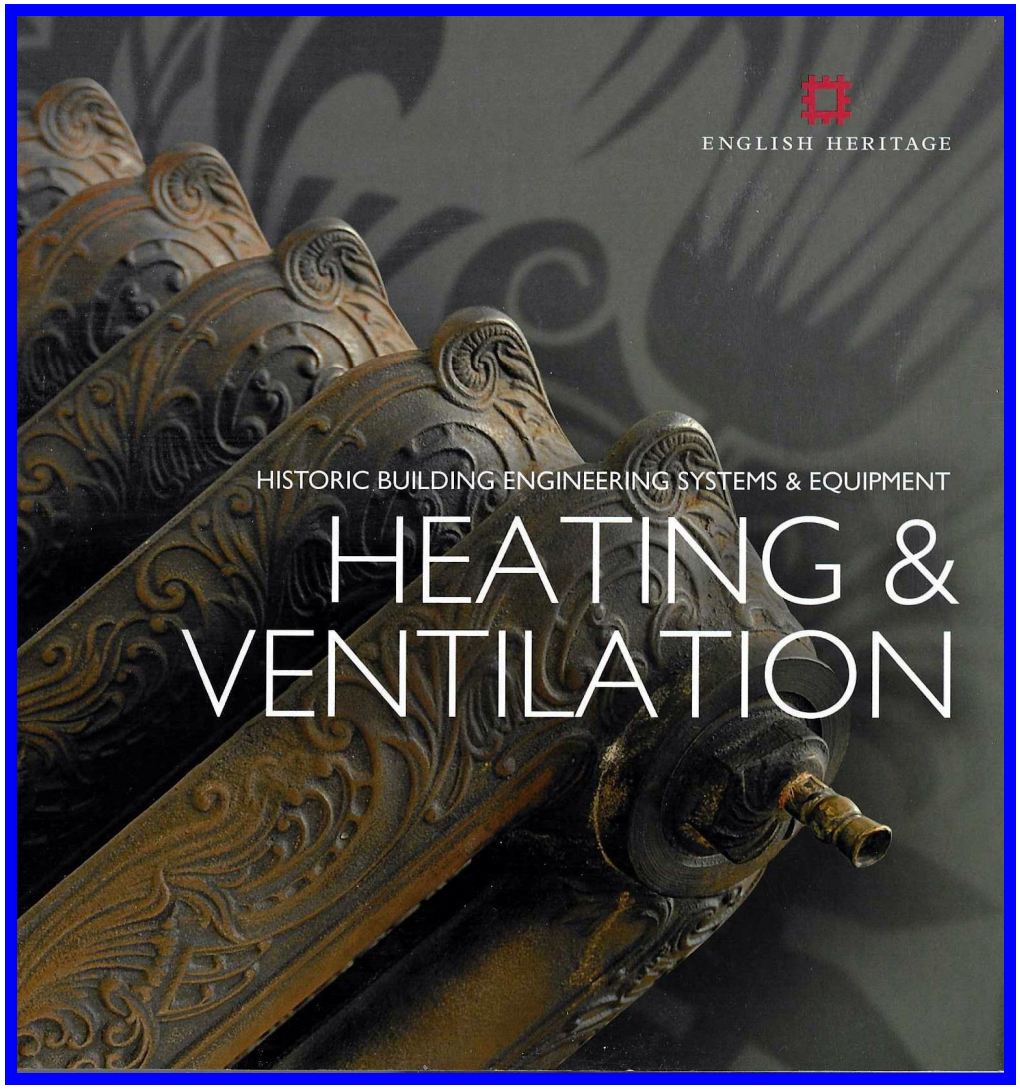
STEAM & HOT WATER BOILERS 1840-1930



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