A purpose made casting allowing a 3-pipe heating coil to set around the curvature of a main church column.

ST MARY REDCLIFFE PARISH CHURCH BRISTOL
The inscription reads “V SKINNER 1874 BRISTOL”
ST ANDREW’S CORTON DENHAM SOMERSET

Set amongst the hills of south Somerset the village of Corton Denham only dates back to the recent times of the 17th century. The village is dominated by its parish church set into the hillside, where there has been a church in that location since the 12th century, rebuilt in the late 17th century and remained so until it was completely demolished in 1869, as it had become too small to hold the congregation of the increasing population of the village.

HB & H PETTER YEOVIL is the stove makers name inscribed on the cast iron front plate.

This type of finned tube stove design is similar to the Gill warm air stove arrangement that had been in manufacture from the 1820’s onwards and may have been used by this local manufacturer.

The rebuilding of the present church consecrated in 1870, was the most likely time when a warm air heating system was installed beneath the central aisle of the Nave. The stove which is installed in a long floor pit, is covered by many cast iron open pattern floor gratings which allowed the convected heat from the stove and its flue pipe to rise up into and warm the church. The stove was solid fuel fired by coal or coke and a storage area for the fuel was provided within the pit towards the front of the stove. Several stone steps were constructed leading down into the pit providing easy access for the stoker to enter the pit and fire the stove.

The construction of the stove comprises a cast iron front plate complete with a firing door and an ash clean-out door set into a single course of brickwork. A square shaped cast iron back plate is attached to the rear of the brickwork from which a long firing tube extends for a distance of approx 2 metres, before it connects to a rectangular shaped flue duct, that is routed under more open pattern floor gratings towards the Chancel end of the church. Metal fins have been fixed to the firing tube at about 80 mm spacings to greatly increase the heat transfer surface area of the stove.

The space for storing the solid fuel can be seen on the left of the floor pit in front of the stove.
This book Heritage Revisited Part-2 continues the theme of its predecessor Part-1 and features a diverse selection of the historic building engineering services, discovered by Members of the CIBSE Heritage Group and portrays the variety of heating and ventilating equipment installed in numerous Churches, Chapels & Country Houses by some of our industry pioneers primarily during the Victorian & Edwardian Periods.

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The village of Brent Knoll is located in the northern area of the County a few miles south of the Mendip Hills. The church dates from the 11th century and has had many renovations and additions through several centuries.

The heating system in St Michael's was an exciting historic discovery as it is very rare to find a Victorian cast iron pipework distribution system with its original radiators and still operating, with the name of the installer displayed on a nameplate.
JOHN WEECH born 1842 Langport Somerset died 1910 Bristol aged 67 years.

John Weech first appears in the Bristol trade directory in the late 1870's as a Horticultural Builder with works in Colston Street Bristol. In the 1880's he changes title and becomes a Hot Water Apparatus Maker and has moved to Upper Maudlin Street Bristol. This is most likely the site where his iron foundry was located.

In the 1914 Kelly's trade directory the firm is listed as John Weech & Sons Ltd Horticultural Builders and Heating Engineers. The firm is not listed in the 1936 Kelly's directory.

From the selection of various cast iron fittings that can be seen in the church it appears that most of the pipeline fittings were purpose made to suit each individual siting suiting the layout of the church building and its arrangement of pews.

The pipework is laid directly on the flagstone floor with no supports or brackets.

It is very unusual to find expansion joints complete with tie bars installed in old cast iron pipework. The expansion in the pipework is absorbed in the neoprene rubber pipe fitted between the flanges. The flexible tie bars prevented the rubber from distorting.

A pair of the expansion joints is fitted in both the flow and return pipes.
Various types of purpose-made cast iron fittings to suit the application
St Peter's church was designed by the Architect G E Street and built 1855 / 1857. It is in the parish of Filkins and Broughton Poggs west Oxfordshire.

The arrangement of the ornate cast iron floor gratings in the main aisle of the Nave hides a large underfloor brickwork duct that houses a cast iron warm air stove that originally heated the church.

