

The Origins of the Liebig Condenser

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Question

When and where did Liebig propose his famous condenser?

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Answer

The term Liebig condenser, named in honor of the 19th-century German organic chemist, Justus von Liebig (figure 1), is usually applied to laboratory scale, counter-current, water condensers made of two concentric tubes - an inner distillation tube and an outer cooling jacket through which there is a continuous circulation of the cooling water. It has been known for more than a century that Liebig was not the original inventor of this ubiquitous piece of laboratory equipment. As early as 1896, Georg Kahlbaum noted that the counter-current condenser was actually first described in 1771 by the German chemist, Christian Ehrenfried Weigel (1748-1831) (1, 2), and, a few years later, Max Speter (3) uncovered two additional, but apparently independ-

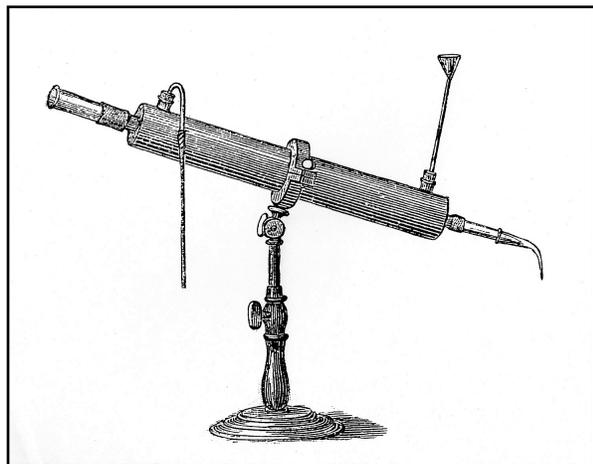


Figure 2. A woodcut of an early 19th-century version of the Liebig condenser (10).

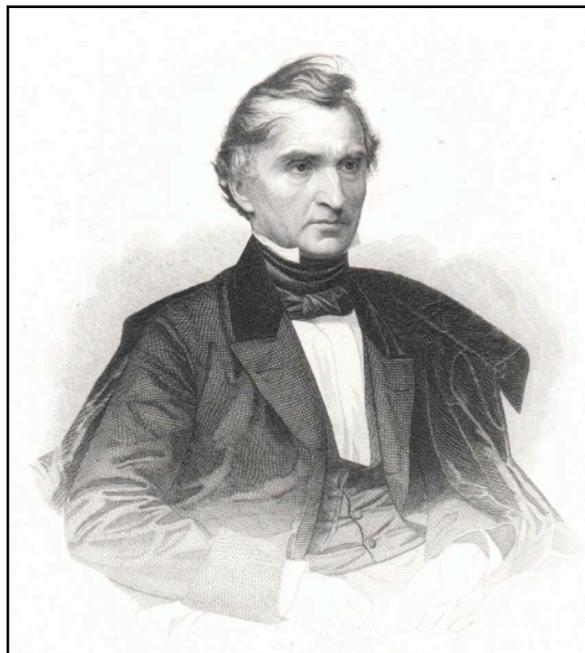


Figure 1. Justus von Liebig (1803-1873).

ent, inventors - the Frenchman, P. J. Poissonier, in 1779 (4) and the Finnish chemist, Johan Gadolin (1760-1852) in 1791 (5).

In Weigel's original design, the cooling water was confined between an inner and outer tube made of tin or zinc and the glass distillation tube did not come into direct contact with the cooling water but was rather suspended inside the inner metal tube. Some improvements in Weigel's design were made in 1794 by the German pharmacist, Johann Götting (1755-1809) (6), and in 1843 Liebig, who incorrectly attributed the condenser to Götting instead of Weigel, described several further improvements (7). In Liebig's case (figure 2), these apparently consisted of eliminating the inner metal tube and tapering the cooling jacket at each end so that the glass distillation tube could be directly sealed to the outer metal jacket by means of either corks or sections of rubber tubing, thus allowing the distillation tube to come into direct contact with the cooling water (8).

The large number of chemists and pharmacists trained by Liebig, and who first came into contact with his version of the condenser in his laboratory at Gies-sen and later at Munich, no doubt accounts for his name eclipsing that of its true inventors, a misidentifi-cation that was already in the chemical literature by the 1840s (9) and which has since been reinforced by countless apparatus dealers. Though most specialized histories of distillation give the correct origins of the condenser (10, 11), its identification with Liebig alone persists in most popular articles and histories of chemistry.

Literature Cited

1. G. W. Kahlbaum, "Der sogenannte Liebig'sche Küh-lapparat," *Berichte*, **1896**, 29, 69-71.
2. C. E. Weigel, *Observationes chemicæ et minera-logicæ*, Goettingæ, 1771.
3. M. Speter, "Geschichte des Liebig'schen Kühlappa-rates," *Chem. Ztg.*, **1908**, 32, 3-5.
4. P. J. Poissonnier, *Appareil distillatoire présenté au Ministre de la Marine*, Paris, 1779.
5. J. Gadolin, "Beskrifning på en forbattrad Afkyl-nings-Anstalt vid Branvins-Brannerier," *Kongl. Vetenskaps Academiens Nya Handlingar*, **1791**, 12, 283.
6. J. F. Göttling, *Taschenbuch für Scheidekünstler und Apotheker*, 15th ed., Weimar, 1794, p. 129.

7. J. Liebig, *Handbuch der Chemie*, Vol. 1, Winter: Heidelberg, 1843, pp. 173-175.

8. See, for example, C. Ettl, "Destillation," in J. Liebig, J. C. Poggendorff, F. Wohler, Eds., *Handwörterbuch der reinen und angewandten Chemie*, Vol. 2, Vieweg: Braunschweig, 1842, pp. 531-533.

9. A photograph of two of these Weigel-Göttling-Liebig condensers obtained from Liebig's Munich laboratory can be found in M. Speter, "Die historischen chemischen Originalapparate des 'Deutschen Museums von Meisterwerken der Naturwissenschaft und Technik' zu München," *Zeit. angew. Chem.*, **1908**, 21, 625-632.

10. H. Schelenz, *Zur Geschichte der Pharmazeutisch-Chemischen Destilliergerate*, Schimmel: Leipzig, 1911, pp. 84-87.

11. R. J. Forbes, *A Short History of the Art of Distilla-tion*, Brill: Leiden, 1970, pp. 254-257.

Do you have a question about the historical origins of a symbol, name, concept or experimental procedure used in your teaching? Address them to Dr. William B. Jensen, Oesper Collections in the History of Chemis-try, Department of Chemistry, University of Cincinnati, Cincinnati, OH 45221-0172 or e-mail them to jensenwb@ucmail.uc.edu