English version

ULTIMHEAT® MUSEUM

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History of technologies linked to heating.

Chapter 4

Little history of water circulating heaters and storage heater

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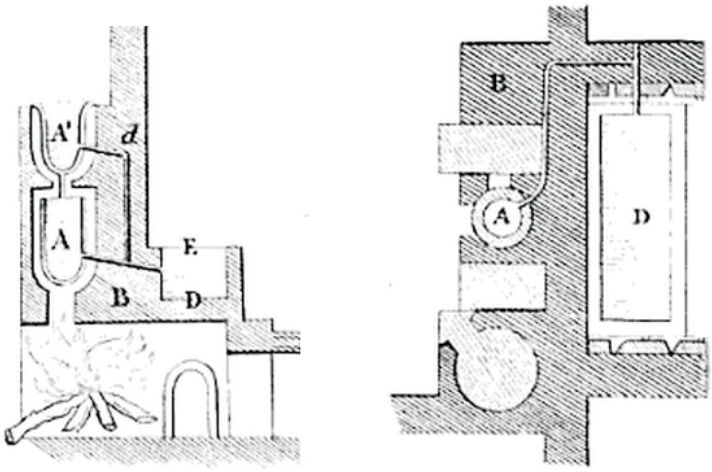
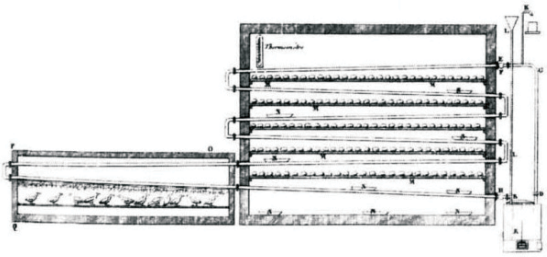
In 62 AD, Seneca, in his book "Natural Questions" (quaestiones Naturales), Book III, describes the water circulation water heaters in Roma at this time as follows:
“We are in the habit of constructing serpentines, and cylinders, and vessels of several other designs in which thin copper pipes are laid in descending spiral coils. The object is to make the water meet the same fire over and over again, and flow through a space sufficient for heating it up; so, entering as cold it comes out hot.”

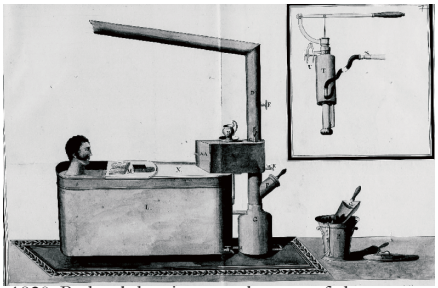


Bathroom heaters with tanks for accumulating warm water and having inlet pipes of cold water and hot water outlet were known and used in Italy at Roman time.
Above: Section of a hot bath of a Roman villa in Pompeii, using the principle thermosiphon with two reservoirs A and A 'supplying water to the tub D by the tube d. (Voyage pittoresque ou Description des royaumes de Naples et de Sicile, par l'abbé de Saint-Non (1781), vol 2).

The Roman architect Vitruvius in the first century AD describes similar circulating water heaters. Although translated and commented again by the Italian architect Palladio in 1556, in his work on Vitruvius, this system disappeared with the Roman civilization. It was not until 1777 that the French engineer Jean Simon Bonnemain reuses the thermosyphon and perfects it for the use of heating by means of circulating water in a boiler and pipes. It was first used to heat plants in the ”Jardin du Roi” in Paris, then to heat a large poultry hatchery near Nanterre with a precise temperature control. This concept for circulating the water in radiators, by means of the density difference between the hot and cold water still remained virtually unknown for nearly 40 years. The Marquis de Chabannes, French emigrant to England, copied the Bonnemain’s work, and improved this system in 1815 to heat apartments with what will later named the hot water central heating. Reimported in France in 1831, it became popular during the second half of the 19th century.

