

A gazetteer of hydraulic power in London

Tim R Smith

Introduction

The first hydro-static machines, known as water-pressure engines, were found in mines in Central Europe in the mid-eighteenth century and in the Northern Pennines a few years later. An important development was the granting of a patent to Joseph Bramah, in 1795, for the hydraulic press. The press, according to Bramah's biographer, Ian McNeil, was second only to the steam engine in importance to industry. It found widespread use. A few nineteenth century examples are preserved in museums. In 1846 William George Armstrong demonstrated his hydraulic crane on the Town Quay at Newcastle, using the local water supply (of about 87 psi) to power it. Whilst there was a certain amount of interest in his low-pressure cranes, demand soared once Armstrong had introduced the weight-loaded accumulator and high-pressure hydraulic system in 1850. Armstrong manufactured hydraulic machinery at his Elswick Works, in Newcastle. After being in charge of the Royal Arsenal during the Crimean War, Armstrong began manufacturing guns, becoming the world's first plutocrat. His home at Cragside, Northumberland, was the first to be lit by Swan's incandescent electric lights, and is now owned by the National Trust.

Ralph Tweddell designed the first hydraulic machine tools, the firm of Fielding & Platt in Gloucester manufacturing them. Presses for the oil seed crushing industry were developed in Hull and Leeds, oil being used as the hydraulic fluid so as not to contaminate the product. Another Leeds development was that of the hydraulic forging press, the Kirkstall Forge being at the forefront. Edward Bayzand Ellington was the main protagonist in the setting up of public supplies of hydraulic power. The first public company was the Hull Hydraulic Power Company which began supplying its customers in 1877. It was followed by the London Hydraulic Power Company (1883), the Liverpool Hydraulic Power Company (1888), the Birmingham Corporation hydraulic supply, the Manchester Corporation Waterworks hydraulic supply and the Glasgow Corporation Waterworks hydraulic supply. Attempts to set up public supply companies in Bradford, Bristol, Leeds and Newport failed.

During the twentieth century, there was a trend towards the use of electrically driven pumps in hydraulic power stations (Figure 1). Many were the three-throw ram pumps made by the Hydraulic Engineering Company at their works in Chester. The Manchester firm of Mather & Platt manufactured electrically driven multi-stage turbine pumps for hydraulic power station use after World War I. The turbine pump had been developed for use in mine pumping. Although much new machinery was electrically driven, many firms did not replace their reliable hydraulic machinery. The Port of London Authority even went back to hydraulic cranes after trying electric ones. The decline of hydraulic power really came with the changes in the transport of goods after World War II, when containerisation revolutionised both cargo shipping and rail freight operations.

In London, hydraulic power was probably more widespread, with more varied applications, than anywhere else in the world. It was here that Joseph Bramah manufactured his hydraulic presses, patented in 1795. There were many early applications of Armstrong's system by both dock and railway companies. London had the largest public supply network, that of the London Hydraulic Power Company, a subsidiary of the General Hydraulic Power Company Ltd. Applications ranged from cranes, capstans and swing bridges in the port to theatre machinery, church organ blowers and even hydraulic vacuum cleaners. There were an estimated 120 separate hydraulic pumping stations and pump houses in London, though not all operated at the same time. Few survive. Even the London Underground system owes its very existence to hydraulic power since hydraulic presses, at first hand-pumped, were used to move the Greathead Shields forward as they burrowed their way through the London clay.

