



Period Distillation

Special thanks to Mistress Arwyn, OL, OP for specifically requesting that I do a class on period distillation and for guiding me to teach this specific subject.

Special thanks to Cynthia Cochran, Jude Harrison, et. al. for legal consultation on this project.

DISCLAIMER/WARNING: This class is **NOT** an endorsement or an advocacy of committing illegal activity!!! The processes detailed in this class are highly regulated in the modern world. **IF** you decide to pursue doing **ANY** distillation of any substance then be sure that you're in compliance with any and all Federal, State/Provincial, County, City and Local Ordinances and Codes. The processes detailed require licenses and other compliances with law in order to be done legally. I do **NOT** advocate illegal behavior or action of any kind, and I do **NOT** bear any responsibility for actions taken as a result of this class.

I. Earliest Evidence of Distillation



Figure 1 Open vat distillation, Konrad Gesner, *Euonymus. De remediis secretis, liber physicus, medicus et partim etiam chymicus...nunc primum in lucem editus. 1569.*

Mesopotamian and Egyptian Distillation

Although we don't possess any writings, cuneiform, or pictographs about the process of distillation from the period evidence of distillation has been dated to 5,000 years ago in ancient Mesopotamia and Egypt.¹ The substances that they were interested in obtaining and purifying wasn't alcohol, but rather essential oils from various plants and fruits for cosmetics, perfumes and incense. King Yahdun-Lim of Mesopotamia (Mari and Terqa) around 1810 BC had established a perfumery to large scale manufacture balms, oils and incense from cedar, cypress, ginger and myrrh to be used for rituals, medicinal and cosmetic purposes as well as to embalm the dead.² ³The first writings that we have of this primitive form of distillation the Egyptians used were authored centuries later by Herodotus, Pedanius Dioscorides, and Pliny the Elder about obtaining

¹ Kockmann, Norbert. 2014. "History of Distillation." In *Distillation: Fundamentals and Principles*, by Eva Sorensen, 1-43. London: Elsevier Inc.

² D. Frayne, *RIME* 4: 602-604; study: Moran Fs (1990), 439-449

³ F. Thureau-Dangin, *RA* 33, 50



“oil of cedar” which might have been turpentine.^{4 5 6} However, the process doesn’t seem to have been illustrated until the medieval and renaissance period, notably by Konrad Gesner in 1569. The sap and resins from the plant would be boiled in water in an open ceramic vessel with layers of wool spread over sticks that were crisscrossed across the opening of the vessel. The vapors from the boiling would condense in the layers of wool. When the wool was saturated with liquid it would be replaced with another fresh layer of wool. Once the process was over the oil would be rung out of the wool by hand.

The Greek natural philosopher Theophrastus (371BC-287BC), commented on the various perfumes, cosmetics, incenses, and medicinal ointments produced by the Egyptians in his treatise, “On Odors”, and gave descriptions of the essential oils of balanos, castor oil, flaxseeds, sesame, safflower, almonds and olives.⁷ He found that balanos oil to be the best followed by new raw olive and then almond oil. He also commented on a popular fragrance that was manufactured in Mendes, the Greek name of the ancient Egyptian city of Djedet, that was exported to Rome. The perfume was made up of balanos oil mixed with myrrh and cassia. Theophrastus also commented on an Egyptian medicinal ointment used by physicians to disinfect the skin during treating injuries to the head or head surgery that was made up of bitter almond oil, green olives, cardamom, myrrh, balsamum seeds, honey, galbano, wine and turpene resin.⁸

Chinese Distillation

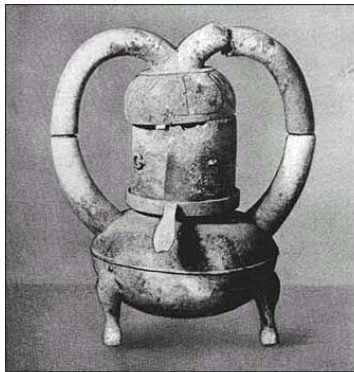


Figure 2 A Chinese Still.

There’s evidence that the Chinese were distilling a drink from rice as early as 800 BC; however, the process was not recorded until the Han Dynasty (206BC-220AD), but instead of detailing the distilling of rice wine it focuses on distilling pig urine. The philosopher/chemist Wei Boyang, also known as the "father of alchemy", was investigating how to make an elixir of immortality.⁹ Why he decided to go looking in a pigsty to find immortality is unknown, but he wrote in his book *Cantong qi*, *Book of the Kinship of Three*, in 142AD about the process of distilling the pig urine to form crystals which were potassium nitrate. When he mixed it with sulfur to create the elixir it would ignite spontaneously. Wei Boyang, not to be deterred from the quest for

⁴ Herodoti Histories. Lib. II, 85.