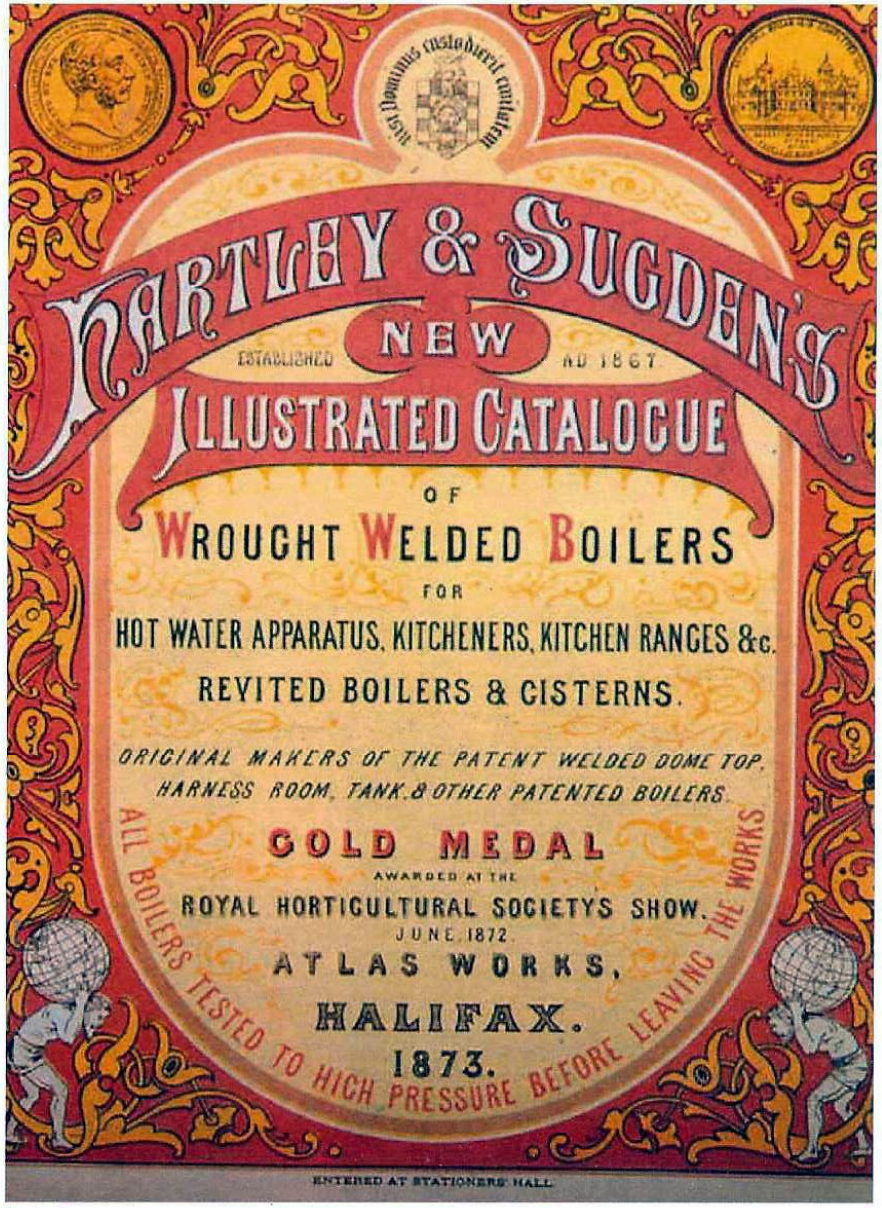
Cover of catalogue of Hartley & Sugden, boilermakers of Halifax, 1873



