English version

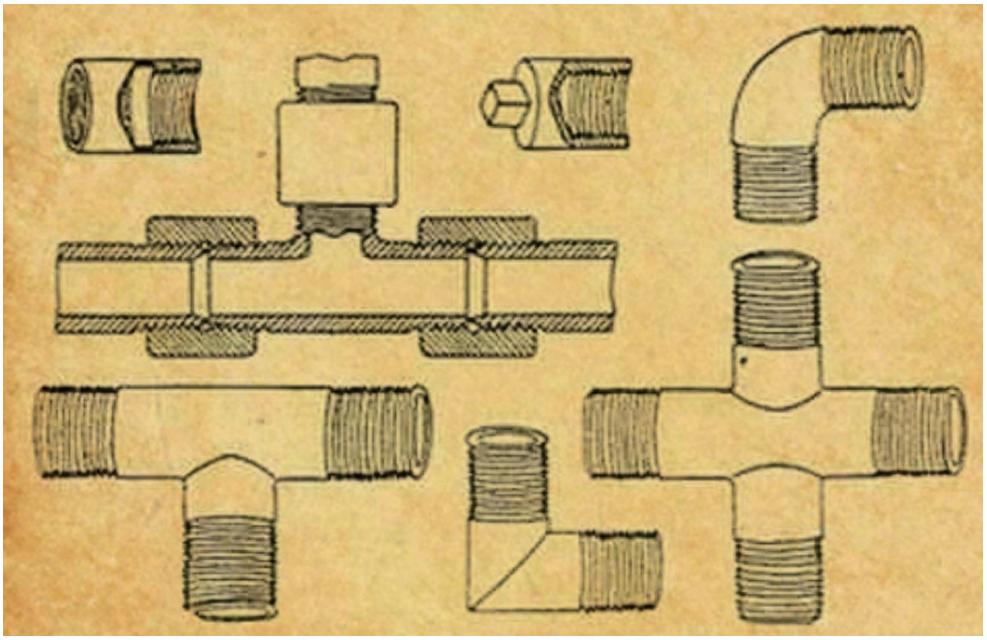
ULTIMHEAT® MUSEUM

Jacques Jumeau

History of technologies linked to heating.

Chapter 1

History of threaded pipe connections



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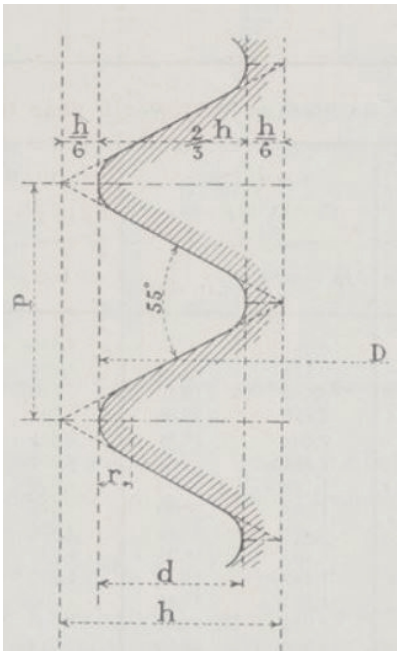
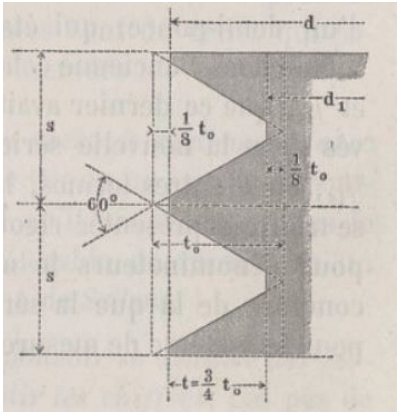
At the beginning of the 19th century, the development of pumps and steam engines posed the problem of a simple, solid, waterproof and pressure-resistant connection of metal pipes. Each manufacturer designed their own system and very soon appeared problems of compatibility and maintenance. In 1841 the English engineer and industrialist, Joseph Whitworth, of Manchester, presented to the Institute of Civil Engineers, a memoir to demonstrate the advantage of applying, for railways, navigation and manufactures, a uniform system screw threads, all over England. He gave a table summarizing the main dimensions which were quickly adopted by several companies and builders. Joseph Whitworth focused on determining the pitch, depth, and shape of screw threads to match their diameter. He endeavored to establish such proportions that, while retaining the necessary power of the nets, they present, at the same time, a great solidity, and may serve both for iron and cast iron. It was based on a 55-degree thread angle with rounded roots and crests of threads to save manufacturing tools. This form of threading, was later declined into a cylindrical female part and a conical male part with a taper angle of 1/16 (6.25%) and was then chosen as the most efficient, because it allowed to perform a Pipe sealing on a step. This form was standardized under the name "British Standard Pipe" (BSP) but also known as Whitworth thread. The conical pitch is designated by BSPT (T for "Tapper"), the cylindrical pitch is designated by BSPP (P for "Parallel"). Quickly used in many as standard thread for the connection of steel pipes used for low or medium pressure, the International Standardization Federation adopted it in 1932 and this threading was then formalized in France. Although there is a conical male + conical female version, it is generally used with a conical male part and a cylindrical female part, with the addition of a sealant on the threading (Originally made of bast of flax or hemp).
A so-called "truncated" version in which the heads and bottoms of threads are truncated and no longer rounded, easier to manufacture, was born in the 1920s and is included in current ISO standards