The stove is of the Gill design which has extended heat transfer fins around the top and both sides of the stove to give it an increased heat transfer surface output into the church. The stove was made in sections which were then clamped together with a tie bar frame. The flue section from the stove has also been fitted with fins to increase the amount of heat transferred from the flue gases. The flue outlet from the stove continues within the floor duct and provided extra heat into the church until the flue finally connected with the chimney.

Manufacturer's name is inscribed on the firing door RIMINGTON SKIPTON
Hen Dy Cwrdd is designated as a Chapel at risk and was acquired after its closure in 2005 by the Welsh Religious Buildings Trust. The current Chapel was heated by two different sizes of direct gas fired cast iron sectional radiators. Two 2 section radiators are installed at ground floor level and two 6 section at Balcony level. These heaters were made by Fletcher Russell & Co Ltd of Warrington. The heaters were supplied with towns gas from the local gas works in Aberdare.
As these gas radiators are direct fired with no fitted flue, the flue gases simply discharged direct into the Chapel. To prevent the build-up of noxious fumes 4 ventilation outlets were fitted in the ceiling. Each octagonal shaped outlet has 'hit & miss' slide dampers fitted to regulate the amount of fresh air introduced to the Chapel.

In 1920 a local electrician installed a DC direct current system and the original switchgear porcelain fuse carriers and jelly mold tumbler switches have still been left in their timber enclosure. A vertical section of timber conduit has also been left in position. The electrician left his name and date of installation written on the timber.

J H Bosner Aberdare
27th February 1920.

LIGHTING INSTALLATION
The original lighting installation for the Chapel was towns gas and several gas fittings and glass shades are still to be seen. Remnants of the gas distribution pipework can also be seen. It is most likely that the gas lighting and gas heaters were installed at the same time during the Edwardian period.
A Norman Chapel has stood on this site since before 1175. Built for the Bromwich family.

The present church had major changes made between 1726 and 1731 by St John Bridgeman as the overdoor inscription states. The church was then rebuilt using local hand-made bricks to encase the original timber framed structure in brickwork and plaster, that can be seen today.

The church has now achieved the unusual status of being a Norman / medieval building existing within a Georgian external brickwork & stonework design.

The heating system was installed by Henry Hope, Smethwick Birmingham during the Victorian period. It was originally fired by a solid fuel sectional cast iron boiler that has now been removed and replaced by a wall hung gas fired boiler. The pipework distribution was heated by gravity circulation which fed four 4"dia cast iron pipe coils laid in the three aisles at floor level against the Pew plinth.

At the Tower west end of the aisles the coils are connected by two box ended pipe coil heaters. The design of these heaters is unusual in that they form a double set around the column.
The inscription H.Hope - 55 Lionel St. - Birm - Estabsh - 1816 with the Royal Warrant emblem awarded by Queen Victoria as Horticultural Builder to the Royal Properties.

The long sleeve sockets as shown above have the name Clark & Hope Birmingham cast into them. This was the name of the firm before it changed to Henry Hope after the death of Thomas Clark in 1875.
The heating system was designed as a LPHW open system with a F&E tank originally using gravity circulation for the pipework distribution. The boiler located in an external basement room was a solid fuel fired cast iron sectional pattern.

The original heating installation was most likely installed in the latter part of the Victorian period or early Edwardian.

This time period can be confirmed from the type of radiator installed. All the radiators in the Church are Haden of Trowbridge manufacture, who had their own iron foundry (1874 – 1905) in the town of Trowbridge.
PIPEWORK INSTALLATION

The installed pipework is an unusual arrangement that used a mixture of cast iron and steel tubing with long sweep pulled bends and cast-iron bolted flanges.

At a later date pipework both circuits were cut into with a reduced size section inserted and a wheel gate valve fitted.

The pipework shown above sets up to a higher level with both radiators supported on purpose made cast iron pedestals.

On either side of the Nave a purpose made cast iron twin fitting has been installed to fix the flow and return pipes and allow for thermal expansion of the pipework.

The pipework distribution system designed to operate using gravity circulation, comprised two one-pipe single loop circuits, one either side of the Nave.

This could have occurred when the system was converted to pumped circulation and some form of water balance was needed to regulate the flow rate in the two circuits.