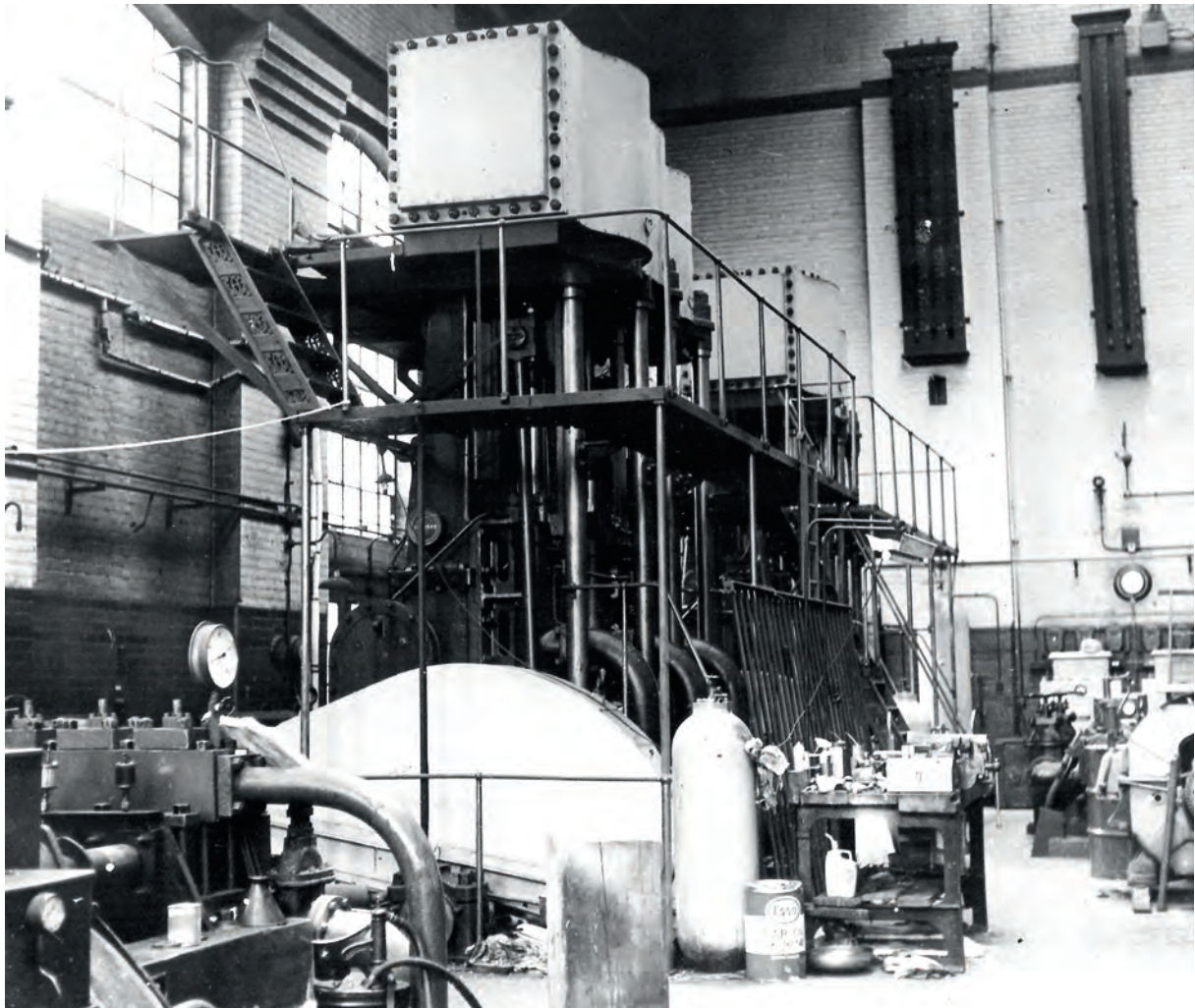


Figure 1. The triple expansion steam pumping engines at LHP's Grosvenor Road pumping station were converted to electric drive by replacing the flywheels with double helical gear coupled to electric motors, as seen here circa 1970. *GLIAS*

An important hydraulic machine in London in the second half of the nineteenth century was the hydraulic lift. The first ones were wagon hoists at Haydon Square and Paddington goods depots in the early 1850s. By 1970 many of London's railway goods depots were using them. The 'ascending room' of 1829 at the Regent's Park Colosseum is said to have been the first public passenger-carrying lift in Britain. It seems to have used the water balance principle with water being pumped back up to a roof-top tank. Many of London's later lifts also used roof-top tanks filled from the public water supply or recycled by pumping water back up after use. These were low-pressure lifts. Although there were a few high-pressure lifts before 1883 the number rose considerably with the advent of LHP.

Hydraulic lifts were used in warehouses, offices, hotels, hospitals, department stores and up-market private mansions. The City & South London Railway used them to carry passengers to and from the platforms of their stations. Although some other tube lines used one or two it was the electric lift that served most underground stations. The early twentieth century saw great rivalry between hydraulic and electric lifts. But lift manufacturers such as Waygoods offered their customers a choice. Nevertheless some hydraulic lifts survived in use until well after the demise of LHP in 1977.



Figure 2. Bishopsgate Goods Depot: this hydraulic wagon hoist on the upper level of Bishopsgate Goods Depot had a wooden framework above it. There were wooden gates at each end to prevent wagons from falling down the shaft when the platform was at the ground level. c. 1980. *Tim R Smith*

Select Gazetteer

74 Back Church Lane (TQ 3425 8102)

This large wool warehouse was built in 1897/8 for wool warehouse keepers Browne & Eagle, who had several wool warehouses in Tower Hamlets. Wool was imported from Australia and other colonies through the Port of London, to be sold on the London Wool Exchange. Buyers would visit the wool warehouses to inspect the lots of wool on the mornings before each sale. This warehouse was the last one still more-or-less in its original state, but has now been converted to other uses. There were fourteen hydraulic wall cranes, complete with jiggers of unknown make. There was also an internal hoist complete with its jigger. This hoist consisted of a pulley slung on a beam above trap doors, not a conventional lift. An earlier warehouse of 1889, built for the same company, stands opposite and the two were once linked by a bridge across the street. The 1889 warehouse has been converted to offices but retains its external wall crane jibs.

Beal's Wharf (TQ 3313 8027)

Beal's Wharf was rebuilt in 1856 following a fire. The opportunity was taken to install hydraulic cranes with steam pumping engine and an accumulator in the basement, making it the first of London's riverside wharves to use hydraulic power. The building now forms the eastern part of Hay's Galleria.¹

Bishopsgate Railway Goods Depot (TQ 3365 8218)

When Liverpool Street station was opened the old Bishopsgate passenger station was converted to a goods depot. The GER approached the London Hydraulic Power Company with a view to purchasing pressure water for the depot. But the LHP mains ran nowhere near and the capacity of their pumping stations was, in any case, insufficient to cater for the goods depot's proposed machinery at that time. The GER had to build its own pumping station, under the arches near Weller Street. All the necessary machinery was purchased from Sir W G Armstrong, Mitchell & Co. The remains of accumulators and a wagon hoist were still in situ but under threat of removal (Figure 2). Their present status is not known.

Brentford Dock (TQ 177 773)

A hydraulic system was established here by the Great Western Railway when engines, pumps and accumulators were brought from Bull's Bridge in 1858.² The system continued to be used until 1963 when it was abandoned after pipework was badly damaged by frost. Although the pump house has been demolished its brick footings and canalside wall have been retained as a feature.

Camden Railway Goods Depot (TQ 2827 8397)

On the west side of the main line, just north of the Regent's Canal, stands a former hydraulic accumulator tower which once served the former L&NWR Camden goods depot (Figure 3). It is now incorporated into a new development as a staircase tower. It had a number of unusual features. The bottom of the tower was 13 feet below ground level. When the tower was built is not known – it appears on the 1870 OS plan. To the north there was a red-brick hydraulic engine house of later date. Its original steam plant was replaced by electric turbine pumps by Mather & Platt in 1923. The building no longer survives.³

Camden Interchange Warehouse (TQ 286 841)

The Interchange Warehouse, built circa 1905 for the L&NWR, allowed interchange of goods between railway and the Regent's Canal. It was equipped with hydraulic platform cranes, one of which was preserved in the reception area, the building having been converted to office use. The tall tower supported a header tank for the sprinkler system.

Canal Works, Old Ford (TQ 3630 8359)

Waterlow's had a printing works here for printing railway tickets for foreign railway companies. Hydraulic ticket printing machines were used. The works has been demolished but the chimney survives as a feature.⁴

Cleopatra's Needle (TQ 3056 8053)

Cleopatra's Needle was raised to its position on the embankment using four Tangye hydraulic jacks. Tangye's used this fact to good effect in their advertising.⁵

Commercial Road Goods Depot (TQ 3415 8101)

Commercial Road Goods Depot was built by the London, Tilbury & Southend Railway to handle traffic to and from Tilbury Docks. The depot opened in 1886 but the large warehouse above it, leased to the dock company, was not completed until 1887. A hydraulic pumping station was built in Hooper Street to serve the depot and warehouse. The contract for hydraulic machinery went to Sir W G Armstrong, Mitchell & Co, whose tender of £25,000 was less than that of Messrs Tannett-Walker of Leeds. Two 150hp steam pumping engines were housed in the upper floor engine room with four Lancashire boilers underneath. The accumulator tower contained two weight-loaded accumulators. The goods depot was demolished in the late 1970s but the hydraulic pumping station survives, listed Grade II and converted too ffices. The accumulator weight-cases have been removed leaving only the cylinders, rams, crossheads and guides.⁶

Connaught Road Swing Bridge (TQ 4160 8055)

The turntable and hydraulic machinery of the Connaught Road swing bridge, of 1880, have been preserved in situ. The bridge carried a single line railway and a single track, public road across the passage between the Royal Albert and Royal Victoria Docks. It has been replaced by a high level swing road bridge and a low level swing footbridge. The railway crosses the passage in tunnel, as the passenger railway always has.

