



Waterworks Museum - Hereford

1851 Simpson Beam Engine

October 2022

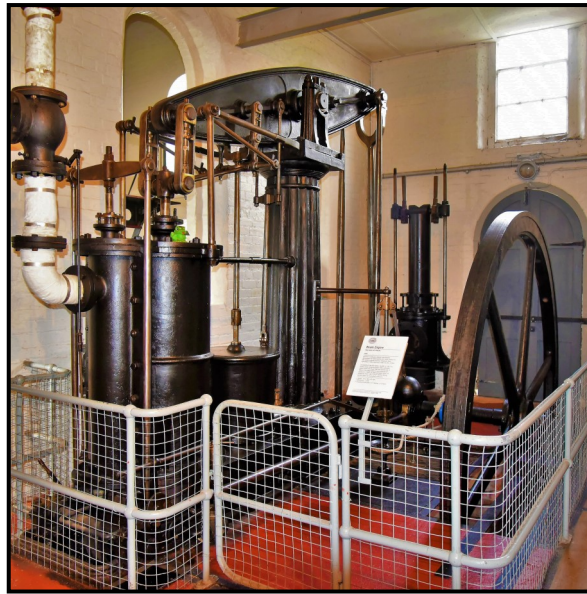
Researched by: Richard Curtis (Trustee)

An engine with more than one important story to tell

Whilst not original to the Broomy Hill pumping station, the 1851 Simpson beam engine is one of the most important items in the Waterworks Museum's collection.

It is identical to the beam engines installed in Hereford in 1856 and 1862, and it sits in Bay 5 where the 1862 engine ran for about 50 years.

Unfortunately, the original beam engines were scrapped early in the 20th century but the 1851 Simpson beam engine allows visitors to see how our Victorian pumping station was originally configured.



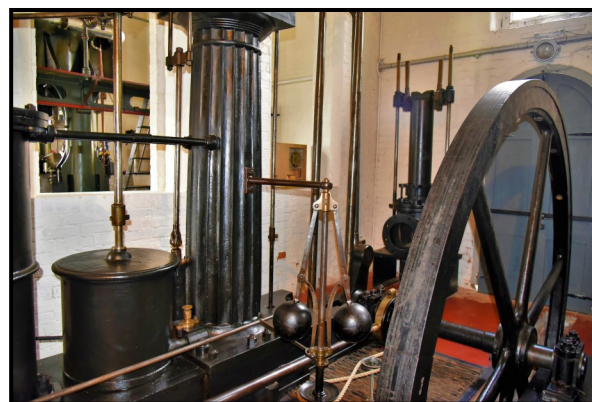
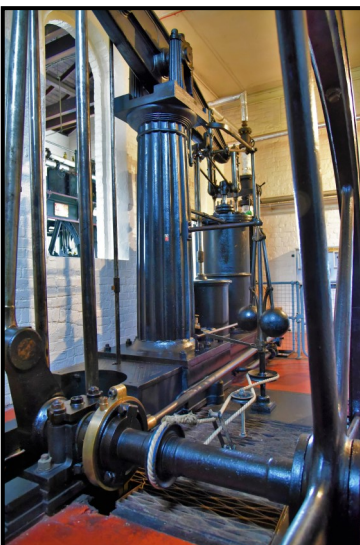
This engine has been on loan at the Waterworks Museum from the National Museum of Wales since 1999.

When built it was installed in a pumping station in Ely, near Cardiff, and was part of that city's first piped water supply, which started in March 1852.

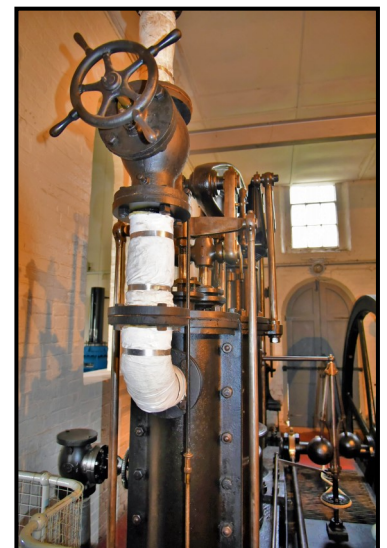
Nearly 40 years later it was moved to Llanishen in Cardiff, where it remained until it was taken out of service in 1921.