⁵ Dioscorides, *De materia medica*. Lib. I, 34, 39, 80.

⁶ Plinii *Historia naturalis*. Lib. XV, cap. 6-7; and Lib. XVI, cap. 22. E pice fit, quod pissinum appellant, quum coquitur, velleribus supra habitum ejus expansis, atque ita expressis color oleo fulvus.

⁷ Smith, William, ed. (1870). "Theophrastus". *Dictionary of Greek and Roman Biography and Mythology*.

⁸ *Enquiry into Plants: Books 6-9; Treatise on Odours; Concerning Weather Signs*. Translated by A. F. Hort, 1926.

⁹ Needham, Joseph, *Science and Civilization in China Volume 5 Part 3*, Cambridge University Press, 1976, p. 50.



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Figure 3 A Chinese gourd and bamboo still.

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immortality, went on to mix this combination with a third powder that he doesn't identify in his book where the resulting mixture would, "fly and dance".^{10 11}

Greek Philosophy

The Western world natural philosophers would frequently describe the process of distillation, but would fail to describe or illustrate the apparatus used. It wasn't until the first century AD that the Greek physician Pedanius Dioscorides (40AD – 90AD) would commit descriptions of apparatuses to text in his *Liber de materia medica* among them are found the cucurbita and the retort which may have been an alembic.^{12 13} The purpose of these apparatuses in his *Liber de materia medica* was to make and purify medicinal substances.

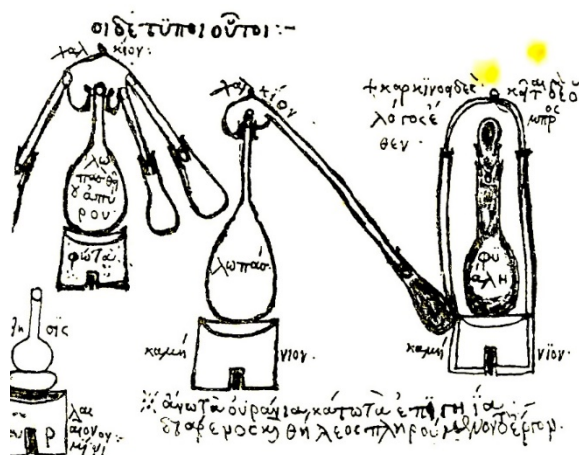


Figure 4 Byzantine Greek manuscript's illustration of Zosimos' distillation equipment, Illustration from the 15th century Byzantine Greek manuscript, Parisinus graces, as reproduced in, *Collection des anciens alchimistes grecs* (3 vol., Paris, 1887-1888, p. 161) Unknown Byzantine Greek illustrator, reproduced by Marcelin Berthelot in his 1887 text, *Collection des anciens alchimistes grecs*.

Zosimos of Panopolis, an alchemist, living around the end of the 3rd century AD prolifically writes a body of works and defines alchemy as the study of, "The composition of waters, movement, growth, embodying and disembodying, drawing the spirits from bodies and bonding the spirits within bodies."¹⁴ One of his most popular texts that was copied and translated for centuries to come was his *Treatise on Instruments and Furnaces* where he went into great detail with illustrations of distillation apparatuses. However, he credits another alchemist, Mary the Jewess, with invention of the alembic and not Pedanius Dioscorides.¹⁵

None of the works that have been attributed to Mary the Jewess by Zosimos are known to have

¹⁰ Padmanabhan, Thanu, *The Dawn of Science: Glimpses from History for the Curious Mind*, 2019 p. 59.

¹¹ Smee, Harry, *Gunpowder and Glory*, 2020, p. 1.

¹² E. Wiedemann in vol.32, 1878, p. 575 of the *Zeitschrift der deutschen morgenlandischen Gesellschaft*.

¹³ Dioscoridis *De materia medica libri quinque*. Editio Kuhn-Sprengel. 1829. Vol.1, p. 367.

¹⁴ Strathern, P, *Mendeleev's Dream—the Quest for the Elements*. New York: Berkley Books, 2000.