These pedestals were most likely made at Haden's foundry. This increased pipework height can be assumed to have assisted the gravity circulation.

These cast iron fittings were most likely cast in Haden's Trowbridge iron foundry.
LADY ST MARY WAREHAM DORSET

Close to the River Frome which flows through the southern part of Wareham is the old 12th century parish church of Lady St Mary.

The Victorian wet heating system installed in this church is of a most unusual shape and design. The heating pipework in the church is of rectangular cross-section and decorated with chevron markings.

The two central pew islands in the Nave have a raised floor approx. 100mm higher than the adjacent aisles, and it is at this change in height where the rectangular pipework is located in a single pipe loop which is in the form of a ring main routed around the four sides of each pew island. This rectangular pipework has no supports or brackets and rests directly on the tiled floor. There is no provision for expansion in any of the long runs. This arrangement appears to work quite satisfactorily and there are no signs of stressing in the socketed joints.

What makes these two main single pipe ring loops so remarkable is that there is no obvious flow and return pipe connections. It needed a detailed search to establish exactly where the two separate ring mains were fed from. It has to be assumed that an internal blanking plate is fitted in the rectangular pipework between the two pipe connections that rise from below, to achieve the correct direction of flow.
What makes these two main single pipe ring loops so remarkable is that there is no obvious flow and return pipe connections. It needed a detailed search to establish exactly where the two separate ring mains were fed from. It has to be assumed that an internal blanking plate is fitted in the rectangular pipework between the two pipe connections that rise from below, to achieve the correct direction of flow.

The white circles depict where the flow and return pipes connect into the underside of the square pipes. Each connection is 100mm diameter cast iron.

At the tower entrance to the Nave are sited two large box-ended pipe coil heaters, each 5 pipes high by 2 rows deep which are also decorated with chevron plus diamond shaped markings.

The inscription on the end headers of the box-ended pipe-coil heaters is the name of the maker. MERCER BROS - MAKER - BLACKBURN
The Parish Church of St Michael & All Angels has probably existed since the 13th century but has undergone many alterations with extensions carried out in later centuries.

The Heritage Group was excited to discover in this church a remarkable and most unusual heating system, installed during the Victorian period that was used to warm the Church.

What makes St Michael's Church so different and therefore very special is this unusual underfloor heating system, most likely installed during a Victorian restoration.

The heating system is designed on a similar principle to the Roman period underfloor Hypocaust heating. This Roman heating system used a furnace fired by solid fuel, which fed the hot combustion flue gases into floor voids.

Vertical ducts connecting with the floor voids were built into the walls that acted as chimneys through which the hot flue gases would rise heating the walls until the gases exited at roof level to atmosphere.

Built into the floor of the Chancel and Nave aisles of the church are several cast iron floor plates each approx. 400mm square with a central removable section. Each floor plate covers a deep brickwork pit. The bottom of each pit is full of ash several inches deep. The brickwork forming the sides of each pit is severely scorched and burnt.

On the removable section of each floor plate is the inscription. MITCHELL'S PATENT WARMING APPARATUS
St Mary's is a small, old-world type of church that dates back to the 12th Century during the reign of King Henry II. The Chancel was rebuilt in 1885.

6-pipe double row box-ended pipe coil heater. The cast iron sockets are bolted through the headers.

View of 4-pipe coil on side wall.

4-pipe double row box end heater with 4-cast iron pipe coil connected into the side casing of the box header. The socket & spigot joints are double bolted together to form the joint.
The Parish Church of St George is the largest in the Kington Hundred. A Church has existed on this site since the 12th century. It has been extended and restored on many occasions.

The Church is heated by a Perkins pressurised pipework system, installed in 1878 and is a rare example of a Victorian Perkins installation that has retained its brickwork furnace and original pipework layout. The firm who installed the system is most likely Baker Perkins whose name appears on the Operating and Maintenance Instructions.