Connaught Road Tunnel (TQ 417 806)

The railway tunnel by-passing the Connaught Passage was drained using hydraulically powered pumps that are said to be still in situ though superseded by submersible pumps.⁷



Figure 3. Camden Goods Depot: the accumulator tower, on the far side of the railway and just right of centre, was built well before the pumping station building to its right. 1980s. *Tim R Smith*

Crossness Sewage Pumping Station (TQ 484 811)

The original manually-operated penstocks of 1862 were replaced, in 1884, by four hydraulic penstocks which can still be seen today. Each penstock was raised and lowered using a cylinder and piston arrangement controlled via 'D' slide valves. A hydraulic power supply of 800 psi was provided.⁸

Deptford Dockyard (TQ 368 784)

The Dockyard's hydraulic system was supplied from a small pumping station with two separate accumulator towers. The buildings have been demolished.

Deptford Sewage Pumping Station (TQ 376 772)

Hydraulic gear, supplied via an accumulator, was used to raise the screens. The hydraulic plant has all been removed.

Earl's Court Exhibition Hall (TQ 253 783)

The floor in the centre of the Earl's Court Exhibition Hall could be lowered on hydraulic presses to form an Olympic sized swimming pool. When in its upper or lower positions the floor, which weighed 720 tons, was supported on fixed struts, which were removed before the floor was raised or lowered. The floor was in three sections, each 95 feet by 65 feet, and raised by 26-inch rams made by Fraser & Chalmers. Originally the presses were powered from the LHP mains but later a self-contained system with electric pumps was used. The Exhibition Hall has now been demolished.⁹

East India Dock (TQ 3853 8079)

Built in 1857-8 to serve the East India Dock, this pumping station on Naval Row was electrified in 1926 and taken over by LHP in 1960. It closed in 1970. After various alternative uses it was converted to dwellings in 2000. The building comprised, from the east, accumulator tower, engine house, boiler house. The chimney has been demolished.¹⁰

East India Dock Basin (TQ 391 808)

At the entrance lock the four hydraulic gate engines, of the double-acting type directly coupled to the gates, survive and are visible through gratings. The hydraulic sluice mechanisms and a number of hydraulic capstans have also been retained.

Farringdon Road Railway Goods Depot (TQ 3145 8205)

The hydraulic pumping station and the GNR goods depot that it served were demolished but the vestigial remains of the pumping station could be seen under the Vine Street Bridge and the Clerkenwell Road bridge. The service pipes from the LHP mains in Farringdon Road could also be seen attached to the retaining wall.

Finsbury Park (TQ 3125 8683)

The Great Northern Railway pumping station here has been demolished.

Gallions (TQ 439 802)

There were a few hydraulic capstans around the entrance lock, some by the East Ferry Road Engineering Works Company Ltd, dated 1916. The swing bridge over the Royal Albert Dock entrance has gone as has the modern accumulator tower which stood near the King George V entrance. The hydraulic pumping engines were housed in the impounding station.

Greenland Dock (TQ 364 791)

Much hydraulic machinery has been preserved around the Greenland Dock including the machinery and turntable of the Armstrong bridge that carried Redriffe Road over the Russia Dock Passage (TQ 362793). There are a number of three-cylinder capstans, with cylinders set at 120 degrees to each other and driving a crank on the spindle directly. Some are by Carrick & Wardale of Gateshead. Others are anonymous but are probably by Armstrong. There is one capstan powered by a two-cylinder Armstrong hydraulic engine. At the entrance lock there is a hydraulic swing footbridge, hydraulic sluice gear and direct-acting hydraulic gate engines. An earlier form of gate engine is plinthed further along the dock quay.

Her Majesty's Theatre, Haymarket (TQ 2973 8050)

Hydraulic machinery here, including the safety curtain which was still operated hydraulically, was photographed by English Heritage in the 1990s. Current status is not known.

Hermitage Entrance, London Docks (TQ 3416 8020)

The hydraulic pumping station of 1856 was demolished in the late 1990s. The present building on the site is pure pastiche. The PLA impounding station opposite had hydraulic gear for raising and lowering the screens, with self-contained pumps.¹¹

Kensal Green Cemetery (TQ 230 825)

Built by Archibald Smith of Leicester Square in the late 1830s, the lift, which was used to lower coffins into the catacombs, has been restored by the Dorothea Restoration Engineers.

Kennington Underground Station (TQ 3165 7830)

The stations of the City & South London Railway were equipped with hydraulic lifts, pressure water coming through pipes laid in the tunnels from a pump house at Stockwell. Kennington is the only station to retain its lift dome which contained the sheaves at the top of the lift shaft (Figure 4). A model of a pair of Armstrong lifts can be seen at the London Transport Museum.



Figure 4. Kennington Tube station: Kennington is the only City & South London station still to have its dome, which housed the sheaves above the hydraulic lifts. 1981. *Tim R Smith*

Kensington Court (TQ 259 795)

Under an agreement between the developers, the Hydraulic Engineering Company and the General Hydraulic Power Company, the houses in Kensington Court were provided with direct-acting hydraulic lifts in place of the back stairs. The necessary pressure water, at 450 psi, was supplied from a nearby pumping station built for the purpose. A return main took waste water back to the pumping station, a 160 psi accumulator being connected to the return main to act as a brake for descending lifts. The water was then re-used. Once the LHP mains reached Kensington pressure water from LHP was used, being reduced to 450 psi at the pumping station. The former pumping station has been converted into a residence and is known as 'The Pump House'.

Kensington 7 Sheffield Terrace (TQ 253 800)

There was a hydraulic passenger lift on these premises, once supplied from the LHP mains but, after the demise of LHP, with its own power pack. The current status is not known.