¹⁵ Edmund Lippmann, *Entstehung und Ausbreitung der Alchemie*, Springer, 1919, pp. 48–49



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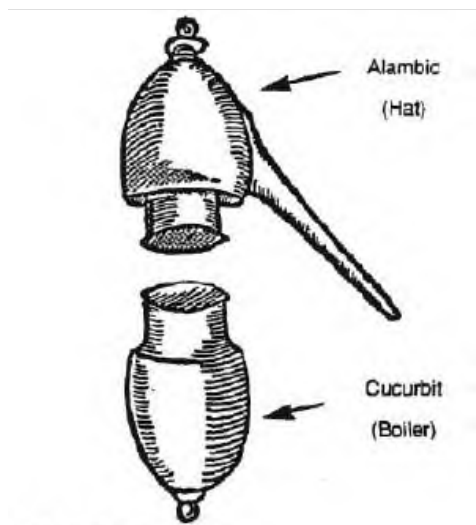


Figure 6 An Alembic.

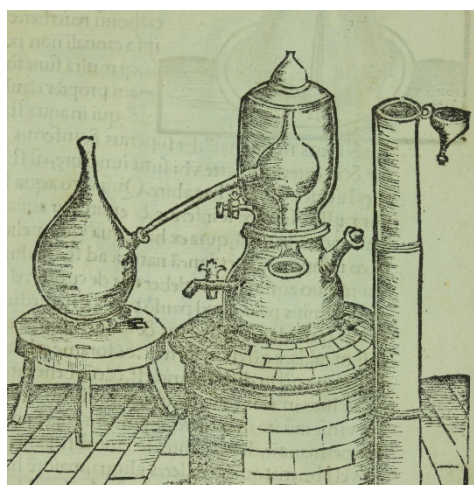


Figure 5 An alchemical balneum Mariae, or Maria's bath, from *Coelum philosophorum*, Philip Ulstad, 1528, Science History Institute.

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survived as of this date; however, multiple sources note that Mary the Jewess was an alchemist who lived in Alexandria between the first and third centuries AD.¹⁶ She was credited with the invention of the alembic in the Western World, a two part apparatus made of a cucurbit or bottom pot and a alembic or hat with a side tube or even multiple side arms such as the Dibikos, a two armed alembic, and the Tribikos, a three armed alembic.¹⁷ Mary recommended that the copper or bronze used to make the tubes should be the thickness of a frying pan and that the joints between the tubes and the still-head should be sealed with flour paste.¹⁸ A receiving vessel set at the end of the side tube would catch the resulting distillate. Mary the Jewess was also credited for inventing the double boiler or the “bain-marie” (Mary’s Bath) which is still used today in cooking. The apparatus consists of a distilling flask placed in a hot water bath and a jacket of cool water surrounds the condenser. It enabled temperature sensitive essential oils to be heated to a constant temperature without burning/damaging the essential oil.

II. Medieval Distillation

Arab Expansion

One of the depositories of ancient Greek/Roman writings was a Muslim monastery/medical school at Gundeshapur. It was an intellectual center of the Sassanid Empire founded by the Sassanid King Shapur I around the 3rd century AD in modern day Iran. Translations were made from Greek to Arabic of the physician Galen and were studied as well as put into practice. 765 AD the founder of the city Baghdad, Caliph Al-Mansur, became severely ill. The court physicians weren’t able to cure him. So, he sent for one of the physicians from Gundeshapur about 400 kilometers away. The physician diagnosed the Caliph by the Galen method of using astrology and humors and cured the Caliph. The Caliph was so impressed that he ordered that the knowledge at Gundeshapur be gathered, translated, copied, studied, and used in his Empire. Over 700 different books, scrolls and treatises of ancient Greek

¹⁶ Feldman, Louis H.; Reinhold, Meyer, *Jewish Life and Thought Among Greeks and Romans: Primary Readings*. A&C Black, October 1, 1996.

¹⁷ Marcellin Berthelot, *Introduction à l'étude de la chimie des anciens et du moyen âge*, Steinheil, 1889, pp. 132, 135–142, 161–16.

¹⁸ Taylor, Frank Sherwood, *Alchemists, Founders of Modern Chemistry.*, January 1992 pp. 38–39.



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knowledge were transcribed among them were the works of Zosimos of Panopolis. Once the works were put into practice the Arabs built upon the knowledge they gained with their own investigations.