In common with all Perkins systems the pipework system in St George's is a continuous single loop arrangement arranged as four circuits including sinuous and spiral pipe coils. With four circuits this makes the pipework system large as with each circuit being approx 500 feet making the total distance 2000 feet or nearly half a mile. The pipework is generally routed along the sides of the Pew's timber plinths with sinuous coils fitted to the walls and Pews. A spiral coil heater is sited in the Chancel and two at the base of the Tower.
The furnace sited in the basement has had its internal pipe coils renewed on several occasions 1934, 1944, 1952 and 1975. In 1994 the brickwork furnace needed repair and in 2001 a complete rebuild of the brickwork furnace and its pipework coils was considered necessary.

Originally fired by coal or coke it has now been converted to oil. The four flow and return circuits, and automatic time and temperature controls can be seen in the picture on the right.

To accommodate the expansion of the water in the system as it increased in temperature, three and two expansion tubes were needed and are installed in the base of the Tower.
St Mary the Virgin Church is administered by the Churches Conservation Trust. It is an imposing Church to be found in a remote rural setting alongside the A480 in Herefordshire. The church with its very tall spire can be seen from a distance of several miles.

The church was built in the first half of the Victorian period between 1843 and 1855 and its construction was funded by the local Price family of Foxley. The Architect for the church was George Moore but the spire of the church had to be completed by the then Reverend R L Freer, as the architect had lapsed into insanity.

**CHANCEL**

A Gurney warm air stove fired by solid fuel is sited against the north west wall.

**NAVE**

A separate wet heating system was installed on both side walls in the Nave to provide heating for the occupants of the pews in that area. This heating system comprised two flow & return circuits of 6" dia cast iron pipework terminating in two very large banks of pipe coils both enclosed in an open latticed timber framework. The banks of coils are positioned on either side of the main entrance.

North-side rows of Pews with single pipe coil
The heat generation for the wet system was provided by a solid fuel fired brickwork furnace sited in a basement room. Within the furnace is a heat-exchanger which is connected to the cast iron pipework. The heating system had gravity circulation.

VENTILATING

The Nave and Chancel areas have floor grilles and gratings fitted which brought fresh air from outside through a system of underfloor ducts. Certain floor grilles in the Church are fitted with damper control which was operated by a centrally sited square key. The external fresh air inlet gratings are sited on either side of the Church.
St Antony’s a Chapel of Ease, originally in the Parish of Newton St Cyres, now Upton Pyne dates from 1867/68. Since 2011 it has ceased to be used as a place of worship. It has a strong connection to Tyntesfield House the National Trust property. The main benefactor for the Chapel was William Gibbs whose family were the owners of the Tyntesfield estate.

Sited in a brickwork floor pit in the main aisle is a warm air stove. It can be assumed that this stove dates from 1868 and most likely installed during the construction of the Chapel.
The heating output from the warm air stove proved inadequate to heat the Chapel and therefore a wet heating system was installed later probably during the 1880's in the Victorian period.

The heating system comprises four box-ended pipecoil heaters installed around the Chapel, fed by cast iron pipework with the exception of steel pipe to the heater in the Vestry. The heaters were made by 'Garton & King Manufacturers Exeter'.
Christ Church Unitarian Chapel is the oldest non-conformist Chapel in Bridgwater there being a building on this site since 1662. This first meeting house was demolished in 1683 and its contents destroyed.

The meeting house as presently built was erected in 1688 with an extensive restoration carried out in 1788.

The Chapel Interior

The Chapel has four aisles forming a rectangle around the building that allows access to the box pews on either side. In the centre of the floor of each aisle are laid decorative cast iron floor plates with small openings along either edge. The floor plates are laid in sections each approx 400mm wide by 1500 mm length.
The Saddle Boiler

The heating system in this Chapel was said to have a saddle type wrought iron boiler still in situ. As saddle boilers can date back to the early Victorian era everyone now discovered has historic and engineering heritage importance.

The boiler for the heating system is sited in a small semi-basement room and is a saddle pattern set into brickwork, with its flow and return cast iron (CI) pipework laid within the brickwork enclosing the boiler.

No name is inscribed on the boiler, but the decorative floor plates in the aisles of the Chapel bear the name Garton & King Manuf'ts Exeter. This engineering firm was well known in south west England and had been in existence since the 17th century with their own iron foundry operating since the 19th century.