Between 1977 and 1998 this engine was on display at the Welsh Industrial and Maritime Museum (WIMM) in Cardiff Bay.

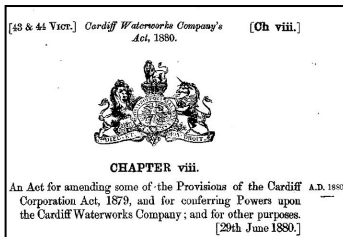
In 1932 the Cardiff Water Works Committee decided this engine should be preserved for public display, but this did not happen until 45 years later with the opening of WIMM in 1977.



The 1851 beam engine is of a design by Simpson's of Piccadilly but it was manufactured under licence by Harvey's of Hayle in Cornwall.



Cardiff Water Works Company (1851-1879)



In Victorian England water companies could only be set up and expanded with the approval of parliament.

The company that provided Cardiff's first piped water supply was formed by businessmen from Bristol, after earlier schemes to extract water from the Glamorganshire Canal and River Taff had failed due to poor water quality.

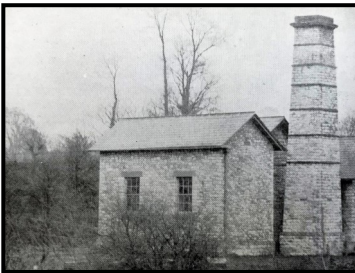
The company identified the River Ely, then 3 miles to the west of Cardiff, as a source of pure water and set about acquiring the legal powers and land needed to build a pumping station at Ely and a holding reservoir on higher ground at Penhill, near Llandaff.

The population of Cardiff in 1851 was around 18,000, but just 10 years later it had risen to 33,000. This growth came after the building of the Rhymney Railway and an extension of the Bute Dock (in 1858 & 1859 respectively). It led to the expansion of the water works at Ely (see below) and in the early 1860's to the building of a reservoir and gravitation scheme at Lisvane, 4 miles to the north east of Cardiff.

TIMELINE

- 1850** Cardiff Waterworks Act.
- 1853** 2nd Act to expand Cardiff water works.
- 1860** 3rd Act to extend the area supplied and to further expand Cardiff water works.
- 1875** Cardiff Corporation acquire powers to buy the business.
- 1878** 4th Act to further extend works at Ely and build a new reservoir at Llanishen.
- 1879** Cardiff Corporation acquires the business and assets of Cardiff Water Works Company.

Water supply from Ely Water Pumping Station



This undated image shows the main building at Ely water works in the late 19th century.

Before 1850 Cardiff's drinking water came from two public wells, which were insufficient for household purposes and of poor water quality. The alternative was the highly polluted River Taf or the Glamorganshire Canal.

The impetus for change followed an outbreak of cholera in 1850 from which one of every fifty of the population died.

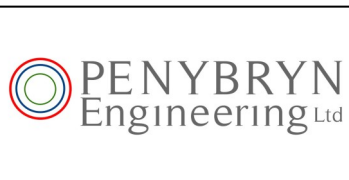
From 1852, water was taken from the River Ely into a collection pool from which it was roughly filtered before being pumped to a reservoir near Llandaff. From here it flowed by gravity to the town and docks.

In the mid 1850's, a culvert was dug along the south bank of the river to collect more water from nearby springs.

Supply was increased further in the 1870's with the digging of a second culvert, on the north side of the river, from which time no water was taken directly from the river.

By 1890, when other water sources had been developed, the water from Ely had become a back up supply, but one often drawn on during periods of drought well into the 20th century.

How the 1851 Simpson beam engine came to Hereford



Penybryn Engineering of Hengoed in south Wales was the specialist firm of engineers which managed the move of the 1851 beam engine to Hereford and its installation at the Waterworks Museum.

Earlier proposals to transfer the Simpson beam engine to a museum had failed but in 1974 it was dismantled and given to the Welsh Industrial and Maritime Museum, which opened its doors in 1977.