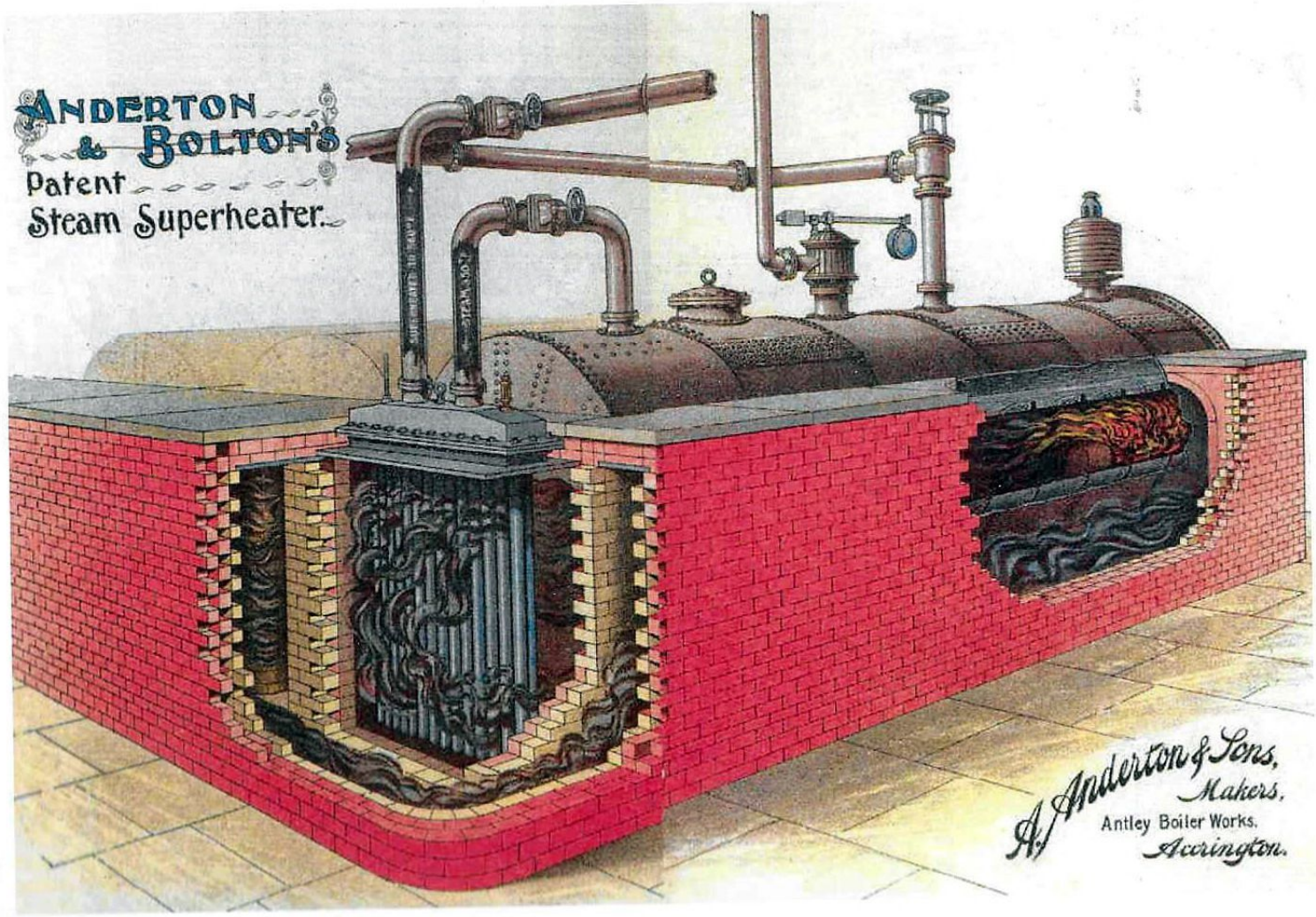
ENGLISH HERITAGE

HISTORIC BUILDING ENGINEERING SYSTEMS & EQUIPMENT

HEATING & VENTILATION

Brian Roberts
Chairman, CIBSE Heritage Group

2 This publication has been produced by English Heritage in association with the Chartered Institution of Building Services Engineers



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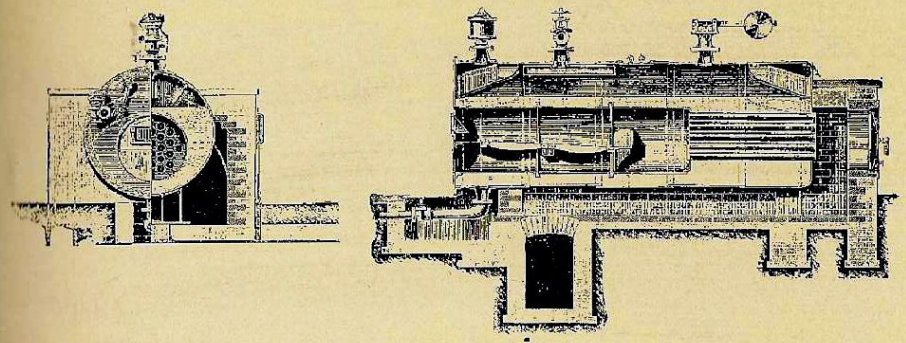
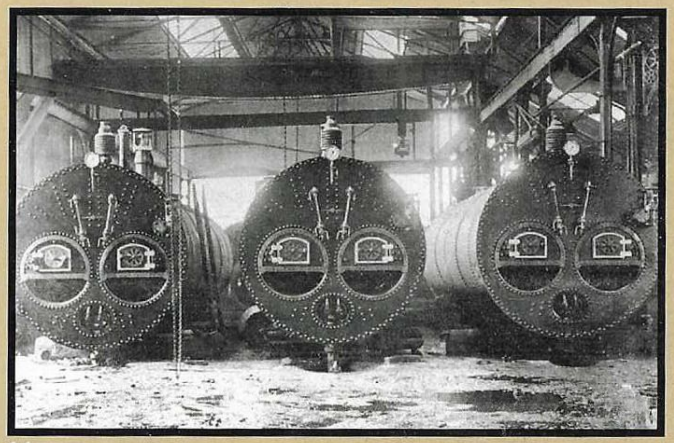
Steam Boilers

