEPHENSON'S LOCOMOTION.*



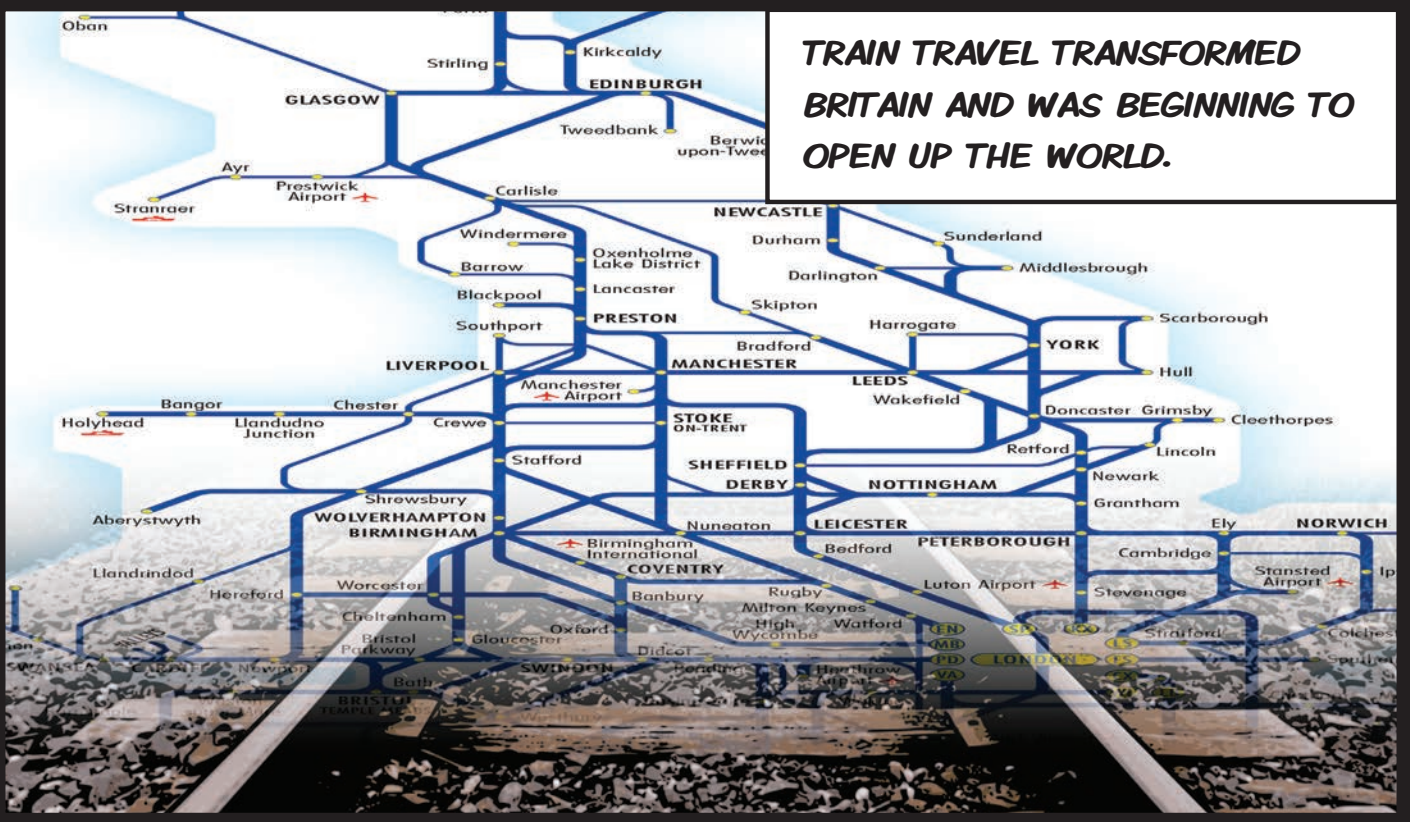
*IN 1830, THE LIVERPOOL AND MANCHESTER RAILWAY OPENED TO TRANSPORT GOODS AND PASSENGERS BETWEEN THE CITIES.*



**WITHIN A DECADE, MILLIONS OF PASSENGERS WERE TRAVELLING OVER THOUSANDS OF MILES OF BRITISH TRACKS. IN NEXT 10 YEARS 4600 MILES OF TRACK WERE LAID.**