The engine lived here until 1998 when this museum closed to prepare for the creation of the Cardiff Bay Barrage. Many items were

put into storage until the opening of the National Waterfront Museum in Swansea in 2005. However some items were distributed to other museums and a new home was sought for two of the collections largest items, including the 1851 beam engine.

A few months later in 1998, after intervention by and with the support of Welsh

Water, the Simpson beam engine came to Hereford.

Here it was stored at Welsh Water's Broomy Hill site before it was installed in the Waterworks Museum. This required a major project, which was completed by June 1999, when it was inaugurated as part of the celebrations of the 25th anniversary of the opening of the Museum in 1974.

Cardiff Corporation Waterworks

The Cardiff Corporation acquired the assets of the Cardiff Water Works Company in 1879 for £300,000. It immediately implemented a scheme to upgrade the water pumping station at Ely, which saw newer, more powerful, engines installed in a new water works building in 1882.

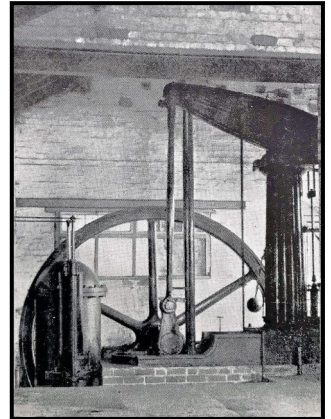
On 9 July 1881, the South Wales Daily News described how at Ely Pumping Works naturally filtered water “was pumped from a well to a connected

collecting culvert built below the level of the bed of the river. No water for the supply of Cardiff was taken directly from the River.”

Two steam engines, of 20hp and 25hp respectively, could lift 1 million gallons every 24 hrs to storage reservoirs at Penhill and Cogan from where water was supplied by gravity.

A similar report in the same newspaper a year later, on 14 July 1882, described the new waterworks at Ely as powered by two 25hp engines.

Therefore by July 1882 the 20hp Simpson beam engine had been taken out of service and at some point it was moved to Llanishen Reservoir, which was opened in the summer of 1888, where it continued to work for the next 30 years.



This undated image shows one of the beam engines at Ely water works in the late 19th century.

Llanishen Reservoir, Cardiff

Authority to build a new reservoir at Llanishen was obtained in 1878, but it was not built until after the Cardiff Corporation had acquired the assets of the water company. It was completed in the summer of 1886 as part of the Taf Fawr scheme for supplying water to Cardiff.

At first the reservoir was filled by rainwater but within a few years 32 miles

of pipes had been laid to connect it to other reservoirs built in the upper Taf Fawr valley.

Llanishen reservoir was in regular use for water supply until the mid-1970's when it became redundant.

We don't know if the 1851 Simpson beam engine (which was taken out of service at Ely in c1882) was moved to Llanishen for the building of the reservoir,

which started in 1883, or later once it was in operation in 1886.

We do know, however, that this engine was taken out of service at Llanishen in 1921.

The picture below shows the adjacent reservoirs at Llanishen and Lisvane, which is the smaller of the two reservoirs.



James Simpson (1799-1869) / Simpson and Co

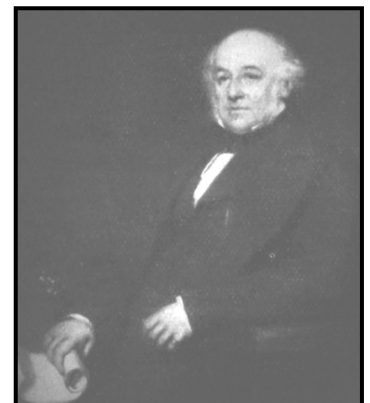
James Simpson was one of the most prominent civil engineers of the Victorian era. He was president of the Institution of Civil Engineers in 1853/64.

Simpson was the consulting engineer who advised the directors of the Cardiff Water Works Company on establishing the first piped water supply for the city of Cardiff. During his career

he was also involved in waterworks in London, Bristol, Liverpool, York, Manchester, Cambridge, Carlisle, Exeter, and in Amsterdam & Copenhagen.

