

**UNDERGROUND ITEMS FROM THE TELEVISION
AN OCCASIONAL SERIES
“INSIDE THE TUBE – GOING UNDERGROUND”
CHANNEL 5 – 21.00 TO 22.00
BROADCAST ON CONSECUTIVE MONDAYS
FROM 3 TO 24 APRIL 2017**

There was a total of four programmes in this series, all of which were presented by engineer and explorer Rob Bell. This review covers the first two programmes of 3 and 10 April. The third and fourth programmes will be reviewed in the next issue of *Underground News*. We should note that details published here are as broadcast, with any serious errors (fortunately, there were very few) noted as we go along.

THE WORLD’S FIRST DEEP TUBE LINE

The first programme began by saying that the London Underground is the world’s oldest Underground railway and is the lifeblood of London some 154 years after first opening. It is now carrying more passengers than ever, with 1.2 billion passengers per year. When the Underground first opened, people were travelling by horse and cart but its past has left a legacy. The programmes will visit ghost stations and places never seen by the public and will discover how the Underground was built.

This, the first programme, was devoted to the world’s first deep tube line – what is now the Northern Line which is used by 700,000 passengers each day. We were told that the Northern Line, one of the deepest lines, runs for 36 miles from north to south, crossing the river. When the first section of the line opened back in 1890 it was hailed as a marvel, an engineering miracle, as the streets and bridges couldn’t cope with a growing population. It was acknowledged that there were underground lines in tunnel just under the surface, but to get people from one side of the River Thames to the other, tunnels had to be much deeper.

Enter James Henry Greathead, a 29-year-old engineer, who devised a method of tunnelling deep under the ground. His first deep tube under the Thames is still in existence, even though it was closed some 117 years ago. The tunnels under the Thames led to King William Street station and we were taken on a trip down the tunnels just before they were closed off for the redevelopment of Bank station. The platforms of King William Street were 70ft below ground and we were taken to them via the spiral stairs, which still had the original C&SLR white tiles with a decorative pattern. The station tunnel vault still retained the glazed white tiles which were visible close at hand because of an extra level being built for sheltering in the Second World War. We then went into the trackless tunnel, which was lined with stalactites, which was the first tube tunnel built under the river that was built by Greathead’s invention – the Greathead shield. It was a revolutionary idea and was described as a cylinder that stopped the tunnel from collapsing onto the miners as it was being dug away at the face. The shield was hydraulically pushed forward into the earth and behind, cast iron segments were bolted together to shore up the tunnel. As the shield moved forward, it left an iron tube behind it. Of course, steam trains couldn’t be used at such a deep level and Greathead had considered pulling carriages through the tunnels by ropes or pushing them through with air. In the end, he took a gamble with new technology by using electricity. But even using new technology, conditions were poor – hot electrical equipment in the locomotives close to the driver, along with brake dust from the thick and solid brake blocks.

There was also the problem of how to get passengers between street and platform level. The answer was found in an American invention by Elisha Otis. He invented the elevator (lift, to you and me!), used in skyscraper buildings to transport people. It was realised that what could go up in the sky to transport people could also go down underground to transport them.

We were shown the crowds using the lifts at Goad Street station where the Station Assistant encouraged passengers to use the spiral stairs with 136 steps, despite signage telling people not to, except in an emergency! We were told that breakdowns and bottlenecks were always a problem at lift stations but in 1911 a better alternative was rolled out at Earl’s Court – the escalator. We were then taken to Angel station, which has the longest escalators on the network – the dangers of not treating

escalators with respect (sliding down the handrails or even 'skiing down them) were explained with such outcomes highlighted by the Station Supervisor!