One of the people that investigated and expanded upon the Greek knowledge was Jabir in Hayyan (died 806?-816? AD), known in west as “Geber”. He translated, investigated and expanded upon the knowledge of the Greek texts in the subjects of cosmology, numerology, astrology, medicine, magic, mysticism, philosophy and alchemy. One of the break throughs that Jabir discovered was the process of obtaining inorganic compounds, such as ammonium chloride from organic substances such as plants, blood and hair through chemistry. Note, being able to derive organic materials from inorganic and vice a versa was considered to be impossible until the 19th century when modern Organic Chemistry was introduced.^{19 20 21 22 23} It’s Jabir’s adaptations and expansion of alchemy that’s the concern of this discussion, because he frequently referenced Greco-Egyptian alchemists such Mary the Jewess and Zosimos of Panopolis; however, where he differed from his Greek predecessors is that he focused on classifying substances systematically rather than the more allegorical methods of the Greeks as well as focused on investigating organic substances rather than inorganic substances.²⁴ Most notably he investigated and is credited with the discoveries of sulfuric acid, nitric acid, aqua regia, and liquid termed “al-kohl” or “al-kuhl” (alcohol).^{25 26} In addition to these investigations Jabir made his own illustrations and descriptions of the alembic and other alchemical apparatuses.

Jabir’s translations and investigations laid the ground work for another Persian physician philosopher, Abū Bakr Muhammad Zakariyyā Rāzī, or simply Razi or Rhazes (865AD-925AD)²⁷ Razi expanded upon Jabir’s works with his own investigations and published over 200 manuscripts in medicine, philosophy and alchemy.²⁸ Among the investigations detailed in Razi’s book, Kitab al-Asrar (Book of Secrets), was perfecting the method of distilling grain alcohol,

¹⁹ Nomanul Haq, Syed. Names, Natures and Things: The Alchemist Jābir ibn Ḥayyān and his Kitāb al-Aḥjār (Book of Stones). Dordrecht: Kluwer. 1994.

²⁰ Stapleton, Henry E. and Azo, R. F. and Hidayat Husain, M., "Chemistry in Iraq and Persia in the Tenth Century A.D" in: Memoirs of the Asiatic Society of Bengal, vol. VIII, no. 6, 1927, pp. 317-418.

²¹ Kraus, Paul. “Les dignitaires de la hiérarchie religieuse selon Ĝābir ibn Ḥayyān” in: Bulletin de l’institut français d’archéologie orientale, 41, 1942, pp. 83–97.

²² Kraus, Paul. Jābir ibn Ḥayyān: Contribution à l’histoire des idées scientifiques dans l’Islam. I. Le corpus des écrits jābiriens. II. Jābir et la science grecque. Cairo: Institut français d’archéologie orientale, 1942-1943. (vol. 1 contains a pioneering analysis of the sources for Jabir’s biography, and a catalogue of all known Jabirian treatises and the larger collections they belong to; vol. 2 contains a seminal analysis of the Jabirian philosophical system and its relation to Greek philosophy; remains the standard reference work on Jabir even today)

²³ McMurry, John, “Organic Chemistry”, Brooks/Cole Publishing Company, 1988, p.1-2.

²⁴ Kraus, Paul. Jābir ibn Ḥayyān: Contribution à l’histoire des idées scientifiques dans l’Islam. I. Le corpus des écrits jābiriens. II. Jābir et la science grecque. Cairo: Institut français d’archéologie orientale, 1942-1943, p. 31-32.

²⁵ Roueche, B. Alcohol in Human Culture. In: Lucia, S., (ed.) Alcohol and Civilization. NY: McGraw-Hill, 1963, p. 171.

²⁶ Husna, Aminatul, “The Reconstruction Concept of Musa Jabir ibn Hayyan Thought: Study of Chemistry for Establishing Civilization in Islamic Integration of Science”, Kaumia, Vol. XII, Num. 2, October 2016, pp. 29-32.

²⁷ Waddell, J., and Haag, H. Alcohol in Moderation and Excess. Richmond, VA, 1940.

²⁸ Majid Fakhry, A History of Islamic Philosophy: Third Edition, Columbia University Press, 2004, p. 98.



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illustrations of his own distilling apparatuses and a method using an “anbik” (alembic) to distil rosewater.^{29 30} (Some of these illustrations occur in the Latin translations of works which are attributed to Jabir.)³¹ It was due to Razi’s prolific publishing and circulation of his treatises that what knowledge he and Jabir accumulated and acquired of their own that copies of their works made their way back into Europe in the 13th century.

Later Back in Europe

During the 13th century the Arab texts were imported back into Europe to be translated from Arabic to Latin. The primary method used to translate the texts was for Spanish monks to employ Spanish Jews to read the Arabic, translate into Spanish and the monks would write the translation in Latin.³² Once the translations were completed they were distributed to the Clergy and to a few select scholars. One of the translators who categorized these works in accordance with Church doctrine was Albertus Magnus, also known as Albert of Cologne or Saint Albert the Great (1200?AD-1280AD). Albertus’s writings were eventually collected into thirty-eight volumes on a wide range of topics among them was a clear detailed description on the process of manufacturing distilled spirits, primarily for medical purposes.³³

“Essence of Wine” and “Aqua Vitae”



Figure 7. Arnaldus de Villa Nova, Bertrand Boysset *Treaty of Survey*, 15th Century, Library Inguimbertine Carpentras Vaucluse, France.