King's Cross Goods Yard (TQ 3005 8353)

The Great Northern Railway were early users of Armstrong's high-pressure hydraulic system, ordering cranes, a steam pumping engine and accumulators in February 1851 for the King's Cross Goods Yard. In 1881 the pumping station was enlarged to cater for the introduction of capstan shunting in place of horses, hydraulic machinery being supplied by Tannett Walker & Co. of Leeds. Electrically-driven three-throw ram pumps were installed in 1927 and the pumping station closed in 1958, after which power was taken from LHP. The Hathorn Davey electric pumps, capable of delivering 150 gallons per minutes were sold to the Liverpool Hydraulic Power Company to be installed at Athol Street. One has been preserved in Liverpool.

The pumping station was demolished some years ago, though the lower parts of walls survived until recently. There are still a few hydraulic capstans and fairleads around the site. At the north-east corner of the Midland Goods Shed an accumulator survives, as does a small pump house built into the goods shed. It housed one



Figure 5. Ludgate Circus: Aldous & Campbell supplied this wall-crane which can still be seen in Ludgate Circus. Its hydraulic jigger would have been mounted on the inside wall of the building. 2007. *Tim R Smith*

electrically-driven pump, installed as a wartime emergency measure and controlled automatically by the adjacent accumulator.¹²

Kirkaldy's Testing Museum, 99 Southwark Street (TQ 3185 8026)

On the ground floor is the large hydraulic testing machine made by Greenwood & Batley to the designs of David Kirkaldy. It can perform tension, compression and torsion tests. In the basement there is a hydraulic chain testing machine and a concrete testing press, the latter made by Musgrave Bros. of Crown Point Foundry, Leeds. There is also a hydraulic intensifier of 1924 by the Hydraulic Engineering Company.

Isle of Dogs, Launching Site of the Great Eastern (TQ 375 784)

Brunel's huge ship, the Great Eastern, was built at John Scott Russell's yard on the Isle of Dogs and launched with the help of hydraulic jacks made by the Tangye Brothers of Birmingham. Tangye's later used the slogan 'We launched the Great Eastern and the Great Eastern launched us!' The launch site has been excavated and opened to public view.

Leytonstone (TQ 3930 8690)

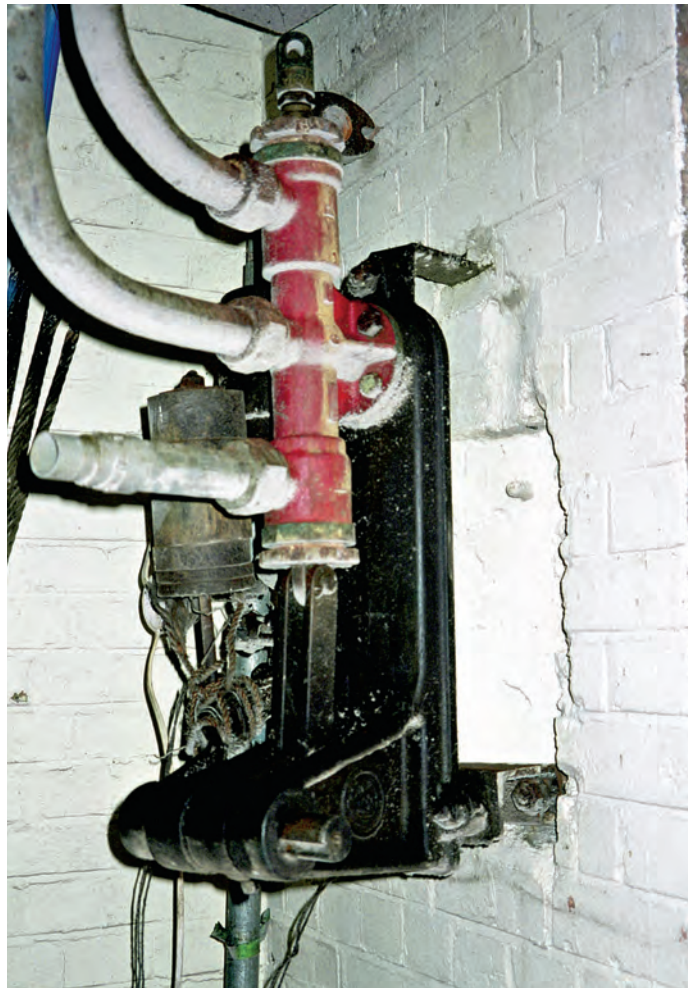
An inclined wagon hoist was built here to convey wagons from the viaduct level to a ground level yard and back. It was built by the Hydraulic Engineering Company and featured in their catalogues. The wagon hoist has gone, but its location can be discerned in the viaduct brickwork. Remains of a hydraulic capstan and fairleads survived on the viaduct.

London Palladium (TQ 2918 8115)

Hydraulic machinery here, including the safety curtain which was raised and lowered by a hydraulic jigger housed along and under the front of the stage, was photographed by English Heritage in the 1990s. Current status is not known.

Figure 6. Metropolitan Wharf: Many hydraulic wall-cranes and lifts were fitted with Aldous & Campbell piston valves. This one controlled a lift at Metropolitan Wharf. 2007.

Tim R Smith



London Transport Museum, Covent Garden (TQ 305 809)

On display are a Greathead Shield, with hand-pumped presses, and a model of the Armstrong lifts as supplied to the City & South London Railway.

Ludgate Circus (TQ 3183 8110)

On one of the buildings in this street there is a wall-crane jib by Aldous & Campbell who were manufacturers of hydraulic machinery (Figure 5). Later the firm became a subsidiary of the General Hydraulic Power Company.

Metropolitan Wharf, Wapping Wall (TQ 353 804)

Two of the four warehouses to the west of King James' Stairs had hydraulic machinery in situ. Warehouse 'A', built circa 1862–3 by William Cubitt, had a suspended hydraulic lift of 1893, by the Hydraulic Engineering Company of Chester. A landside wall-crane had an associated jigger, also by the Hydraulic Engineering Company. In Warehouse 'D', at the west end of the range, there were three hydraulic wall-cranes (two waterside and one landside). One of the waterside cranes was a luffing crane, with two associated jiggers. Its control cabin also survived, though devoid of equipment. Also in 'D' was the hydraulic machinery of a suspended hydraulic lift, circa 1898 (Figure 6).