The first steam boiler proper was a spherical type described by the Marquis of Worcester in 1663. Other early examples include that of Savery (1698) and Newcomen & Cauley (1705). By 1725 the Wagon and Haystack types of boiler were in common use. James Watt used a steam boiler to operate his engine in 1769. None of these was used for heating. The first steam heating was for factories, from about 1799. A number of engineers including Count Rumford (1798), Richard Trevithick (1800 and 1804) and Thomas Tredgold (c1824), produced designs for steam boilers. Perhaps the most important early boiler was the Cornish type, with its single internal furnace, said to have been developed by Oliver Evans of Philadelphia, but given its name in recognition of the help received from Trevithick. A patent by Pearce (1853) was the forerunner of the Economic boiler. The even more famous Lancashire boiler was developed in Manchester by Sir William Fairbain (1855), who increased the length and diameter of the Cornish boiler and introduced two furnace tubes. However, while steam was widely used for power and process work, particularly in the textile industry, factories, breweries and the like, it was not widely adopted for heating and tended to be used only where steam was generated primarily for other purposes.

Notable British steam boiler manufacturers from the Victorian era include Babcock & Wilcox, Cochran, Clarke Chapman, William Fairbairn, Fraser & Fraser, Galloway, Marshall, Musgrave, Paxman, John Thompson and Yates & Thom. Some still exist.



13 Cornish steam boiler with smoke tubes, Marshall & Co, 1898



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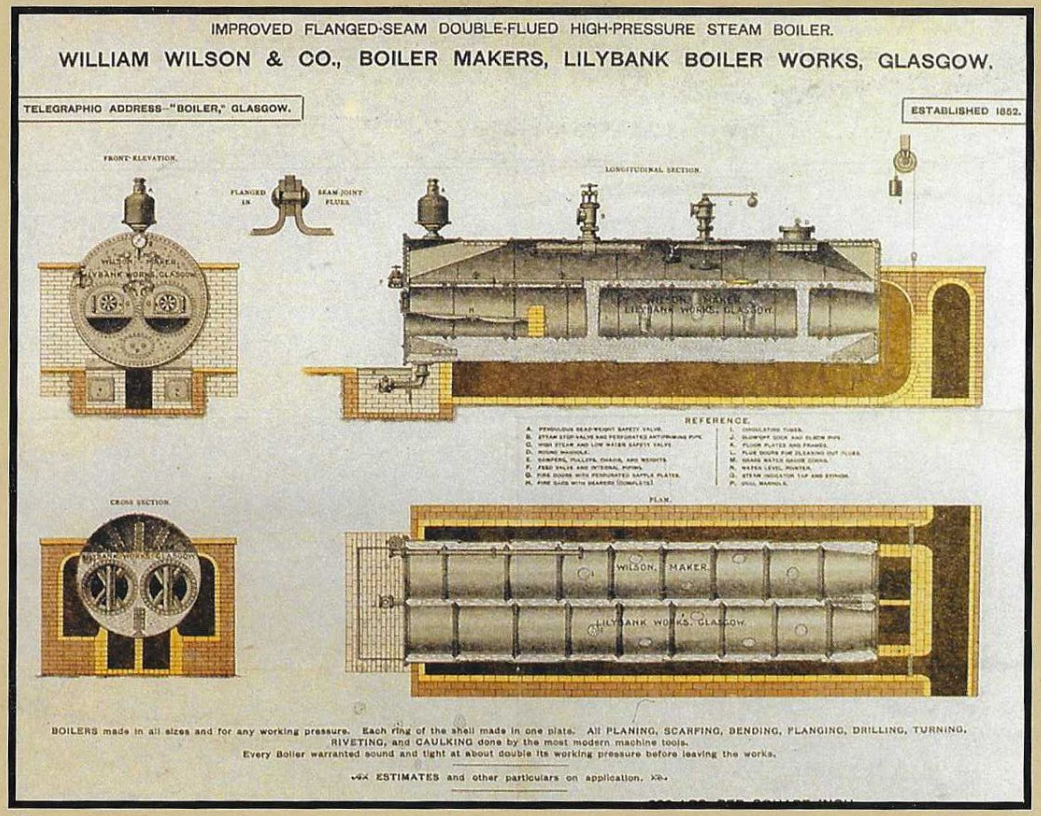