Whitworth thread (1914 Outillage mécanique, Merveilles de la Science)

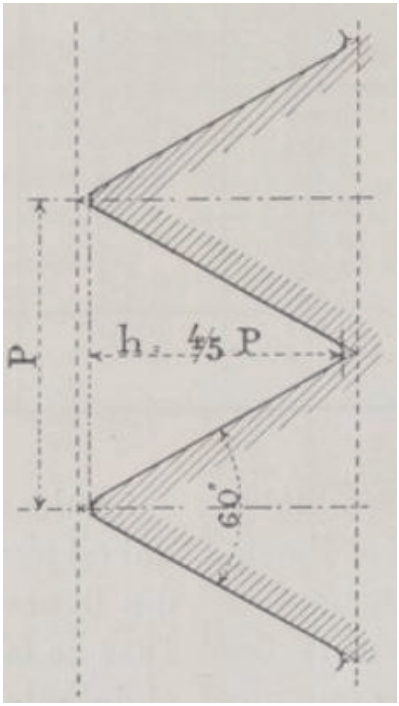
In 1862 the machine tool manufacturer William Sellers of Philadelphia, invented a tapping machine which received a favourable reception of the industrialists. With this welcome, he presented in April 1864 at the Franklin Institute, of which he was president, a study called "Essay on a system of screw thread and nuts" comprising a series of tables giving thread sizes of ¼ inch to 6 inches and presenting the advantages of these threads over Whitworth threads. On December 15, 1864, the special commission appointed for the review of this project recommended to the American manufacturers the adoption of these threads. This form of thread with an angle of 60°, was initially intended for screws and bolts for mechanical assemblies. This threading was later referred to as the American National Standard (ANS), but is often referred to as Sellers threading.



Sellers thread

Robert Briggs of the company Pascal Iron Works in Philadelphia, developed in 1834 a control gage to check the internal threads of piping. In 1862 he made a similar device to measure external threads, and published a memoir called "Briggs Standard Pipe Thread" describing a thread close to the Sellers thread, in which the heads and bottoms of threads are truncated to facilitate the manufacture, and the thread angle is 60°, mainly designed for wrought iron tubes and boiler tubes. It had a taper angle of 1/16 (6.25%)

This threading was adopted by American tube builders at the Pittsburg Congress in 1886, and then by the US Congress in 1889.



Briggs thread

This pipe connection solution, consisting of a conical male part and a conical female part, became the National Pipe Tappered Thread (NPT) when the American Standards Association was created in 1919. The Briggs Standard Pipe Thread then became the American Standard B2.1, which covers straight and tapered threads with Briggs threads and their control methods.

This thread is widely used because it provides both the mechanical connection and the hydraulic seal, with better resistance to high pressures.

It was also rapidly used in European construction workshops, mainly in the shaping of tubes used for heating installations, either hot water or steam.

The NPT thread was originally theoretically leak proof without sealant. But in practice, it must receive teflon tape or joint paste.

A slightly modified version, which seals without sealant (NPTF: F for Fuel) was developed later, as well as a cylindrical version (NPTS: S for "straight")

In Europe, the metric system missed the pace of standardization, and in 1881, no less than 14 systems were in competition. (1881 F. Reuleaux, Le Constructeur)

During the 20th century, the emergence of specific national standards in Europe, where each country wanted to impose its system, continued to create great confusion in forms and denominations. For example, French Standards NF E03.004 and 00.5 and German DIN 477 may be cited.

Despite the European attempts of the last decades to impose metric and / or parallel metric pipe threads, it is, with rare exceptions, NPT (USA) and BSP (GB) threads that are universally used because of their historical pre-eminence. Uniting standards emerged that standardized BSP threads. These are: ISO 7 and ISO 228.