**BY 1854, 92 MILLION JOURNEYS WERE BEING MADE IN ENGLAND ON A NETWORK OF 6,000 MILES.**



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# UNDERGROUND

**SUPERHERO**  
**ANDY MITCHELL**  
**'INFRASTRUCTO'**

**ARCH ENEMIES**  
**CONGESTION**  
**TRAVEL DELAYS**

*INCREASING NUMBER OF PASSENGERS WERE ARRIVING AT LONDON'S NEW MAINLINE TRAIN STATIONS IN THE 1850S.*



*THEY WERE FINDING THE ROADS CONGESTED AND A SLOW JOURNEY TO THEIR FINAL DESTINATION.*



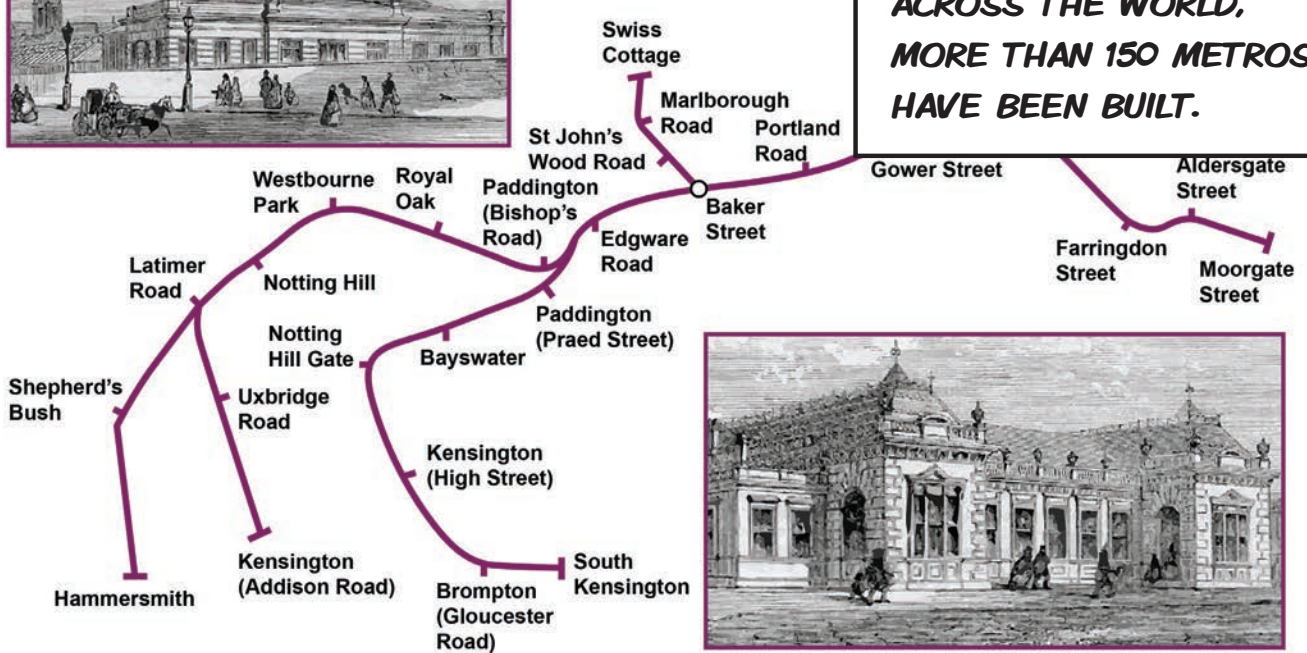
*JOHN FOWLER HAD THE FORESIGHT TO TUNNEL UNDER THE NEW ROAD AND LINK PADDINGTON AND KING'S CROSS TO THE CITY.*



**JOHN FOWLER WAS CHIEF ENGINEER FOR THE METROPOLITAN RAILWAY, IT OPENED IN 1863.**



**THE NETWORK QUICKLY EXPANDED IN LONDON. ACROSS THE WORLD, MORE THAN 150 METROS HAVE BEEN BUILT.**



**2018 MARKS THE OPENING OF THE NEW CROSSRAIL MAIN LINE RAILWAY, WHICH TUNNELS UNDER LONDON AND CONNECTS WITH THE TUBE STATIONS. THE DIRECTOR IS ANDREW WOLSTENHOLME.**

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