The success of the pioneer and revolutionary tube line led to a flurry of investment and new deep level lines being built – what we know today as the Central, Bakerloo and Piccadilly lines. However, the British entrepreneurs soon ran out of money but salvation came from Charles Tyson Yerkes, an American financier with a 'shady' past. From 1900 he set about buying up the Underground and building lines that went beyond the centre of London. He had to dig deep, both literally and financially, and built the deepest underground station under Hampstead Heath – but it never opened. This was North End (more commonly known as Bull & Bush by staff), the Underground station that was partly built but never opened, 221 feet below street level. Construction stopped because of objections from the local residents, led by Dame Henrietta Barnett, a wealthy Hampstead resident. With the development potential around the proposed station, she purchased the 283 acres surrounding the proposed station area and bequeathed it to Hampstead Heath, meaning that it was impossible to erect any buildings in the area – thus the station was never completed. But the station eventually did find a purpose in the 1950s, which remained secret for decades. Never been filmed before, this was the floodgate control centre, a bunker where the Underground could be controlled in the event of a nuclear war, which would have been a key part in Britain's civil defence during the cold war. However, more powerful nuclear bombs made the control room redundant within a few years, as there would be no London, let alone an Underground system.

Yerkes, the father of our modern Underground, founded the Underground Electric Railways Company which combined competing Underground lines into an integrated network. We were told that in the 1930s¹, the Underground joined two lines together, what we now know as today's Northern Line. The project was hugely complicated – trains coming in from the south had to branch in and out again and the reverse happening with trains from the north. It was described as an engineering wonder at the time. This tangle of tunnels lies deep under the streets of Camden and after passenger services had ceased our presenter was taken with track engineers to maintenance work taking place on the newer and more reliable electric points.

Joining up the two lines to make today's Northern Line left an unwelcome legacy, as the extreme curve at Embankment northbound continues to cause headaches for platform staff with the excessive gap between platform and train. This is as a result of the station's history when the station was a terminus and was part of a huge loop under the River Thames. In 1926 the line was extended south to Kennington and the loop was sealed up and abandoned but the northbound platform had to be retained with its sharp curve. In the 1960s this led to an automatic "mind the gap" announcement which used the voice of Oswald Lawrence. His widow often comes to the platform to hear his voice and when it was replaced by a different voice she campaigned to have it reinstated, which it was. Also at Embankment, we were shown the ceiling-mounted flood doors that were fitted to prevent flooding in case of a breach of the River Thames, now long disused.

The programme then turned to sheltering in the Underground during the Second World War. But even then, Londoners were not always safe. At Balham, the station's Area Manager had done much research into the bomb disaster that occurred on 14 October 1940 as to why a deep tube station was so vulnerable. The bomb caused a large crater, into which fell a bus, fortunately without passengers at the time. But as serious as this was, it was nothing compared to the devastation 43 feet below ground at platform level. That night, some 600 people were sheltering at Balham station, who believed they were safe. But the bomb penetrated the station tunnel and exploded just feet above the sheltering families causing burst water mains and flooding the station tunnel. We saw a photo of the devastation and that the station clock had stopped at 20.02 – the moment of the explosion. A total of 68 people lost their lives on the platform that night, including the Station Master, who drowned in his office at the end of the platform.

The war brought widespread destruction across the Underground but it kept on running due to the dedication of its staff. However, plans to expand the Northern Line were put on hold, and plans to develop Highgate station into a major transport hub were also put on hold. The main line platform above the (then new) tube station were rebuilt in the 1930s but its potential was never realised and remain as a designated urban wilderness. We were taken to the high-level platform via the long-closed

¹ This was in fact in the 1920s when the Hampstead was joined with the C&SLR. This was the only stand-out error in the programme. Ed.

stairs from the ticket hall and were told that, post-war, London couldn't afford to complete the extensions – the partly completed work (all around North London) has since been reclaimed by nature. With a Wildlife Warden, we were taken into the abandoned tunnels at Highgate which is a bat sanctuary.