Arnaldus de Villa Nova (1240? – 1311AD) was a physician, professor, theologian, mathematician, astrologer/astronomer, translator, and alchemist. He traveled extensively becoming the physician of Peter III of Aragon and Pope Clement V. He was made the head of the school of medicine at the University of Paris from 1291-1299AD where he not only taught the subject, but also translated numerous Arabic medical texts that were coming out of the middle east via Bologna, Italy as well as ancient texts authored by the Greek physician Galen.³⁴ We know this, because he prolifically wrote letters to other university professors about his translations and investigations of said translations. One of the pursuits of alchemy is to reduce materials to its “essence”, and Arnaldus was intrigued by Jabir in Hayyan’s observations and Abū Bakr Muhammad Zakariyyā Rāzī’s treatise on alcohol.³⁵ Arnaldus decided to

²⁹ Modanlou, H. D., "A tribute to Zakariya Razi (865 - 925 AD), an Iranian pioneer scholar". Archives of Iranian Medicine. PubMed. 2008, 11 (6): 673–7.

³⁰ E. Wiedemann, *Zeitschrift der deutschen morgenlandischen Gesellschaft*, vol.32, 1878, p. 575.

³¹ E. Wiedemann; M. Plessner, "AL-ANBĪK", *The Encyclopaedia of Islam*, 1 (2nd ed.), Brill, 1986, p. 486a.

³² Burke, James, "The Day The Universe Changed", Little, Brown and Company, Boston, 1985, p. 91.

³³ Patrick, C. *Alcohol, Culture, and Society*. Durham: Duke U Press, 1952, p. 29.

³⁴ D. Campbell, *Arabian Medicine and Its Influence on the Middle Ages*, p. 5.

³⁵ Braudel, F., *Capitalism and Material Life, 1400-1800*. NY: Harper and Row, 1974, p. 170.



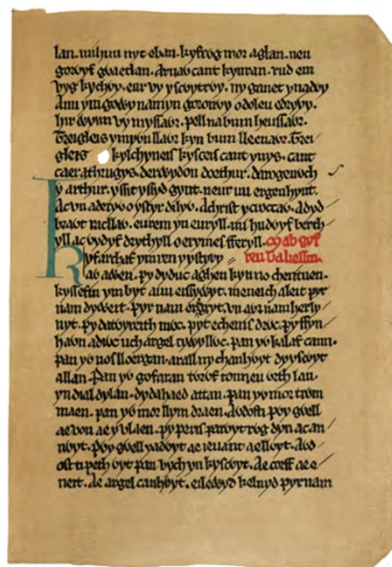
distill wine to get to its essence and termed the resulting distillate “aqua vitae” or “water of life”.

“We call it aqua vitae, and this name is remarkably suitable, since it is really a water of immortality. It prolongs life, clears away ill-humors, revives the heart, and maintains youth.”³⁶

- Arnaldus de Villa Nova

III. Renaissance

The Book of Taliesin: Song to Ale



The Book of Taliesin in Book XX, “Song to Ale”, has a rough guideline for the makings of beer, wort, and whiskey. Grain was spread on a floor in a depth of 4 to 6 inches and covered in water. Once it has been soaked for 12 to 24 hours the grain sprouts and is periodically turned over and thrown up in the air using wooden shovels. This process is known as “forking” or “raking”. The grain is then dried in a kiln, traditionally heated by burning peat to impart a smoky peaty taste. The grains are then immediately ground to break open the husks. The grains are then boiled to release the starches which breaks down to simple sugars where upon it’s placed in a fermenter until the process is completed.³⁷ However, that is just half of the process. Once fermentation is completed the beer/wort is then distilled in an apparatus such as an alembic; however, more modern means might be necessary to avoid toxic compounds, such as

Figure 8 Book of Taliesin (Llyfr Taliesin), Aberystwyth, NLW, Peniarth MS 2, facsimile, folio 13, First half 14th century.

³⁶ Roueche, B. Alcohol in Human Culture. In: Lucia, S., (ed.) Alcohol and Civilization. NY: McGraw-Hill, 1963, p. 172.

³⁷ Unger, R. W., “Beer in the Middle Ages and the Renaissance”, University of Pennsylvania Press, Philadelphia, 2007, p. 4.