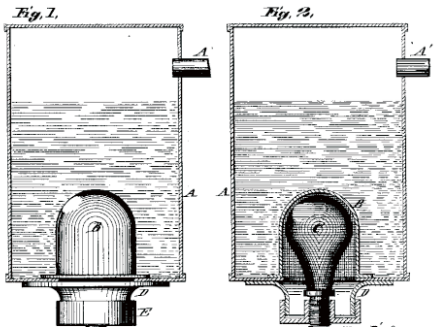


1777 Hatchery heating by boiler and thermosyphon , by Jean Simon Bonnemain (Ultimheat Museum document)



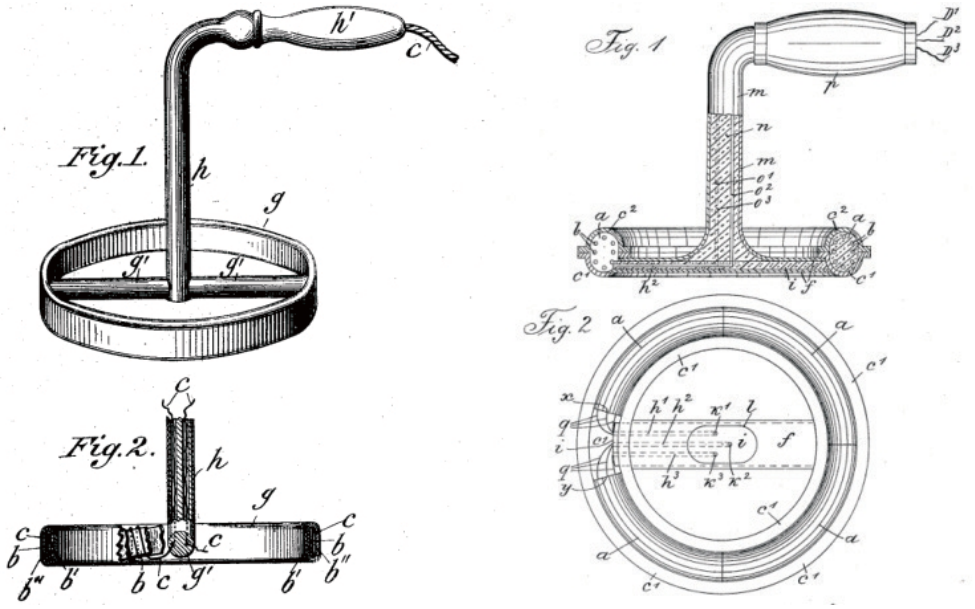
1820: Bath tub heating was also one of the centers of interest of researchers at the time. M. Bizet, of Paris, invented a tub heated by thermosyphon (INPI Patent), very close to what the Romans were using. Coal, which was becoming more widely used in Paris, is used to heat the boiler.

1896: Mr. Morineau in Paris, develops an instantaneous water heater with a coiled tube exchanger, gas fired, similar to models already on the market under the name “capillary tub heaters”, but for the first time it had an automatic valve detecting the passage of the water to turn on and turn off the burner.

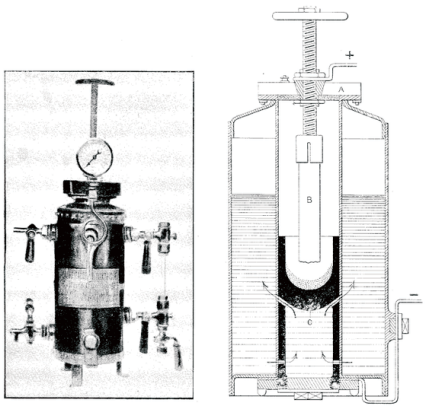


1889, Daniel Smith, from St Louis (Missouri, USA), files a patent for an electric storage water heater, whose heating is provided by a platinum wire inside a glass bulb, under a protection dome. (US patent 411737). Although this patent remained unexploited, it can be considered as the ancestor of electrical water heaters.