Midland Grand Hotel, St Pancras

The Midland Grand Hotel at St Pancras opened in 1873. The original idea was to use low-pressure direct-acting lifts supplied from header tanks in the eastern tower and the central tower. But the Midland's engineer calculated that the capacity of the tanks in the towers would be insufficient for the number of lifts envisaged. So, in the eastern half of the building, completed first, Armstrong high-pressure suspended lifts were

installed instead. The high-pressure supply came from a pumping station just north of the passenger station, originally built to supply a wagon hoist and shunting capstans. Unfortunately, in 1874 the rope broke on the passenger lift. Armstrongs replaced it but the Midland decided that the passenger lift in the western section would be a low-pressure direct-acting one. All luggage lifts and service lifts used the high-pressure supply, except for one hand-worked lift – probably a dumb waiter. The water tank in the central tower supplied the one passenger lift.

Millwall Dock (TQ 377 791)

The pumping station here has been demolished. It survived into the 1980s.

Millwall Dock Entrance (TQ 3715 7905)

At the entrance to the Millwall Dock, on the west side of the Isle of Dogs, a hydraulic gate ram has been preserved. Nearby there is a hydraulic capstan.

Mint Street Goods Depot (TQ 3386 8083)

The Midland Railway's Mint Street Goods Depot, on the edge of the City, was equipped with hydraulic cranes and a wagon hoist when it opened in 1862. Horse shunting was replaced by hydraulic capstan shunting in 1882. The depot was partly housed underneath the arches of the London & Blackwall Railway viaduct. The accumulator tower, a replacement originally planned for one accumulator but altered to house two, was completed 1902–3. The tower, an empty shell, once a prominent feature on Royal Mint Street, has been demolished.¹³

Museum in Docklands (TQ 372 806)

On display is a jigger, by the Hydraulic Engineering Company of Chester, taken from a warehouse in Wapping. It has been remounted against the museum wall.

Nelson Dock (TQ 3655 8026)

A hydraulic patent slip engine has been preserved in the redevelopment of Nelson Dock into an hotel.

Nichols & Clark Warehouse, Blossom Street, E1 (TQ 3345 8205)

There are said to be three hydraulic crane jiggers in this warehouse.¹⁴ Current status not known.

Poplar Dock (TQ 383 804)

The North London Railway's Poplar Dock was the first dock in London to have hydraulic power, in 1851. The Northumberland & Durham Coal Company set up three hydraulic derricks on the East Quay for the unloading of colliers. The company ran coal trains from there to depots along the North London Railway to Camden. In the 1870s a new basin was built to the west of the original dock and the opportunity was taken to enlarge the hydraulic system with a new pumping station (TQ 3804 8063) and three remote accumulators (Figure 7). The pumping station was demolished to make way for the Docklands Light Railway, but two of the accumulator towers survive, one on Preston's Road (TQ 3835 8026) and the other in the car park of the New Billingsgate Market (TQ 3810 8038). In the latter, the remains of the accumulator survive in the 17 feet deep pit below the tower. In the north-east corner of the dock a projecting platform has the stone bed of a 30-ton hydraulic crane which was installed in 1877–8 by Tannett Walker & Co. On the west side of the entrance lock is a hydraulic capstan missing its capstan head. It had a Brotherhood hydraulic motor and was made by the Hydraulic Engineering Company (Figure 8).¹⁵

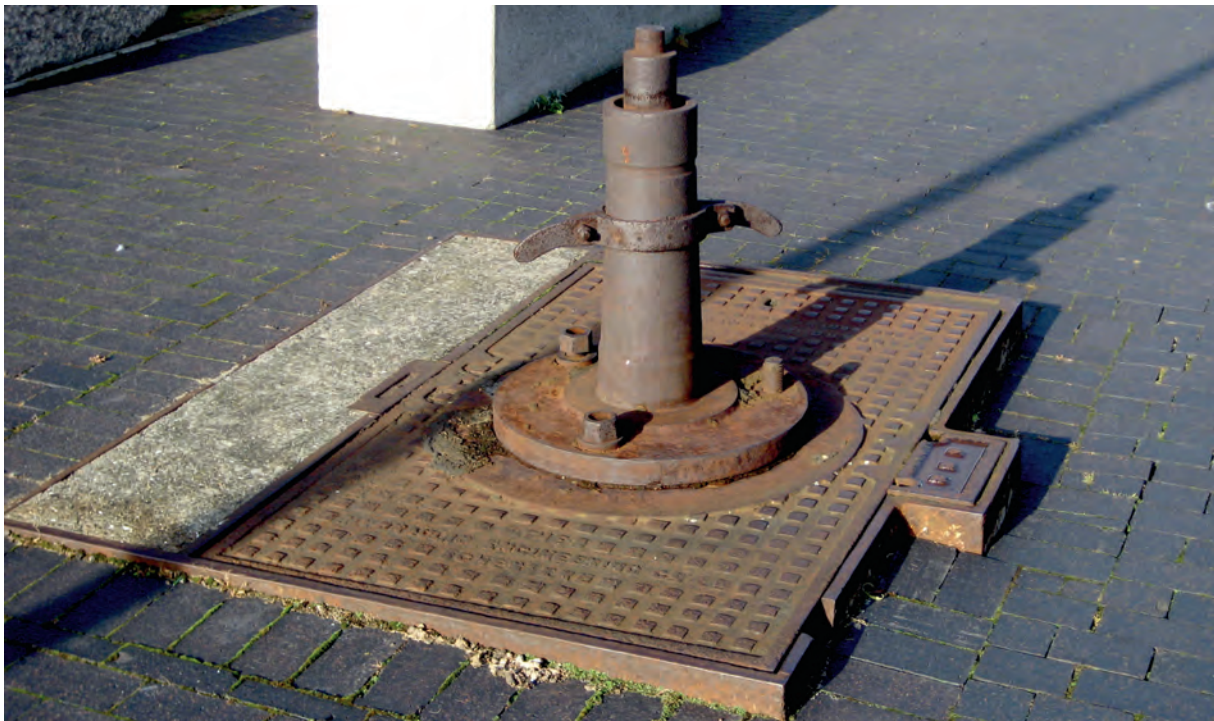


Figure 7. Poplar Docks NLR Pumping Station: viewed from the entrance to the docks in Preston's Road, the pumping station can be seen on the far side of the site with its accumulator tower prominent. 1980s.