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congeners, longer chain, alcohols, acids, and esters, which also get concentrated during the process.^{38 39}

<p>Kanu y Cwrwf Llyfr Taliesin XX</p> <p>Kany y Cwrwf. XXIII.</p> <p>“...Ef ae tawd yn llyn Hyny vo eginyn. Ef ae tawd weith arall. Hyny vo yn vall. Dreuhawc dyderuyd. Dysgofac yr eluyd Golchettawr y lestri. Bit goryw y vreci. A phan vo anawell Dydyccawr o gell. Dydyccawr rac rieu. Ykein gefedeu...”</p>	<p>Song To Ale⁴⁰ Book of Taliesin XX</p> <p>“...lie shall steep it in the Llyn (Lake), Until it shall sprout. lie shall steep it another time Until it is sodden. Not for a long time will be finished What the elements produce. Let his vessels be washed, Let his wort be clear. And when there shall be an exciter of song, Let it be brought from the cell, Let it be brought before kings. in splendid festivals...”</p>
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For medicinal purposes only...no, really...



Figure 10 British Library Sloane 1977.
Roger Frugardi of Salerno, *Chirurgia*,
French, first quarter of the 14th century.

“Fill a pot of dregs of good ale to the third part and put thereto a handful of common salt, and seeth it in a lymbeck and stop it well above with paste, and distill it; and that is a precious water.”⁴¹

- “Another Water” from a Cathar medical handbook, 15th century



Figure 9 *Tacuinum sanitatis* - medieval handbook on health. 'Magister Faragius' (Ferraguth) of Naples. Italian, 14th century.

³⁸ Nixon, M. and McCaw, M., “The Complete Distiller”, The Amphora Society, Auckland, New Zealand, 2001, p. 11-12.

³⁹ Wilson, C. A., “Water of Life”, Prospect Books, Allaleigh House, Blackawton, Totnes, Devon, 2006, p. 158.

⁴⁰ Llyfr Taliesin, Book of Taliesin, Book XX, “Song to Ale”, Aberystwyth, NLW, Peniarth MS 2, facsimile, folio 13, First half 14th century.

⁴¹ Muller, “Aus Mittle-Englischen Medizintexe”, Leipzig, 1929, p. 29-31.



16th Century Production and Merriment

The printing press in Europe was not only used for printing text but was also excellent in producing pictures and illustrations. One of the first books that explored and expanded experimentation with distillation apparatuses was *Liber de arte distillandi de simplicibus* or *The Virtuous Art of Distilling* by Hieronymus Brunschwig, 1500.⁴² Brunschwig was a surgeon, alchemist and botanist, and his work on distillation, separations and purifying substances was not only applied to medicine, but to the production of distilled spiritous for recreational purposes.⁴³

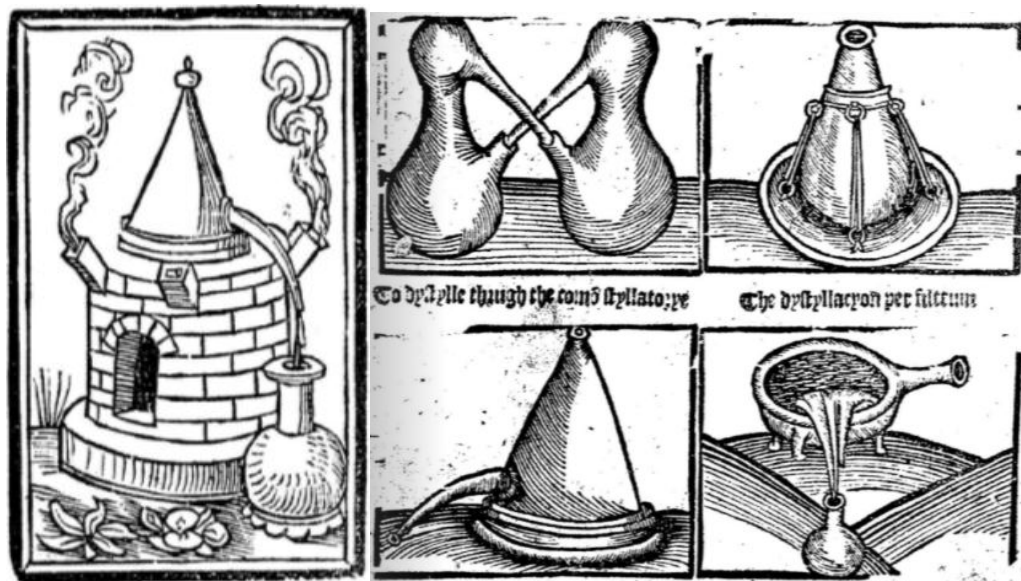


Figure 11 Woodcut Images of Distillation Apparatuses, *Liber de Arte Destillandi De Simplicibus*, Hieronymus Brunschwig, 1500, fol. 112.