Simpson and Co, was founded by Simpson's father in 1790. In 1851 the firm built steam engines at Grosvenor Engine Works in

Pimlico, London. The business was run by James' brother William, who he had trained in engineering. James Simpson worked closely with his brother and introduced several innovations in steam engine design to improve their efficiency.



Focus on . . . Installing the beam engine

This is a modified version of an article that first appeared in the Museum's journal, 'WaterWords', in 1998/9. Original account written by the then vice-chairman, Ray Morgan.

The Museum occupies the buildings of the Victorian water pumping station for the city of Hereford and includes two bays where once stood single-cylinder beam pumping engines, long since scrapped. One of these bays was therefore the ideal setting for a beam engine offered to the Museum on loan by the National Galleries and Museums of Wales. It added a key artefact to the collection policy of displaying pumping engines from each main era of industrial development in Britain.

Choosing the site

Careful consideration was given to the selection of the site for the engine. Bay 5 was chosen because it required less structural alteration but this decision presented problems.



Manoeuvring the massive centre column through the narrow doors of Bay Five

The original engine had been located at the well level, some 7 feet (or 2.1 metres) below the floor level. This meant the construction of piers and the placement of steel beams to support the beam engine.

Clearing the Bay

Before major construction work could proceed all exhibits had to be removed from Bay 5 and repositioned elsewhere in the Museum. This was done by the Museum volunteer engineers with the use of hauling gear, rollers and greased

plates. The help of Dwr Cymru-Welsh Water staff is gratefully acknowledged in assisting to clear the bay. This work occupied several weeks in the deep winter period but eventually all was cleared in readiness for the building contractor to begin.

Planning

Careful planning was required because the engine was almost as large as the bay and space had to be found for the viewing areas and safety rails. Three principal centre lines were set, one for the engine base casting, one for the crankshaft, and finally one for the line of the flywheel. All measurements were made from these datum lines which ensured precise control of the engine position. Accuracy in both dimension and level was required and the outcomes were excellent, reflecting great credit on the contractors.

Access to the Bay

Much consideration had to be given to how (and indeed whether) the principal engine components could be brought into the bay through the existing doorway. It was known from Museum records that in days past major changes of equipment often necessitated the removal and replacement of brickwork in the front elevation of the building. In this case access was restricted to the outer door only and the clearances were certainly minimal [see photo left]. The weights of the various components had been calculated but the limited capacity of the lifting facilities available at the Museum gave cause for concern.

Erection of engine

The contract for re-assembly of the engine was awarded to the company which had dismantled it at the Welsh Industrial and Maritime Museum in Cardiff and had transported it to the Dwr Cymru-Welsh Water site in Hereford.



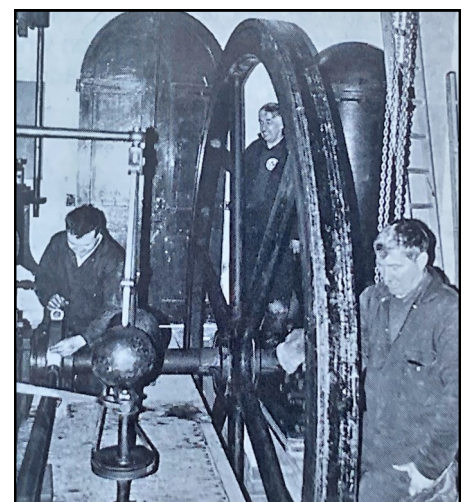
Inspecting the floor ready to receive the engine

Discovery of fractures

On close inspection at Hereford there were found three serious fractures in the casting forming the engine bed which added to the problem of placing it in position. Great care was called for in handling the engine for which a gantry crane was brought in by the contractor. The accurate control lines and levels established earlier made assembly much more straightforward. It was good to see the engine taking shape and the painstaking re-assembly was rewarded by the engine turning freely when the motor drive was brought into operation.

Finishing

The fixing of protection barriers and all cleaning and painting was done by Museum volunteers. Lighting in Bay 5 was improved, including lights below floor level, to show the engine at its best. It remains a wonderful example of mid-nineteenth century British engineering.



Contractors at work installing the engine