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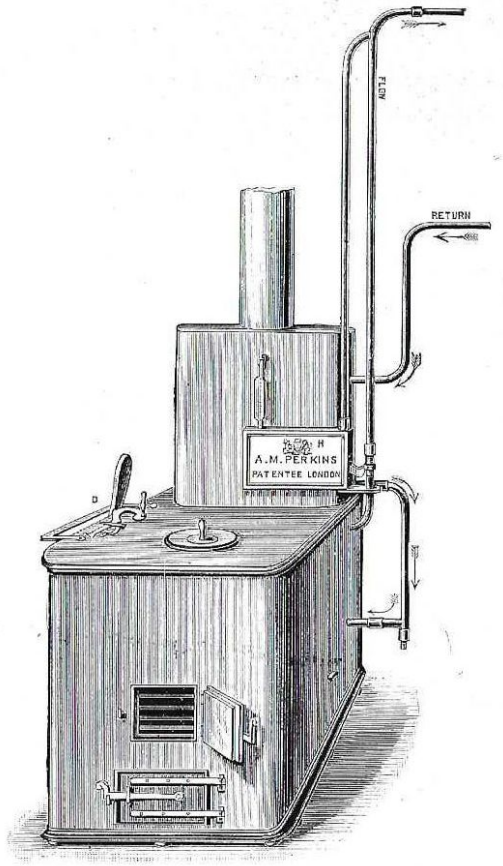
14 John Thompson Lancashire steam boilers, 1895

15 William Wilson, Lancashire style high-pressure steam boiler, Glasgow, c1900

17 Perkins high-pressure hot water boiler, patented 1831

18 Hartley & Sugden, Gold Medal Boiler catalogue, Atlas Works, Halifax, 1872



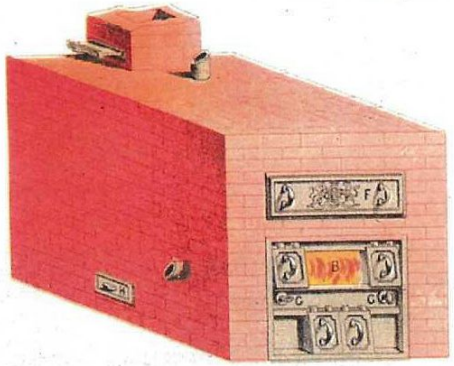
The high-pressure hot water system also required a governor (heat regulator), an expansion tube and air plug, and various suitable stopcocks and valves. A detailed description is available in Jones 1904 (see Further Reading).

Perkins went on in 1839 to develop a medium pressure system using a water supply cistern containing a relief valve in place of the expansion tube (BP 8311). This overcame most of the objections to the very high and dangerous temperatures and pressures used in the original system. It appears not to have been extensively used at that date, but was later copied by a number of other firms who made a speciality of this system. In 1840, Perkins published his book *A M Perkins' Improved Patent Apparatus for Warming and Ventilating Buildings*. In it he lists numerous examples of installations in public buildings (including churches), private mansions, hothouses, manufactories and offices.

The temperatures and pressures of the high-pressure system greatly concerned the fire insurance companies who eventually raised their premiums to a level where new systems were rarely installed. Many continued in use, particularly in churches, well into the 20th century. Sometimes the furnace was upgraded to oil-firing. More generally the furnace was replaced and the existing piping and pedestal coils retained to warm the building.