Figure 8. Poplar Docks NLR Brotherhood Capstan: a Brotherhood capstan can be found on the west side of the entrance passage to the docks from Blackwall Basin. It has, unfortunately, lost its head. 2008. *Both Tim R Smith*

Poplar Dock Hydraulic Pump House, Duthie Street (TQ 3842 8063)

The Midland Railway's dock at Poplar was supplied with hydraulic power from a pumping station built in 1882 in Duthie Street. Machinery supplied by Sir W G Armstrong, Mitchell & Co. included two accumulators loaded to 720 psi. The chimney has been demolished but the red brick pump house and accumulator tower survives, and is in alternative use.¹⁶

Regent's Canal Dock (TQ 363 810)

The original hydraulic pumping station of 1852, which stood on the west side of Commercial Road locks (TQ 3634 8110) has been demolished. The second hydraulic pumping station of 1869 was housed under an arch of the London & Blackwall viaduct, with boiler house and accumulator tower to the north. The accumulator

tower (TQ 3645 8186) survives and has been occasionally open to the public, stairs having been inserted into the weight-case of the accumulator and a viewing gallery placed on the roof. The third hydraulic pumping station was built in 1898 on Narrow Street, on the site of the original entrance lock (TQ 3624 8084). It has been demolished.¹⁷

LHP Rotherhithe Pumping Station, Renforth Street (TQ 3538 7958)

The London Hydraulic Power Company's Rotherhithe pumping station began work in 1903. It originally housed eight inverted vertical triple expansion steam pumping engines. These were supplemented, in the late 1920s, by a Parson's steam turbine. The station was electrified in the early 1960s. The buildings have been converted into flats.¹⁸

Rotherhithe, Hope Sufferance Wharf (TQ 3509 7983)

A hydraulic crane survives. Unfortunately the control cabin has been removed.

St Katharine Docks (TQ 341 806)

Little survives of the once extensive hydraulic system here. One wall of an accumulator tower could be found until recently. Several cranes, which were mostly hydraulic, have been relocated on new buildings, though not necessarily in positions they would have originally occupied. One wall-crane, by the Hydraulic Engineering Company of Chester, has been set up with its hoisting and slewing jiggers on view, in a frame outside the hotel that is on the site of 'A' warehouse. The public can operate the crane by pushing a button.¹⁹

St Mary Magdeline Church, Richmond (TQ 1793 7483)

A hydraulic organ blower with a single-acting hydraulic engine, by Watkins & Watson, mounted horizontally worked a feeder and bellows, also horizontal and rail-mounted. The supply and waste pipes are in situ. A pressure gauge is calibrated up to 150 psi, though the supply pressure is likely to have been much less.

St Pancras Goods Depot, Reapers Close, NW1 (TQ 2969 8381)

Hydraulic power was used here from the 1860s when the goods station was opened. The St Pancras Goods pumping station served both the goods station and the large warehouse on the opposite side of the canal. This warehouse was built to store ale and porter from Bass of Burton-on-Trent. The pumping station was closed c.1908 after which power to the depot was supplied from Somers Town depot. The canalside buildings of the St Pancras Goods pumping station survive, much altered, and now used as the Jubilee Waterside Centre.

St Pancras Station (TQ 2994 8330)

Before the works for the Channel Tunnel Rail Link began, the remains of the pumping station which served St Pancras passenger station could be seen beside the gasworks to the north of the station. The pumps and boilers were under the viaduct. The chimney and accumulator tower projected above the viaduct and it was the lower brick courses of the tower which could be seen. There are several pictures of the tower as Midland Railway locomotives were often photographed in front of it.

St Paul's Cathedral

Hydraulic organ blowers were used here from the 1890s. In 1912 an Ellington automatic injector fire hydrant was installed. It survives, out-of-use in the Cathedral, having been moved from its original position. Both the organ blowers and fire hydrant were supplied from LHP.²⁰

Figure 9. Shad Thames accumulator: the accumulator from Shad Thames Storm Water Pumping Station is now on display at the Museum of Science and Industry in Manchester. The accumulator was made in Manchester and has cast iron blocks to provide the weight. 2009.

Tim R Smith



Shad Thames Storm Water Pumping Station, Maguire Street SE1 (TQ 3388 7995)

The screens were raised by hydraulic power. There were two three-throw ram pumps each driven by a gas engine, 5½" bore by 9" stroke, by Campbell, and an accumulator, loaded to 1200 psi, thought to be by Mather & Platt. All have been removed but the accumulator is now on display at the Museum of Science and Industry in Manchester (Figure 9). Instead of a weight-case it has cast-iron block weights.

Somers Town Railway Goods Depot. Euston Road, (TQ 2984 8303)

Built by the Midland Railway in the 1880s, Somers Town goods depot stood on the site of the new British Library. It had its own hydraulic pumping station, with machinery by Tannett Walker & Co of Leeds. During the 1930s the steam plant was replaced by four two-throw single-acting pumps driven by 100 hp 3-phase motors with belt drive and double-helical gear. There were two station accumulators and a small remote accumulator. The former were retained after the supply was switched to LHP in the late 1950s. All have now been demolished.

South West India Dock (TQ 3718 8013)

The former PLA impounding station is still in use. It has hydraulic gear for raising the screens, with self-contained pumping plant.

Stoney Street, SE1 (TQ 325 803)

There are a few wall-cranes on the west side of the street. One of them, serving the arches of the railway viaduct, retains its small hydraulic jigger, mounted on the inside wall next to an emergency exit.

Strand Palace Hotel (TQ 305 808)

The remains of a hydraulic lift, by R Waygood & Co, survived in 1989. The hotel was supplied with pressure water at 1000 psi though a special main from LHP's Falcon Wharf Pumping Station across the river on Bankside.

Theatre Royal, Drury Lane (TQ 3055 8103)

Hydraulic stage machinery working bridges is still in situ.

Tower Bridge (TQ 3363 8010)

The famous twin bascule bridge was opened in 1894. Hydraulic power for moving the bascules was supplied from a pumping station established under the arches of the southern approach viaduct. This now forms part of the Tower Bridge Experience visitor attraction. Two of the four Lancashire boilers, by Crosthwaite of Leeds, have been kept. The feed pumps are by Clarke, Chapman & Co Ltd of Gateshead, to Woodeson's patent (111866 of 1917).