Between 1890 and 1900, the development of electric power flourished inventions that tried to use it as a means of heating for water and houses. Hundreds of patent were filed in a few years, most of them in the US, which were the pioneers of domestic electrical power distribution. But in Europe this energy was then very expensive, and electrical distribution was patchy and limited to lighting needs. Wood, coal, gas and kerosene remained long time the only water heating means. The precursors in Europe between 1890 and 1892 were Crompton (England), Friedrich Wilhelm Schindler Jenny (Switzerland), and Henriot and Lebrasseur (France). Electrical water heating appliances are, at that time, limited to kettles

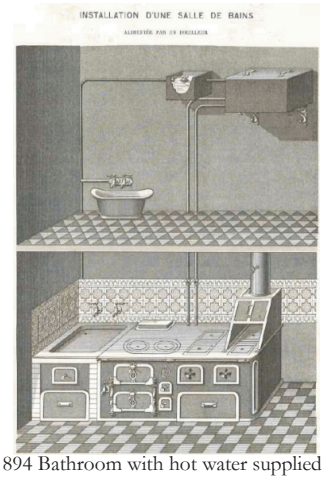


1891, The Swiss citizen Friedrich Wilhem Schindler-Jenny, resident in Kennelbach (Austria-Hungary), makes the first immersion heaters, for warming water tanks (Austro-Hungarian Patent No. 37527 and No. 13680 of August 22, 1891). These patents will be extended in Switzerland, Belgium, France, Italy, England and the USA.

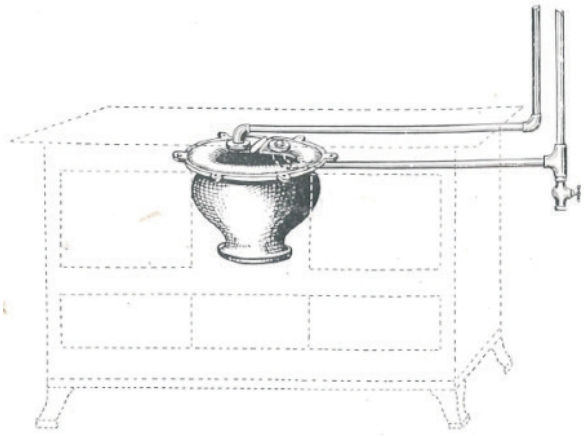


1900. The first electric boiler seems to have been that of the Russian engineer Ougrimoff, which was presented at the Universal Exhibition. He called this device « Calorifacteur électrique ». It worked by creating an electric arc between two electrodes, and was particularly used to produce steam. In 1923, the Swiss company Oerlikon started to manufacture similar electric boilers, named electrode heating boilers, under the name Revel. This

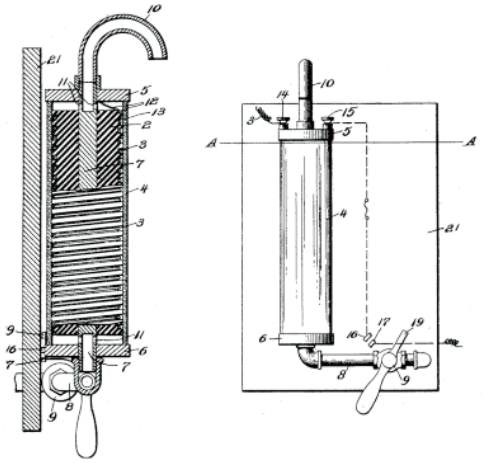
technical solution to produce steam and hot water is still manufactured by some companies , mainly for high power boilers.
The mansions of the early 20th century generally produce hot water via a cast iron heat exchanger called "bouilleur" (boiler) located in the foyer of the stove. By thermosyphon, his boiler feeds a large water tank located higher, thermally insulated, ancestor of our storage water heaters and foreshadowing the current systems called REC (Renewable Energy). This system was common in almost all stoves manufacturers catalogues throughout the first half of the century. Similar exchangers were installed on central heating boilers with hot water production.



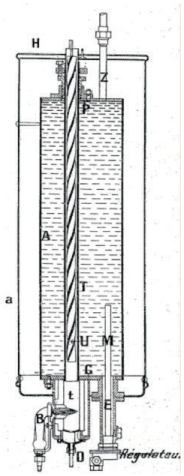
1894 Bathroom with hot water supplied by a stove with « Bouilleur »
(Chappée Catalog, Ultimheat Museum)



Heat exchanger « Bouilleur » mounted inside a stove
(Catalog of Ets Demoulin, Farciennes, 1932, Ultimheat Museum)