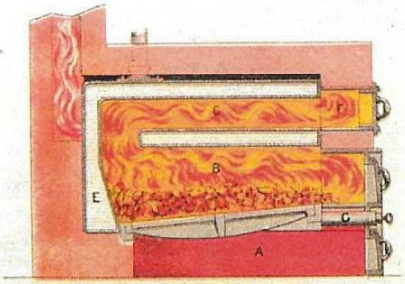
HARTLEY & SUGDEN'S
IMPROVED WROUGHT WELDED SADDLE BOILER
TO WHICH THE
GOLD MEDAL.
WAS AWARDED AT THE
ROYAL HORTICULTURAL SOCIETY'S SHOW.
AT BIRMINGHAM, JUNE, 1872

"COLD MEDAL BOILER"
REGISTERED TITLE

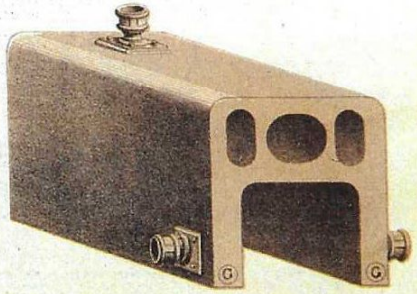


ELEVATION, IN BRICKWORK.

CROSS SECTION.



LONGITUDINAL SECTION.



ELEVATION, WITHOUT BRICKWORK.

A *Ashes Pit*
B *Fire*
C *Centre Flue*
D *Right & Left Return Flues*
E *Water-way Terminal End*
F *Sliding Soot Door for Cleansing Flues, with Fire Brick Casing*
G *Sludge Plugs for cleansing internal part of Boiler*
H *Regulating Flues*
I *Hollow Space round Boiler utilizing Heat given off from external surface of Boiler.*

Hot Water Boilers

Although Britain pioneered the steam engine and the steam boiler, the use of steam for heating in other than factories was comparatively rare. Hot water heating is said to have been introduced into Britain from France c1816, but the Price Brothers of Bristol seem to have been largely responsible for its spread. They secured a patent (BP 5833) in 1829 for their system.

The first hot water boilers were smaller and cruder than steam boilers. A high-pressure hot water heating boiler and system was patented by A M Perkins in 1831, but this was an exception as most heating systems were of a low-pressure type (open to the atmosphere) with the water temperature below boiling point. S T Crook (some say Cook) discovered 'fire-welding' in 1854 and opened his Premier Works in Halifax in 1863. Yorkshire soon became a centre for the production of heating boilers. The majority were of the hot water type; a few were for steam heating. Early firms manufacturing boilers in Yorkshire include:

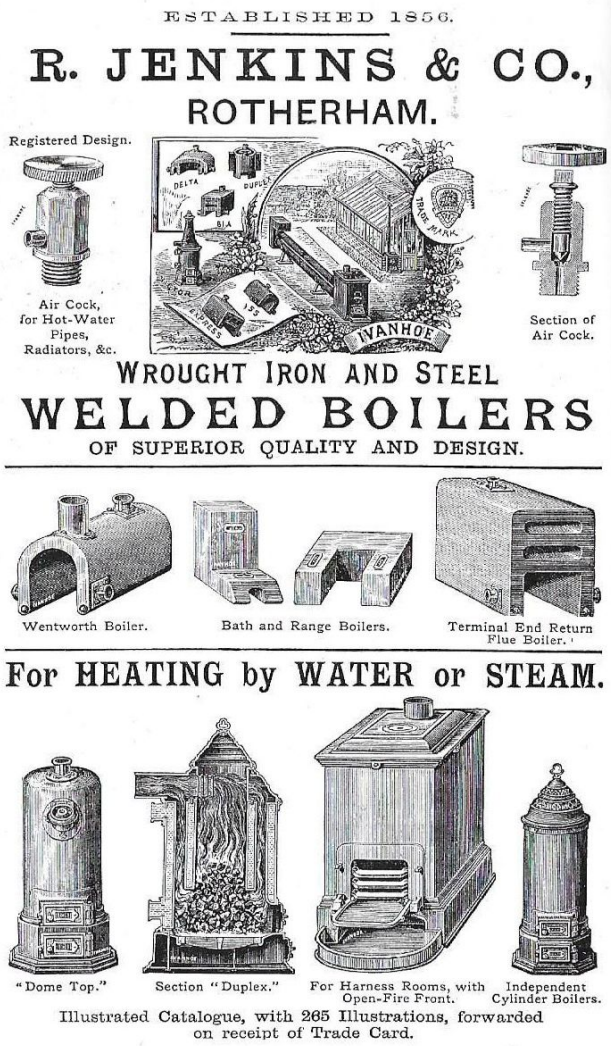
Graham & Fleming, Premier Works, Halifax (1863), successors to ST Crook's Exors;