“The vertuose boke of Distyllacyon of the waters of all maner of Herbes, with the figures of the stillatoryes. First made and compyled by the thyrte yeres study and labour of the moste connyne and famous master of phisyke, Master Jherom bruynswyke. And now newly Translate out of Duyche into Englysche. Nat only to the synguler helpe and profyte of the Surgyens, Phisycyens, and Pothecaryes. But also of all maner of people, Parfytely and in dewe tyme and ordre to lerne to dystyll all maner of Herbes. To the Profyte, cure, and Remedy of all maner dyseases and Infirmytees Apparant and nat apparent. And ye shall understande that the waters be better than the Herbes, as Avicenna testefyeth in his fourth Canon saynge that all maner medicinys used with theys substance, febleth and maketh aged, and weke. Cum gratia et privilegio regali.”

- Hieronymus Brunschwig, 1500.

⁴² Lawrence M. Principe. Arbeitsmethoden. In: C. Priesner and K. Figala (editors). *Alchemie. Lexikon einer hermetischen Wissenschaft*. Beck, Munich 1998, p. 53.

⁴³ Henry E. Sigerist. Hieronymus Brunschwig and his work. Anhang zu: *The book of Cirurgia by Hieronymus Brunschwig*. R. Lier, Milano 1923.



Brunschwig identified many benefits he believed liquor provides. He wrote in his *Medicinarius*, 1505, that liquor:

“Comforts the heart. Heals all old and new sores on the head. Gives a person good color. Cures baldness by causing the hair to grow. Kills body lice and fleas. Cures lethargy. Cures all deafness. Reduces toothache. Cures bad breath. Heals mouth, tongue and lip cankers. ‘It causes the heavy tongue to become light and well-speaking.’ Cures short breath. Causes good digestion. Improves appetite. Eliminates belching. Draws the wind out of the body. Eases yellow jaundice, dropsy (edema), and gout. Relieves breast pain from swelling. Cures all bladder heals all diseases in the bladder. Dissolves bladder stones. Prevents food poisoning. Cures malarial fevers. Heals all shrunken sinews. Cures the bites of a rabid dog. Heals all stinking wounds. Provides courage. Causes good memory. Eases the diseases caused by cold. Purifies ‘the five wits of melancholy and of all uncleanness.’”⁴⁴

- Hieronymus Brunschwig, 1500.

He also detailed the how to distil “wormwood water” (absinthe) from *Absynthium ponticum*, *Absynthium cretensis* and *Absynthium marinum*.^{45 46} During the 16th century there were advances and commentaries made by various physicians and alchemists on distillation and distillation apparatuses.

Philip Ulstadt

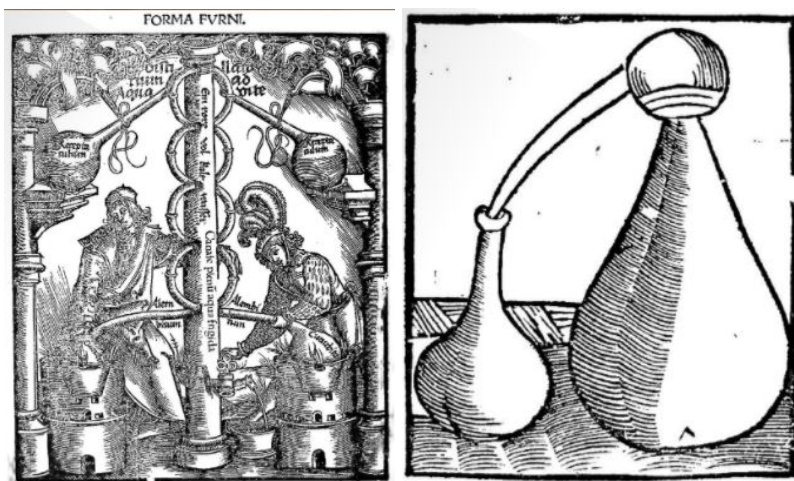


Figure 12 Detail from *Coelum Philosophorum, seu De secretis naturae liber*, Philippo Ulstadio Patricio nierebergensi autore by Philippus Ulstadius Argentorati...Arte et impensa Joannis Grienynger, 1528.

⁴⁴ Roueche, B. Alcohol in Human Culture. In: Lucia, S., (ed.) *Alcohol and Civilization*. NY: McGraw-Hill, 1963, p. 172-173.

⁴⁵ Hieronymus Brunschwig, *Liber de arte destillandi. De simplicibus*. 1500, fol. 112.