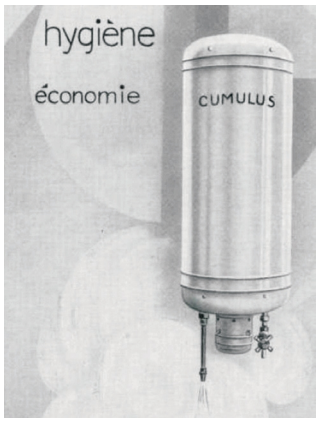
February 1905, the American citizen Eli Sager apply for a patent for an instantaneous electrical water heater



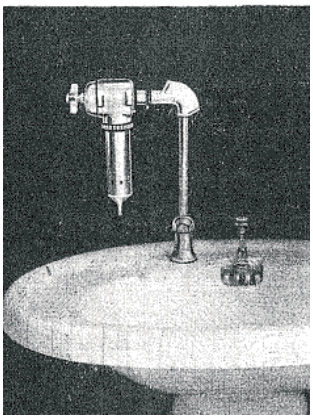
In 1913 Ets Grouvelle and Arquembourg in Paris developed the first storage gas water heater equipped with a temperature controller. "The Marseillais"

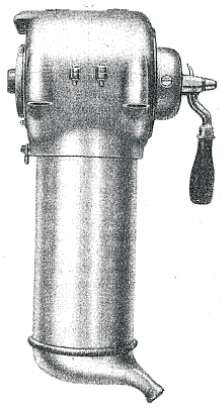
1915 While the rest of Europe is at war, Switzerland that produces cheap electricity by means of hydroelectric dams, sees the rise of the first electric storage water heaters, they are described by the magazine of Civil Engineering (22 May 1915)
"The use of electricity, as heat for cooking, tends to spread wherever the electricity can be produced fairly cheap ... .M. Ringwald, director of power plants of Central Switzerland in Lucerne, has made to the General Assembly of the “Swiss Society for the use of waterfalls”, a very interesting conference

on the use of electricity for cooking and heating ... The Company that manages the speaker serves several locations where are used a lot of electrical cooking appliances, so that it was possible, therefore, to make serious statements ... .. A device based on the principle the accumulation of the heat is the hot water tank, which is largely in favor of the public, particularly one with a capacity of 15-30 liters. The apparatus consists of a thick plate cylinder, surrounded by a heating resistor easy to replace; everything is wrapped in insulation.
The device is connected to a water line; at night, the water heats up, the power is expended 160 to 200 watts. An automatic switch reduces the power consumed to 50 or 70 watts, which is sufficient to compensate for losses, when the water has reached a temperature of 80 to 90 degrees. This unit can be connected to any pipe light.
As the unit works mostly at night, electricity is counted at a very low price (5 cents per kilowatt hour), it uses the same counter as the light, and it records only determined fraction of the energy used for heating water.
It was found that over 24 hours, these devices consume, for 16 to 18 hours, the maximum power "



In 1917 thanks to the opportunities of the Swiss market described above, a Swiss engineer, Fritz Sauter, who developed in 1910 an automatic switch electric appliance system to use the night rate, invented an electric storage water heater named "Cumulus", whose name has been later coined into French language for electrical storage water heaters. It started to be sold in France in 1922, when Sauter set up its French factory in Saint Louis. The tanks are then thermally insulated with cork granules.
In 1928, Sauter claimed to have sold more than 15000 of them worldwide. (Ultimheat Museum document).

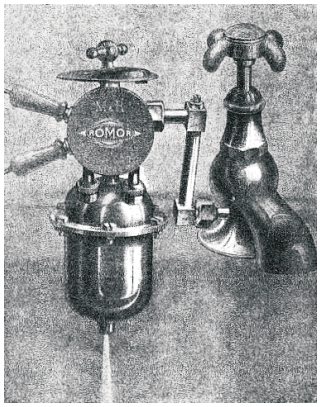


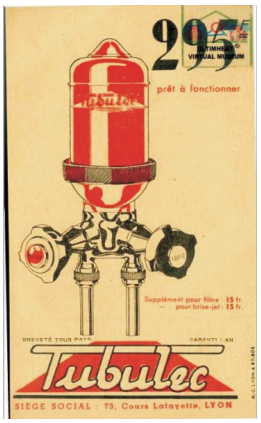


1922, the company Presto, Paris, develops a faucet mounted instantaneous water heater in which water is heated by its own conductivity, without heating wires. This technical solution, had the default is to be very sensitive to the quality of water, is still used to produce steam on machines to take off the wallpaper and similar equipment.
(Ultimheat museum documents)

From 1925, electricity is increasingly available in homes, and as it becomes less expensive, storage water heaters and electric tub heaters proliferate.