The programme then moved south to Kennington to see one of the newest tunnels and the oldest. This is the extension to Battersea, the first time that the Northern Line will have been expanded for well over 70 years. Having lain derelict for several decades, Battersea Power Station is being redeveloped in a £9-billion project and to serve the many offices and flats being built, the Northern Line will be extended from Kennington for two miles to serve it. We were taken underground at the construction site near Kennington, down a 25-metre-deep shaft to the junction where the new tunnels will meet the old. 200,000 tonnes of soil was dug out to create this access shaft. The tunnels at the junction are being built by hand and without a tunnelling machine as they are so close to the existing line, just as tunnels were dug 130 years ago. The new tunnelling has exposed the existing iron tube of the present Kennington loop line, which continues in use during the construction process. The main running tunnels will be driven by tunnel boring machines, using the same principles as used by Greathead almost 130 years ago but a lot quicker using modern day technology with remote controls. We were given a close look at the machines, which were being prepared for boring within a few weeks of the programme, which will require a 750-tonne crane to be brought in to lift them down into position. The work will take six months and 300,000 tonnes of earth will be removed. The extension will open in 2020.

THE HISTORY OF THE CENTRAL LINE

The second programme of the series was devoted to the Central Line, which transports 260-million passengers a year and purports to be the most packed line in Britain. It struggles with its past, being a marvel of Victorian engineering but is now battling this 19th century legacy to keep the network running today.

We began in the early morning at Hainault Depot with an Instructor Operator who, with his 33 years' service, has seen passenger numbers double. In days past the rush hour began around 07.30 but now it goes on for most of the day with queues forming outside some stations, even for the first trains. The infrastructure and the staff are pushed to the limit. We were told that the Central Line is London's most important transport artery but 120 years ago it was the line that nobody wanted to build – it was to be the first to transport people under the clogged city centre. However, Ernest Cassel was convinced that the line would be a 'gold mine', with people willing to pay good money to travel from their homes in the west to the city centre. He was a penniless German immigrant but rose to become one of the richest men in England and financial adviser to the Prince of Wales. The original Central London tunnels have become the line's greatest asset but also a great liability.

We were taken on a train from Holborn to the long-closed British Museum station and were told that the tunnels hadn't changed since they were built in the 19th century². We were shown that stations were built on the 'hump' principle, to slow trains down on arrival and speed them up on departure, thereby saving energy. When the Central Line was built, it incorporated many sharp curves³, which was necessary to avoid buildings above, but this slowed down capacity. To have built the line straight would have meant paying enormous sums of money to the owners of the most expensive buildings in London, under which the line would have passed. It was thus decided to tunnel under the roads instead and bend the route to fit. However, the decision to build around the buildings has left a costly legacy which the Underground has to battle with every day. Track curves not only make more noise but also wear out the track quickly, and each night an army of workmen descend to maintain and renew the track, the renewal time span varying with the location and amount of wear. Curved rails wear out ten times faster than straight rails, which is why the Central Line is so costly to maintain. Replacement rails arrive on site straight and are then bent as necessary to fit the curves.

We were told that the decision to go around rather than straight caused delays in construction, made more complex by having to build Bank station under one of the busiest road junctions in London,

² In theory that is correct, but the tunnels were 'enlarged' in the 1937-38 period.

³ "... many sharp curves" isn't really true, as it follows a fairly straight course. There is the Caxton Curve, west of Shepherd's Bush, just east of St. Paul's and the platforms at Bank – but that's about it. The extensions to Wood Lane and Liverpool Street added the worst curves, but these were subsequent additions to the line.

digging tunnels but without stopping the traffic above. Today, Bank is London's biggest subterranean station and has earned the title of the most confusing Underground station, having ten platforms, six lines and over seven miles of passageways. Building it back in 1900 was so complex that it pushed the Central Line's finances into the red. The curvature of the Central's platforms was necessary because of the close proximity to the Bank of England's vaults. By the summer of 1900 the Central London was almost ready but it was close to bankruptcy. Cassel and his partners then took a big gamble – there would be no first and second class travel, but everyone would travel together paying a flat fare of 2d, and thus the “twopenny tube” and social integration was born.