Lumby, Son & Wood at the West Grove Boiler & Safe Works, Halifax (1858), trade name *Solar*;

Robert Jenkins, Rotherham (1856), trademark *Ivanhoe*;

Hartley & Sugden, Atlas Works, Halifax (1867), trademark *White Rose*;

Binns & Speight, Crown Boiler Works, Bradford.



19 Robert Jenkins, Rotherham, 1891 Established 1856

20 Wagstaff sectional saddle boiler, 1874

21 James Keith horizontal section hot water heating Challenge boiler, 1891 Horizontal sections are unusual

22 Cut-away view Challenge boiler

The Institution of Heating & Ventilating Engineers (now the Chartered Institution of Building Services Engineers, or CIBSE) was founded in 1897 and by 1900 had nearly 200 members; today there are some 18,000. In 1897, Kelly's Directory listed over 600 firms as heating apparatus manufacturers and fitters. The most prominent manufacturers included:

The Beeston Foundry Co, Beeston, Notts

T Fletcher & Co, Warrington

The General Iron Foundry Co, Broken Wharf, London

William Graham & Sons, Castle Yard, London

Jones & Attwood, Titan Works, Stourbridge

James Keith, Holborn Viaduct, London

Kinnell & Co, Southwark, London

Mather & Kitchen, Derby

Thomas Potterton, Cavendish Works, Balham

J Ashton Riley, Canal Boiler Works, Huddersfield

Steven Bros & Co, St Andrew's Wharf, London

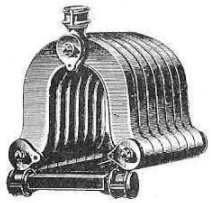
Weeks & Co, Kings Road, Chelsea, London

T C Williams & Sons, London Street Ironworks, Reading

From around 1890, H Munzing of Upper Thames Street, London, who styled himself an 'American merchant,' was a major importer of both hot water and steam boilers from the USA.

One of the earliest, possibly the first, sectional boiler (i.e. made and delivered in sections for site assembly) was Wagstaff's saddle type of 1874. Another early and unusual boiler was the *Challenge* by James Keith, which had horizontal sections (this had the disadvantage that the grate area was constant regardless of height). Hartley & Sugden produced a sectional boiler, the *European*, in 1902. American imported sectional boilers were superior at this time and used taper nipples instead of rubber rings for jointing. British firms quickly adopted this practice, one of the first such cast-iron sectional boilers being the *Robin Hood* of Beeston. The first American company to set up a factory in Britain was probably the American Radiator Co, who started manufacturing under the name of the National Radiator Co in Hull in the early 1900s. They introduced the *Ideal* boiler and the company later became Ideal Boilers & Radiators.

The major manufacturers of hot water heating boilers can often be recognised by the brand name of their main boiler series: Hartley & Sugden *White Rose*, Beeston *Robin Hood*, Ideal *Britannia*, Lumbys *Solar* and the Mather & Kitchen *Severn*. However, many makers had half a dozen or more trade names each. The list is considerable.



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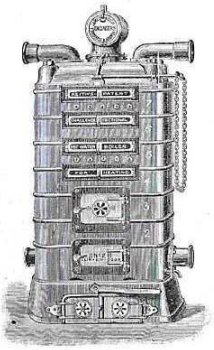

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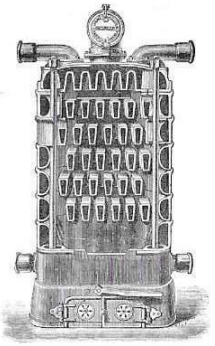

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