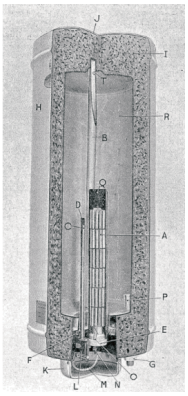
Manufacturers like Lemercier and Etelec-Electrocumul start their production. Many others will follow.

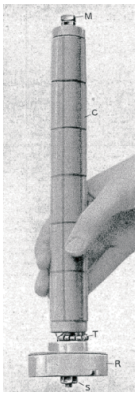




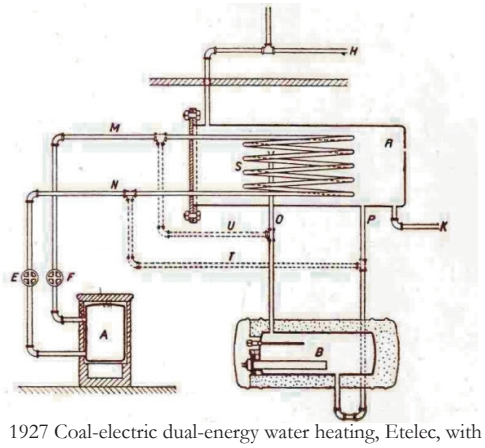
1924. The electric instantaneous water heaters mounted on the faucet are expanding, The mark "Romor" manufactured by Moerch and Roumet in Paris , has some success with them. The company Tubulec will also manufacture them until the 1950s (Ultimheat Museum documents).

1928, In the east of France, electricity companies set up special discounted electricity price during the night. Therefore, accumulation water heater producers will install there factories overwhelmingly in this part of France.

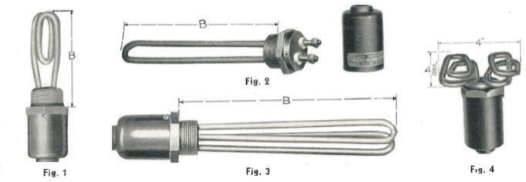




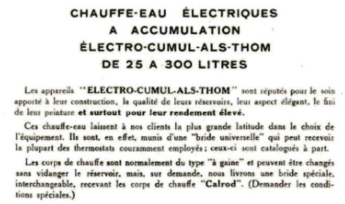
1928 “Electro-cumul” electric water heater made since 1925 by Etelec, Etablissement électromécaniques de Strasbourg. The heater is single tube type, with ceramic barrel on which are coiled heating wires. Water is heated at 95°C. (Ultimheat Museum)



1927 Coal-electric dual-energy water heating, Etelec, with tubular heat exchanger inside a storage tank. (Ultimheat Museum)



1932 Calrod sheathed tubular heaters (Ultimheat museum document)


CHAUFFE-EAU ÉLECTRIQUES
A ACCUMULATION
ÉLECTRO-CUMUL-ALS-THOM
DE 25 A 300 LITRES

Les appareils "ELECTRO-CUMUL-ALS-THOM" sont réputés pour le soin apporté à leur construction, la qualité de leurs réservoirs, leur aspect élégant, le fini de leur peinture et surtout pour leur rendement élevé.

Ces chauffe-eau laissent à nos clients la plus grande latitude dans le choix de l'équipement. Ils sont, en effet, munis d'une "bride universelle" qui peut recevoir la plupart des thermostats couramment employés ; ceux-ci sont catalogués à part.

Les corps de chauffe sont normalement du type "à gaine" et peuvent être changés sans vidanger le réservoir, mais, sur demande, nous livrons une bride spéciale, interchangeable, recevant les corps de chauffe "Calrod". (Demander les conditions spéciales.)