The flow and return CI pipework (approx 3" dia.) from the boiler then entered into a small under floor duct. What then made this heating system so different and possibly unique was that these two pipes appeared to connect directly to a metal trough.

Another query to be answered was where did the water come from that was needed to originally fill the heating system. In the semi-basement room close to the boiler is an open Well full of water. This Well must have provided the water used to fill the whole system, most probably by bucket. The quantity of water calculated to fill the trough would have taken approx 100 normal size buckets.
Distribution System

Examination of the floor plates showed that there was a cast iron metal trough sited underneath. The trough was fitted tight to the underside of the floor covers and secured to it by screws. Each length of trough was constructed with one end socket into which the spigot of the next section was jointed by using caulking hemp/rope soaked in black mastic. Both sides of the trough had flanged tops with a slight groove into which was laid a hemp rope soaked in black mastic. This sealed the top of the trough when screwed to the underside of the plate making the trough watertight.

The metal trough (internal dimensions of 215mm wide by 125mm deep) would have been filled with water that circulated by gravity circulation. The heating system water circuit was arranged as a simple single loop around the four aisles from and returning back to the boiler.

The floor surface of the four aisles is flat and level with no steps, so the water can only have circulated due to the circulating pressure created by the small height difference of approx. 900 mm between the flow and return pipes connecting to the saddle boiler.

Air Venting

Another strange feature of this heating installation is that no obvious cold feed or air vent pipework can be found. However, upon inspection, the two furthest corners of the floor trough are each fitted with a small lead pipe with an open end, placed into the top of the trough. These lead pipes then rise up inside the end corner of the adjacent box Pew, which has a series of small holes drilled into the box pew corner. This seems to be the means by which the sealed water trough was air vented.
A further query was what method could have been used to fill the water trough. Inspection of the decorative floor plates found a number of small circular holes drilled in the centre of the plate that may have been used as the filling positions. The holes are located in one aisle at the start of the trough on the flow side, and with similar openings at the end of the trough on the return. These circular holes could have held a funnel through which the water was poured. Dip-sticks could have been used to measure the correct depth of water. Removable plugs could then have been fitted in the holes.
To have had any positive effect in the Chapel of raising the space temperature would have required the circulating water to have been very hot to maximize the radiant and convective heating output.

The saddle boiler was solid fuel fired with no safety or temperature controls fitted, so the overall control of the boiler temperature and its output was at the discretion of the person acting as the stoker fireman. To start the water contents of the system moving and achieve an initial gravity circulation must have required the boiler flow temperature to be very high close to boiling point. Otherwise there would not have been sufficient difference in temperature between the flow and return pipes to “kick-start” the gravity circulation.

Whether this novel method of circulating hot water was capable of providing sufficient heat output to raise the air temperature in the Chapel to an acceptable comfort level is doubtful. The water circulating in the trough could only transfer its heat to the occupied space above firstly, by conduction and radiation from the warm surface of the floor plates, and secondly by convection through the small openings in the sides of each section of floor plate.

**Design Considerations**

As the building would have had intermittent usage, the length of pre-heat time would have been disproportionate to achieve the required space temperature. Most likely the boiler when fired up at the commencement of the heating season would have had to always remain alight and only banked down during the periods when the Chapel was not in use. This method would have kept the large quantity of water in the trough always warm never allowing it to become cold. The success of this method of circulating hot water as the heating distribution around the building is highly debatable.
The fabric of the church with the exception of the Chancel dates from the 14th century. The Chancel had a major reconstruction which was completed in 1891. This date is considered to be the year when the Perkins HPHW system was installed. The village of Yarcombe was not connected to the national electricity grid until the early 1960's, so it is no surprise to find the pipework system still working with its gravity circulation.

It is always remarkable to find a Perkins heating system still in use, that was originally installed during the Victorian period. The brickwork furnace shown above has two circuits / banks of rectangular spiral heating pipe coils. It was originally solid fuel fired but has now been converted to oil firing.

Two 4-pipe high sinuous pipe coils are fitted to the Pews in both side aisles. The Victorian craftsmanship shown in the forming of the return bends has to be recognised and appreciated when it is considered that the construction of all this pipework was hand-made most likely at the Church.