The two magnificent 1894 steam pumping engines by Sir W G Armstrong, Mitchell & Co, can be seen in the adjoining arches. They are twin tandem compounds with the pumps driven from extensions of the piston rods. The double-acting force pumps are to the standard Armstrong design but with the valve assembly alongside the pump barrels rather than under the floor. The engines worked independently to form two duplicated hydraulic circuits.

The accumulator tower houses two weight-loaded accumulators, each 20 inches diameter by 35 feet stroke (Figure 10). The lower sections of the cylinders are sunk into wells below the tower. Each accumulator controls one of the steam pumping engines. Each has two forms of relief valve, the standard Armstrong relief valve as originally fitted and a Hydraulic Engineering Company relief valve fitted to cope with the introduction of LHP supply in the 1970s.

On display is one of the hydraulic engines which raised the bascules. In the engine rooms there are a bascule drawing engine ram cylinder, a crosshead assembly and a bascule locking bolt assembly. There are two packing presses used to compress tallow and hemp packing for the pumps. There is a direct acting hydraulic lift which was used to raise tubs of coal to a high level tramway over the coal store.

Some machinery remains within the bridge piers.²¹

Tower of London (TQ 3341 8053)

During the nineteenth century the Tower was used for the storage of munitions. Hydraulic power was introduced in the 1850s. In 1863 the pumps were relocated to a new pump house and accumulator tower at the west end of the wharf, outside the main complex. The pump house survives as a souvenir shop; the accumulator tower has a bureau de change on the ground floor. From ca. 1885 power for the cranes and a lift inside the White Tower was taken from the LHP mains.

Tower Subway, Tower Hill (TQ 3343 8060)

The Tower Subway was the second tunnel under the Thames, after the Brunels' Thames Tunnel. It was begun in 1868 and completed within a year by Greathead using Barlow's tunnelling shield, now known as the Greathead Shield, the shield used subsequently to drive the 'tube' railway tunnels through the London Clay. The shield was moved forward using hand-pumped hydraulic presses.

Figure 10. Tower Bridge accumulator: in contrast to the Shad Thames accumulator, those at Tower Bridge, like this one in the engine room, have wrought-iron weight-case filled with Thames ballast. Weight-cases were more usual for accumulators housed in towers. Free-standing accumulators were more likely to have cast-iron weights, making them more compact.

2009. *Tim R Smith*



After the opening of Tower Bridge the subway fell into disuse and was sold to the London Hydraulic Power Company who used it for their cross-river mains. In the 1920s LHP built the present 'kiosk' on Tower Hill, which still bears the company's name. After LHP ceased its operations the subway passed to Thames Water. Water pipes had been laid through the subway for many years.

Union Chapel, Compton Terrace, Islington (TQ 3168 8460)

The magnificent Father Willis organ was fitted with four low-pressure hydraulic organ blowers by Watkins & Watson. Although superseded by Discus blowers, the hydraulic blowers survive in a dark chamber behind the organ (Figure 11).²²

LHP Wapping Pumping Station, Wapping Wall (TQ 3530 8053)

The London Hydraulic Power Company built their third large pumping station in Wapping, opened 1891, to serve the London & St Katharine Docks and the nearby riverside warehouses. It was the first to use inverted vertical, triple expansion steam pumping engines, of which there were six. In the 1920s two Mather & Platt electrically driven turbine pumps were installed to allow the original six Fairbairn-Beeley boilers to be replaced by three large Babcock & Wilcox boilers. In turn, this allowed the building of a turbine house, on the south side of the engine house, for a large Parson's steam turbine. In the 1950s the steam plant was replaced by seven electrically driven three-throw ram pumps. Five of them were constant speed pumps (two large and three small), and two were variable speed pumps with dc motors controlled from a small 'pilot accumulator' (Figure 12). The large accumulators became redundant. Like other LHP pumping stations,