Since opening in 1900 Bank station has just got bigger and bigger and now 380,000 passengers use the station each day – we saw the pressure that the staff were under with a visit to the station control room – what was once a rush ‘hour’ is now often three intense hours or even longer.

Back in 1900 in the opening week, the Central London was doing so well that it was on course to deliver a healthy profit for Cassel and his investors. That good news was short lived because very soon it became evident that the vibration from the giant motor on the unsprung locomotives were causing damage to the buildings above, even though the trains did not pass directly underneath them. The solution was to do away with the huge motor on the locomotives and replace them with smaller motors fixed to each axle and distributing the weight along the train, which reduced vibration by 80%. (The modern-day version of motor changing was then featured taking place in Hainault Depot using hydraulic jacks and overhead cranes, the whole job of motor replacement now taking about two hours). Once the motor problem had been resolved, the Central London then went on to carry 45 million passengers a year. The trains were packed during the rush hour but were relatively empty during the day, and one man had an idea to fill the trains and also his pockets – one Harry Gordon Selfridge, who opened his world-famous department store in 1909 close to Bond Street station. He applied to not only rename Bond Street station to Selfridges but to build an entrance direct from the station into his store. Both were refused by the CLR but it didn't stop people using the line to shop in his store.

The programme then went on to say that Oxford Street is the biggest shopping street in Europe and then featured its busiest day of the year with 620,000 shoppers in the area in a festive shopping spree. The four Central Line stations on Oxford Street thus had to brace themselves for ‘the mother of all rush hours’ for the return traffic. We saw that Oxford Circus had to close because of overcrowding, with one impatient passenger trying to force his way in! Even over a century ago, the Oxford Street shops made the Central Line the busiest Underground line of all.

The Central Line was set to expand tenfold with ambitious plans in the 1930s but work was stopped soon after the beginning of the Second World War. The Gants Hill tunnels were turned into a vast armaments factory and stations were taken over for the war effort. At Bethnal Green, the unopened station became the biggest air raid shelter in London. On 3 March 1943, during the sounding of the air raid sirens, a lady and young child slipped and fell entering the station which caused a domino effect, the result being that 173 people lost their lives, 92 of them children. This was the biggest loss of life in the history of the Underground. Each year since the tragedy, survivors meet for a reunion and we saw interviews with some of them. After the war it took London Transport three years to complete the extensions and in doing so Oxford Circus became one of the Underground's busiest stations with 250,000 passengers a day. However, the Central Line also boasted the Underground's quietest station, Roding Valley. Filmed in the winter, we saw the Station Supervisor putting down salt on the icy station footbridge. The Supervisor remarked that his busiest time of the day was at 08.19, the last through train from Roding Valley to central London, as passengers could guarantee themselves a seat which they were unlikely to get if they had to change at Woodford! The Central Line extensions had seen passenger numbers rise and by the 1980s the line had hit its limit. Enter the new (1992 Tube Stock) trains which had fewer seats but more space. In addition, the line would be resigalled with the new trains operating in automatic mode with the driver operating the doors and starting the train. However, with a 90-second service being possible with automatic operation, and more trains in service for longer periods, this brought fresh problems – how to maintain the trains that spend less time in the depot and how to clean them quicker. In Hainault Depot a £1-million ‘hoover’ was installed in 2005 which blasts the dust and dirt out into a sealed track in the depot and into the ‘hoover’, saving time and a small army of workers which used to do it manually. The amount of dust and dirt extracted is best imagined rather than seen! We were then taken to Stratford station, the Central Line's major interchange station in East London, where automated trains on the Central and Jubilee lines has enabled an increase in capacity – traffic continues to grow.

The programme ended with reference to Crossrail, in the hope that the line, when opened, will take some of the pressure off the (almost) 120-year-old Central Line – it began by uniting London, in that all its passengers were ‘equal’, using “the twopenny tube”.