There is a single expansion tube located in the Vestry. The system fill point for the two pipework circuits is sited behind the rear Pews.
ARLINGTON COURT
NORTH DEVON

Arlington Court has been the family home of the Chichester family since its construction in 1820. The main house was enlarged by the addition of the staircase hall and servants wing in 1865. It became a National trust property in 1949.

The original heating system installed in the house was a Perkins HPHW type wet system. It was probably installed when the staircase hall was added. The majority of the distribution pipework has now been removed. Two items fortunately from the original system still remain which are of great interest and rarity.

First, the original iron cased furnace (fired by solid fuel), is still complete with its refractory brickwork lining and pipework coil remains in its original position in a basement room. The furnace was made by the Liverpool firm of Renton Gibbs who was a major manufacturer and installer of Perkins heating systems in the late 19th century. A check made in the Renton Gibbs reference list of contracts dated 1898, shows an entry for Sir Bruce Chichester Arlington Court Barnstaple.

A view looking forwards and down into the furnace showing the pipework coils around the furnace and the refractory brickwork.
Second, either side of the main staircase are two beautifully decorated ornamental cast iron heater enclosures each covering a Perkins spiral type heater coil. These Perkins ornate heater enclosures are wonderful examples showing the Victorian craftsmanship in casting metalwork.

The current wet heating system most likely dates from the very early 20th century and is fitted with a variety of cast iron column radiators. One small size sectional radiator fitted in the Music Room is a cast iron Ornamental pattern of Rococo design manufactured by the American Radiator Company. This dates the system to the first decade of the 20th century.
DUNSTER CASTLE
SOMERSET

Dunster Castle is located on the north facing wooded slopes of the Exmoor Hills alongside the picturesque village of Dunster, near Minehead in north Somerset. The Castle built during Norman times has been the ancestral home of the Luttrell family for 600 years, who gave it to The National Trust in 1976.

The Castle was remodelled between 1868 and 1872 which is the most likely period when the first central heating system was installed. By 1868 wet heating systems were becoming the usual method for heating larger buildings.

The main LPHW system has a mixture of several types of Ideal Radiators. The plain 4-column, plain 3-column, plain wall and window pattern that date from the very early 1900's, manufactured by the National Radiator Company Ltd.

An interesting feature with these radiators is that most of them have a regulating quick-opening valve fitted to the return pipe connection of the radiator providing a coarse form of regulation.

Examples of these heaters which date from the original heating system still remain as semi-ornate box-ended pipe coil heaters, most of which are encased in full or flat faced metal pedestals.

Plain wall pattern Neo-classic radiator
The remnants of a Perkins HPHW heating system with a single loop still remains in the Estates Offices.

Single pipe open brickwork furnace built possibly by Garton and King Exeter.

Cast iron cased brickwork furnace with a single loop with the nameplate John King Limited Liverpool. This furnace appears to have been the first heating furnace installed but was for some reason later removed and replaced by the open brickwork furnace.
This unusual shaped 16 sided building is located near Exmouth in Devon with extensive views overlooking the northern side of the River Exe estuary. The building was constructed in the 1790's for the two Parminster sisters Mary and Jane. It became a National Trust property in 1991.

Very little of the original Victorian heating system remains in the building. The system installed was a low-pressure wet heating system with cast iron distribution pipework serving 5 box-ended pipe coil heaters. Only one of the pipe-coil heaters has survived in the house and can be seen in the Library. The other four heaters were removed and disposed of as recently as the 1970's.

The heating system is considered to have been installed during the 1860's or 1870's, by dating the style of the pipe heater and boiler.

The one remaining pipe coil heater is a 5 tier double row bottom fed external socket pattern with rectangular box-ends.

A most unusual item seen in the heating system is a pipe coil comprised mostly of cast iron socket & spigot joints. It is fitted under the timber seat in the Entrance Hall, supported on purpose made timber chocks that act as the supports.

The wrot or cast iron boiler "set into brickwork" pattern is still extant in a sub-basement room. The boiler appears to be of the type called "chambered with terminal end" and has the name "Parkin & Sons Exeter" inscribed on the cast iron front plate. This firm was still trading in 1939.
GAS LIGHTING

The original gas distribution pipework system with wall lights, complete with glass globes and mantles is still operational. Other replica gas lighting fittings have been added to the system to match with the original styles.