1936. The sheathed tubular heaters, recently invented in the USA (Calrod-General Electric) and Sweden (Baker) arrive on the market; Als-thom uses them on its Electro-cumum storage water heaters. (Ultimheat Museum document).

The reservoirs of hot water storage or circulation heaters are then made of copper for small volume or galvanized steel for large models. In these, leakages due to corrosion are common, especially at the welds, as the galvanic corrosion is not yet well mastered

1935: Ones begins to consider heat pumps heating with hot water storage, produced at the night low cost electricity: "The principle of the heat pump, very seductive in itself, seems not about to be used routinely. It leads to

expensive machinery, usually non-silent and of a delicate maintenance. It requests bulky bodies, such as the heat exchanger and the evaporator, and will allow the exclusive use of off-peak hours power with the hot water heater and with a prohibitive accumulator volume due to the low temperature of the water used.
Its practical use in the current state of the art seems difficult "(Bulletin de la société industrielle de l'Est, July 1935)

October 10, 1939, Russell Games Slayter, Owens-Corning, the patent filed in 1934 for a process for the industrial manufacture of glass wool patent is published. (Patent US2175225 A). Gradually, after 1945 the storage water heaters manufacturers will replace cork by glass wool. (1943 Ad. of Owens Corning for the use of glass wool in home appliances, Ultimheat Museum)

May 15, 1941, Orrin E.Andrus, from the EO Smith water heaters Cy (Cleveland, USA), proposes a sacrificial zinc washer in enameled storage water heater to reduce galvanic corrosion.
Following a series of articles in "Transactions of the Electrochemical Society, vol. 90 (1946), pp. 499 to 503, and in Corrosion, Vol. 1, No. 2 (June 1945), pages 67 and following, water heater manufacturers imagine the sacrificial anodes . In 1946, the sacrificial magnesium anode, in its present form, is described in the patent US2459123A, filed by the Cleveland heaters company (Cleveland, USA), published in January 1949.
In France, in 1953, the company Lemercier frères, will be the first to use sacrificial magnesium anodes under the brand "Magnodium".

1945-1950: Immersion heaters using sheathed tubular heaters elements have become common, under the brands Metallurgie du Nickel(Métanic) Rubanox, Tubalox, Spyrox, Baker, Calrod. Many French manufacturers equip their water heaters with them.

1946: the Company Ero (Sorgue, France) offers water heaters with 200°C enameled tanks at in place of galvanized, cemented or metalized tanks. This enamel is a thermosetting resin, Bakelite type, whose elasticity resists to thermal expansion of the tank, and which, by electrically insulating walls, protects them from galvanic corrosion. (Ultimheat Museum)

1947: The Swiss company Rütschi invented the "Perfecta" wet rotor silent pump, which will become later the universal standard for central heating circulators.
Until then, the acceleration of the

flow of water, which allows the use of small diameter pipes, was made by compressed air systems, or by the use of city mains water supply to ensure operation of pump or by noisy electrical pump units requiring the use of special "soundproof" gaskets, and therefore their use was limited to a small number of houses.

1952: Herbert Lindemann, engineer at the "Lonza electric and Chemical Works" of Gample, Switzerland, is developing a process for producing flexible thermoplastic foams with closed cells, containing PVC, and other components such as NBR. Because of their excellent temperature resistance, these foams will be widely used as thermal insulation in the air conditioning apparatus. (Swiss Patent 322 586 of 25 November 1952).

1955-57: Electrical circulating pumps for central heating take flight, they are made by Emergy in Lyon, Julien and Mège in Lyon and Salmson in Paris and Laval (Using the Perfecta wet rotor License), and allow designers of hot water heating systems to overcome the constraints of the thermosyphon. (Ultimheat Museum Documents).

1955 In France, the company “Forges de Gueugnon” installs a rolling mill for cold rolling the stainless steel produced by Uginox since 1950. Stainless steel, which until that date was only used in professional and industrial equipment will soon start to be used in heating household appliances. In 1958 it starts to be used in washing machines tanks.

1960: One sees the first storage water heaters with "Uginox" stainless steel tanks. This excellent technical solution, avoiding most of the corrosion risks, however, will remain limited to high-end appliances.