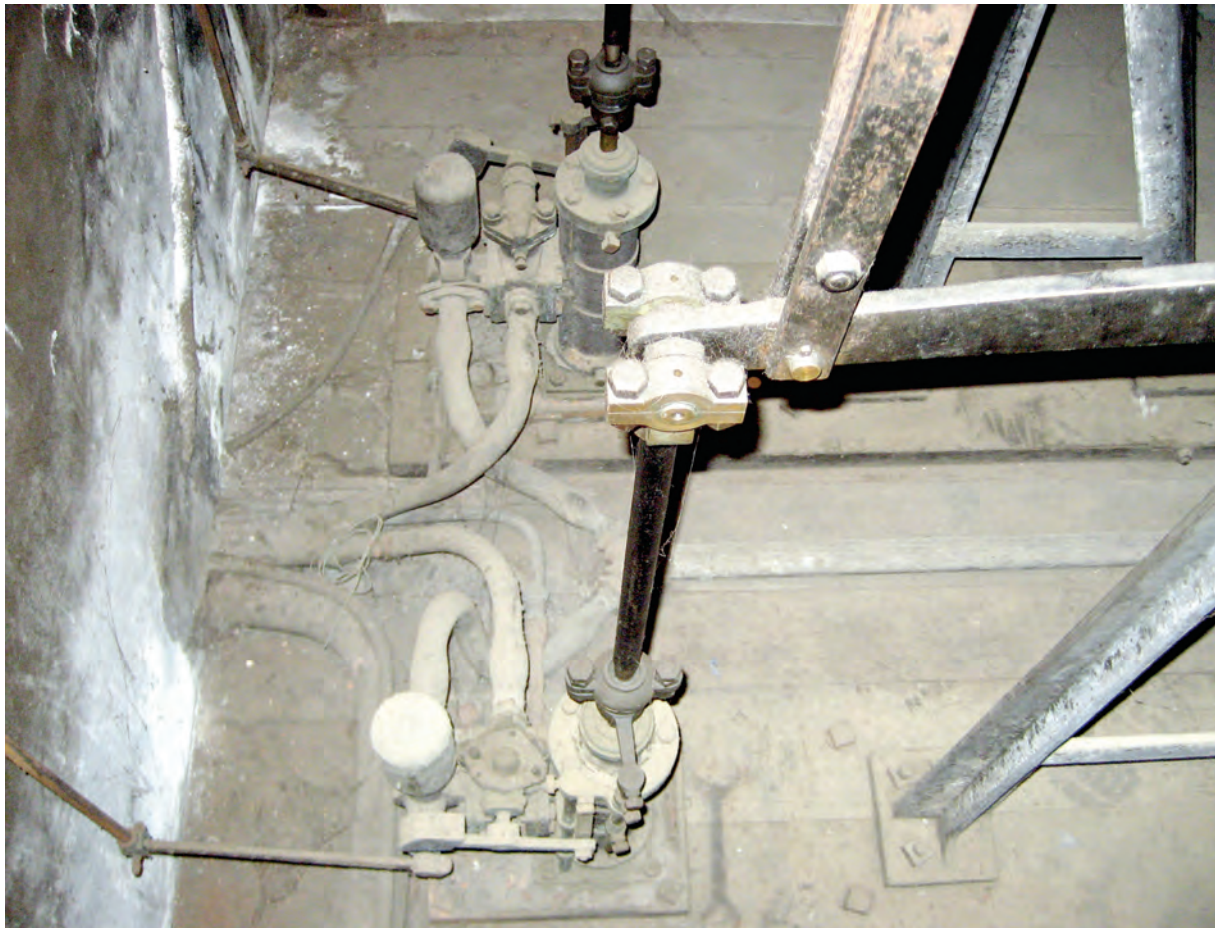


Figure 11. Union Chapel, Islington: the 'Father' Willis organ at Union Chapel, Islington originally used hydraulic organ blowers, seen here. Nowadays an electric blower is used but the hydraulic blowers have been retained, disconnected. 2010. *Tim R Smith*

Wapping has the characteristic roof-top tanks together with a pair of unique underground reservoirs. Wapping closed in July 1977. The building formed the 'Wapping Project' which included a restaurant in the former turbine house and an 'arts space' in the boiler house. The engine house retains its five pumping sets and overhead crane.²³ The building is in new ownership and its future uncertain.

Waterloo Railway Station (TQ 311 799)

The 'Armstrong' lift, which was used to take stock to and from the Waterloo & City Line was removed when Waterloo International station was built. The 'Abbot' lift, which raised coal trucks to the power station, has also been removed.

West India Docks (TQ 375 805)

The lock gates of the South West India entrance each have individual hydraulic pumps. The Manchester Road bridge (the 'Blue Bridge') (TQ 3830 7993) is also provided with its own hydraulic pumps. All these machines use oil as the working fluid.

At the Blackwall Entrance (TQ 3843 8023) a number of hydraulic machines have been retained in the redevelopment of the area, including four Armstrong turnover capstans and one set of sluice gear. The swing bridge there has been replaced by a fixed bridge. The outer lock gates have been retained in a fixed position and the connecting rods and crossheads have been kept but the hydraulic cylinders to which these were attached have, unfortunately, been removed. This lock was, in 1894, the first in London to have this arrangement.²⁴

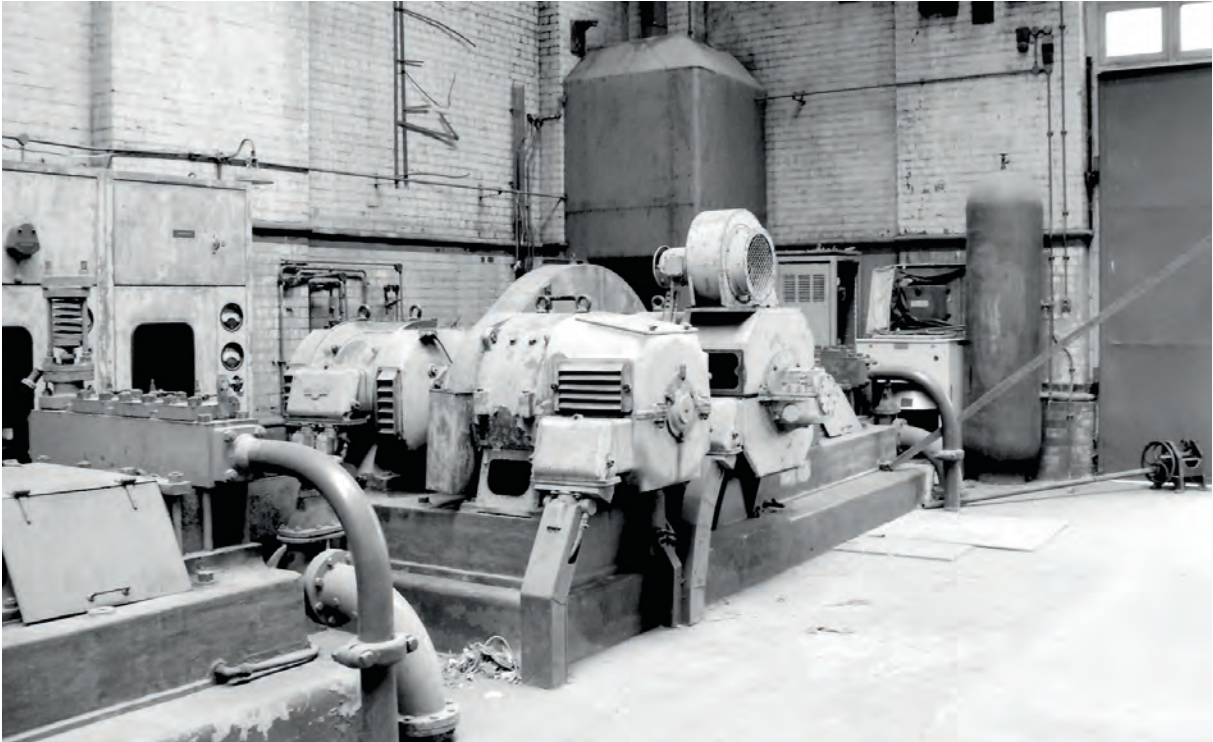


Figure 12. LHP Wapping pumping station: one of the dc pumping sets in the engine house at LHP Wapping with, in the corner behind, the small accumulator that controlled their operation. 1998. *Tim R Smith*

West Norwood Cemetery (TQ 3240 7225)

A hydraulic coffin lift, by Bramah & Robinson, 1839, survives in the vaults, though the chapel it served has gone.

Wharf Road (TQ 321 832)

In the ceiling above the entry to the former Waterlow's printing works there was a hydraulic hoist designed to lift reels of paper off carts.

Willow Walk Goods Depot, Dunton Road (TQ 339 783)

The site of the LB&SCR Willow Walk goods depot's hydraulic pumping station could be discerned in the brickwork of the road bridge over the railway. It once housed two pairs of steam pumping engines, four Cornish boilers and two accumulators.

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