RAIN WATER HARVESTING

On the north side of the building is a Cob and Thatch Barn. This building has the unusual feature as part of a rain-water and ground water collection system. Situated at both ends of the building are two large underground storage chambers which are inter-connected by a salt glazed balance pipe. Both storage chambers have a pre-chamber which was filled with coke presumably to act as some form of cleansing filter. The purpose of the pre-chamber is unknown. Reasons for this would be welcomed.

The stored water was then pumped up to a header tank located at the top of the brick tower. The water was then fed and piped down under gravity into the property to supply items of sanitary equipment considered necessary.
Hidden away and forgotten about for well over half a century is an example of early 20th century electrical history, a hydro-electric power generation system. Inside this small building can be found the equipment of a hydro-electric generating plant. It became a National Trust property in 1972.

The property Knightshayes Court was built as the home of the Heathcoat Amory family between 1869 and 1874. Later, most probably around the end of the 19th century the family must have decided to adopt the luxury of electricity, using this new technology which could be used to light the rooms in the house. To generate the power to create this electricity, a new water course was constructed diverting water from the adjacent River Exe, and then harnessed to drive a water turbine. This new form of lighting must have been a dramatic improvement upon the earlier lighting provided by oil lamps. There is no evidence in the property that a gas service was ever installed.

**TURBINE BUILDING**

The building measures approx 10 metres x 5 metres with a floor to ridge height of 10 metres. The basement of the building was constructed as a reservoir to store the water needed to power the turbine. Sluice valves were installed to isolate the water supply and allow for maintenance of the equipment. A new water-course was constructed to divert water from the River Exe into the turbine building.

One end of the building houses the water turbine which is submerged within the reservoir, and through a vertical drive shaft, pulley and belts drove a dynamo which generated electrical power at approx. 110 volts DC.

At the same end of the building adjacent to the vertical drive shaft is a second vertical drive shaft fitted with a bevelled gear.

The top section of the bevelled gear was connected to a horizontal drive shaft which powered equipment housed in an outside lean-to building. As this top gear section and drive shaft have been removed, its purpose will never be fully known. A reasonable assumption would be that it powered farm machinery.
Distribution Cabling

From the DC dynamo the electrical cables were then routed through a buried cast iron pipe across ¾ of a mile of adjacent fields to Knightshayes Court.

As DC cables generate heat, a means of dissipating this heat was needed. So an interesting feature of this buried pipe is that it was filled with oil presumably to act as a heat conductor removing much of the excess heat generated by the cables. The oil filling equipment for the cast iron pipe is still extant within the turbine building with the inscription,

**Johnson & Phillips Brookes Patent Liquid System for Underground Mains Sole Makers Engineers London**

To store the DC electric current for the periods when lighting was not required batteries / accumulators were provided. A room at the rear of the courtyard was used to house the batteries / accumulators.

At a later date most probably during the 1940’s the DC dynamo was removed and replaced by an alternator/generator manufactured by Brook Motors Ltd of Huddersfield providing power most likely at 415 volts 3 phase 50 Hz AC. This alternator/generator complete with its drive belts and switchgear is still extant within the building.

The original DC cable network was then abandoned and new AC cabling installed which was routed from the turbine building as overhead cables fixed to poles. Any electrical current surplus to requirements could be fed into the National Grid. Meters were installed to measure the amount of electrical current used.
The McGeough Bond family commissioned Arthur and John Williamson the Dublin Architects to design their new property to be built in County Armagh Northern Ireland. The property was built during the 1820’s as a Greek revival villa. It became the property of the National Trust in 1979.

HEATING SYSTEMS

The first method of heating the various rooms was the fitting of fireplaces which had differing ornate tiled surrounds

The second method of heating would have been the installation of the two cast-iron warm air stoves.

Of particular interest about this stove is that its flue pipe is routed under the floor of the Lobby and then rises vertically inside the adjacent wall. As this underfloor flue pipe would have produced negative draught the problem has been overcome by the fitting of a removable brass plate in the floor above the flue. This allowed an auxiliary fire to be lit at the base of the vertical section to draw the flue gases into the vertical chimney.

