

A Few Alembics

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The alembic, which is one of the oldest known forms of distillation apparatus, dates from between the 1st and 3rd century AD and is sometimes attributed to an early alchemist known as Marie the Jewess (1-4). The term *alembic* is from the Arabic *al + anbiq*, meaning “the + still.” The apparatus consisted of four parts (figure 1): a boiling pot or flask, a condensing or still head, and a side tube or beak for draining the condensed liquid vapor into a receiving flask of some sort. Strictly speaking, the term *alembic* (also known in Greek as an *ambix*) originally referred only to the condensing head, whereas the terms *cucurbit* or *bikos* were used to describe the boiling pot or flask. Generally the alembic head was sealed to the cucurbit using a mixture of clay and egg white, known as luting. This mixture was also sometimes applied to the bottom of the cucurbit itself to help prevent cracking of the glass during heating. Since at least the 17th century, the term alembic has come to stand for the entire apparatus.

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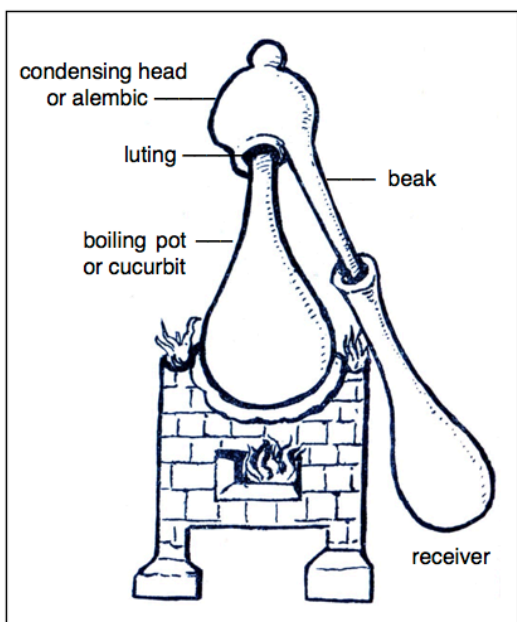


Figure 1. A 15th-century drawing of an alembic with the various parts labelled.



Figure 2. A handblown replica of an early alembic with a broken beak and a woven straw support ring (Jensen-Thomas Apparatus Collection). Note the absence of a collection gutter.



Figure 3. Two replicas of small, flat-bottom alembics with clay luting (Jensen-Thomas Apparatus Collection).



Figure 4. A reproduction of a circa 17th-century alembic with an “ostrich”-necked cucubert, clay luting, various receiving flasks, charcoal furnace, bellows, tongs, and poker (Jensen-Thomas Apparatus Collection).

tions of alembics (figures 2-4). Indeed, both glass and copper alembics continued to be sold by laboratory supply houses well into the early decades of the 20th century (5).

Modern experimental studies have shown that the simple alembic was surprisingly efficient when it came to separating water-alcohol mixtures (6). Nevertheless, starting in the 15th century, various attempts were made to improve the alembic, including constructing the condensing head out of copper (which is a better conductor of heat than glass), surrounding the head with a basin of cold water, or extending the beak into the shape of a coil that was then run through a container of cold water. The first of these alterations was known as a Rosenhut (figure 5), the second as a Moor’s head (figure 6), and the last as a serpentine or worm (figure 7). Though these changes did improve the rate of distil-



Figure 5. A Rosenhut as pictured on the title page of Puff von Schrick’s 1474 booklet on the distillation of flavored brandies. The copper cone on top of the furnace is the Rosenhut or condensing head. The cucubert is hidden within the furnace itself.



Figure 6. A metal alembic with a Moor’s head. The valve to the right is to drain the water basin after the distillation is complete. Detail from a 17th-century painting by David Teniers the Younger.

SOME ALEMBICS

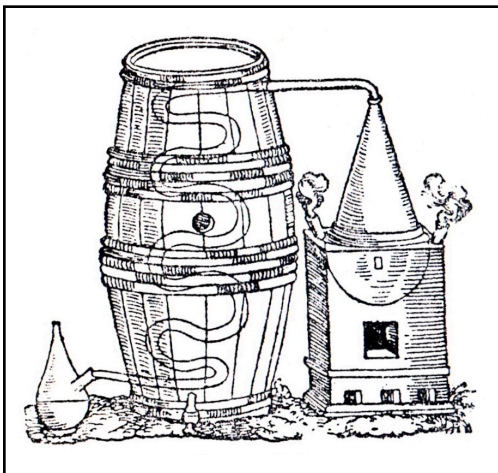


Figure 7. A 1567 woodcut of a worm or serpentine condenser.

lation, modern studies show that they did not significantly change the separation or fractionation efficiency – this being instead largely determined by the thermodynamics of the liquid-vapor equilibrium in the boiling pot (6).

The last of the above modifications gradually morphed into the well-known whiskey still (figure 8), which came in various sizes, ranging from several gallons in the case of the personal “moonshine” still, all the way up to several hundred gallons for the industrial-level stills used by legitimate breweries and liquor distilleries.

References and Notes

1. H. Schelenz, *Zur Geschichte der pharmazeutisch-chemischen Destilliergeräte*, Springer: Berlin, 1911.
2. F. S. Taylor, “Evolution of the Still,” *Ann. Sci.*, **1945**, 5, 185-202.
3. R. J. Forbes, *A Short History of the Art of Distillation*, Brill: Leiden, 1949.

4. Anon, *From Liquid to Vapor and Back: Four Centuries of the First Chemical Separation Process*, University of Delaware Library: Newark, DE., 1991.

5. See, for example, *Illustrated Catalogue of Chemical Apparatus, Assay Goods, and Laboratory Supplies*, Eimer & Amend: New York, NY, 1912, p. 9, Item 2053 and p. 126, Item 2990.

6. A. R. Butler, J. Needham, “An Experimental Comparison of the East Asian, Hellenistic, and Indian (Gandharian) Stills with Regard to the Distillation of Ethanol and Acetic Acid,” *Ambix*, **1980**, 27, 69-76.



Figure 8. A working desktop model of a copper alembic with a water-cooled coil condenser like those used for industrial-scale distillation (Jensen-Thomas Apparatus Collection). Once again the condensing coil is hidden from view in the cylindrical container to the right through which the cooling water circulates.