At the rear of the ornamental stove is fitted a Musgrave tiled cast iron solid fuel stove.

This drawing illustrates how the flue pipe called a descending stove, was incorporated into the building structure and with a smaller fresh air pipe improving the combustion of the fire.
Another method of heating the rooms was the installation of a Perkins two-circuit HPHW wet heating system serving pipework on the first floor.

This wet heating system although no longer in use is still complete with its original pipework and cast iron furnace that was manufactured by Musgrave’s of Belfast. This would date the installation at the end of the 19th century.

This type of a metal cased fire brick lined Perkins furnace is a rarity of historic interest with important heritage value. It is the Vulcan Boiler as manufactured by Musgraves of Belfast.

Musgraves of Belfast ceased trading in the 1960’s so any of their equipment now discovered has become irreplaceable.
GAS LIGHTING
The gas light fittings in the rooms are attractive due to their variety of design shapes and styles.
ACETYLENE GAS PLANT

Located in an out-building is a size A1 Acetylene Gas generating plant. It was constructed in situ in 1906 by the Acetylene Corp, Great Britain of Westminster London. The plant was abandoned many years ago.

Inscription reads

A1 ACETYLENE PLANT CONSTRUCTED
BY THE ACETYLENE CORPORATION LTD
49 VICTORIA STREET WESTMINSTER No

The companies CATALOGUE OF GENERATING PLANT front page is shown below.

A comprehensive list of operating & maintenance instructions was provided for whoever was going to be responsible for the day-to-day operation and safety of the gas plant,
SUNNYCROFT
WELLINGTON SHROPSHIRE

Sunnycroft is a Victorian Villa typical of those built for the prosperous Victorian business classes during the late 19th century. Situated in the suburbs of Wellington in Shropshire, it remained in the ownership of the same family from its completion c1880 until 1997. The house and its grounds were bequeathed to The National Trust in 1999.

HEATING SYSTEM
When the property was extended in 1899, the owner had installed a low-pressure hot water central heating system. The rooms in the extended part of the house are fitted with ornamental style cast iron sectional radiators that carry the inscription “The Beeston Decorated” and what appears to be a Patent number. This name refers to the manufacturer, The Beeston Boiler Co Ltd of Nottingham. This decorative pattern of radiator made by the Beeston firm is the first time the Heritage Group has seen examples to establish that any of this style has survived. The Decorated radiator is shown in the 1921 Beeston catalogue but had been withdrawn from manufacture by the late 1920’s.

The heating system installed in the original part of the house has been designed to match the Victorian pipework layout and radiator patterns, and thus stay in keeping with the heating system installed during the 1899 extensions to the property. Below is an example of the more recent 20th century cast iron radiator selected to match the original ornamental style.
An important part researching historical engineering services is to find the name of the firm who originally installed the heating system. Many of the firms during the Victorian period did not leave any indication of the firm's name, either as a name plate or inscribed on the equipment.

However, an old solid fuel Beeston boiler (left in the basement) has the name J T Edwards and Son Birmingham inscribed on the bottom cleaning door.

**GAS LIGHTING**

The property was not converted from gas to electricity until 1947. This late date for conversion has proved fortunate as it has meant that virtually all the original gas wall lights (brackets and glass shades) are still as originally fitted. Remarkably the gas wall lights in the Billiard Room can still be used if required.
CIBSE HERITAGE GROUP

Following a group visit in September 1998 by members to the Construction History Society Archive being established in Frome Somerset, the group then moved on to visit the G N Haden Archives displayed in the Trowbridge Museum.

CREDITS

This third book Building Engineering Services Heritage Revisited Part 2 is again a collaborative effort by the members of the CIBSE Heritage Group including those pictured above back in 1998. Thanks are extended to members who have contributed to the store of books, documents, photographs and illustrations in the Heritage Group Collection. A special thanks goes to our friends at Historic England and National Trust for their considerable assistance.

For more information about any of the buildings in this booklet visit the Heritage Group Website at <www.hevac-heritage.org>