⁴⁶ Murray's *Apparatus Medi-caminum Gottingias* 1766. Vol. 1, p. 118.



Ulstadt detailed an expanded column based on a Vigreux method to obtain higher and purer distillate yields in “to distill alcohol, called “the fifth essence” from wine” which Ulstadt called for the use of a balneum Mariae, or Mary’s bath.⁴⁷

Walter Hermann Ryff

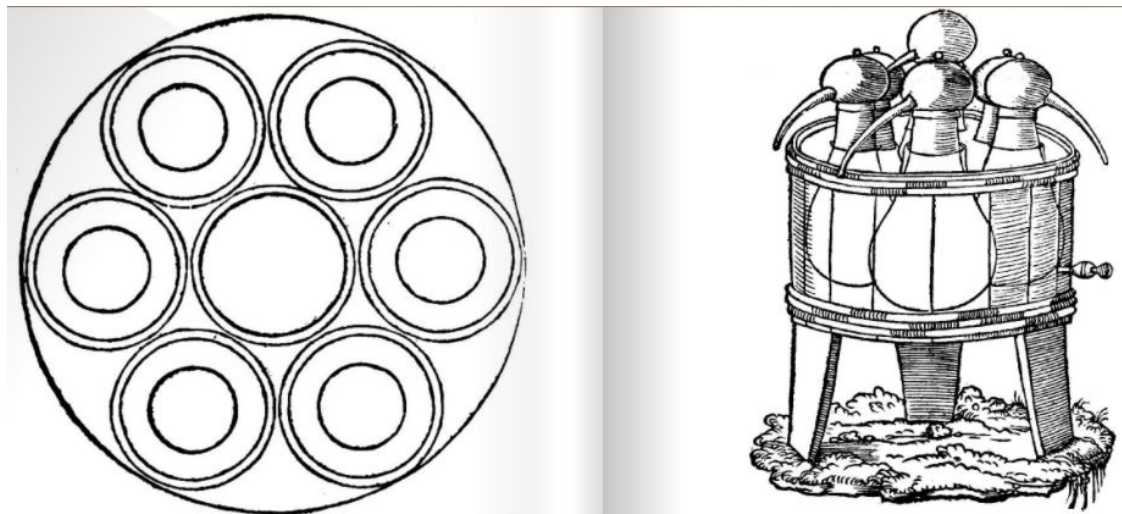
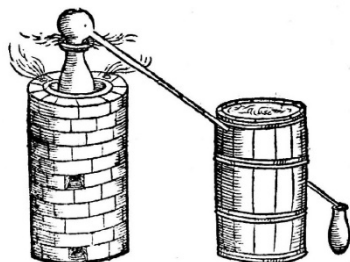


Figure 13 Woodcut Images of Distillation Apparatuses, *Das Neue Grosse Distiller Buch*, Walter Hermann Ryff, 1545.

Ryff’s work was heavily based on Brunschwig’s *Liber de arte distillandi de simplicibus*, but with different woodcut images.⁴⁸

Jacob Besson



Besson improved upon the condensation coil portion of the apparatus by detailing an advanced water cooling jacket.⁴⁹

Figure 14 Woodcut Images of Distillation Apparatuses, *De Absoluta Ratione Extrahendi Olea, et Aquas e Medicamentis Simplicibus*, Jacob Besson, Zurich, 1559.

⁴⁷ Philipp Ulstadt, *Coelum philosophorum, seu liber de secretis naturae*. Adcessit Ioan. Anto. Campesji Directorium summae summarum medicinae. Nunc autem recens apposuimus Rosarium philosophorum, Magistri Arnaldi di Villanova. 1528.

⁴⁸ Walter Hermann Ryff, *Das Neue Grosse Distillier Buch*. 1545.

⁴⁹ Jacob Besson *De absoluta Ratione extrahendi olea, et aquas e medicamentis simplicibus*, Zurich, 1559.



Konrad Gesner

The Treasure of EVONYMVS,

conteyninge the vvonderfull hid se-
cretes of nature, touchinge the most apte formes
to prepare and distyl Medicines, for the conser-
uation of heith: as Quintessēce, Aurum Potabile,
Hippocras, Aromatical wyues, Balmes, Oyles
Perfumes, garnishing waters, and other man-
fold excellent confections. Wherunto are toped
the formes of sondry apt fornaces, and ves-
sels, required in this art. Translated
(with great diligence, & laboure)
out of Latin, by Peter Mors
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Oxford.

Imprinted at London
by Iohn Daie, dwelling ouer
Aldersgate, beneath Saint
Martines.

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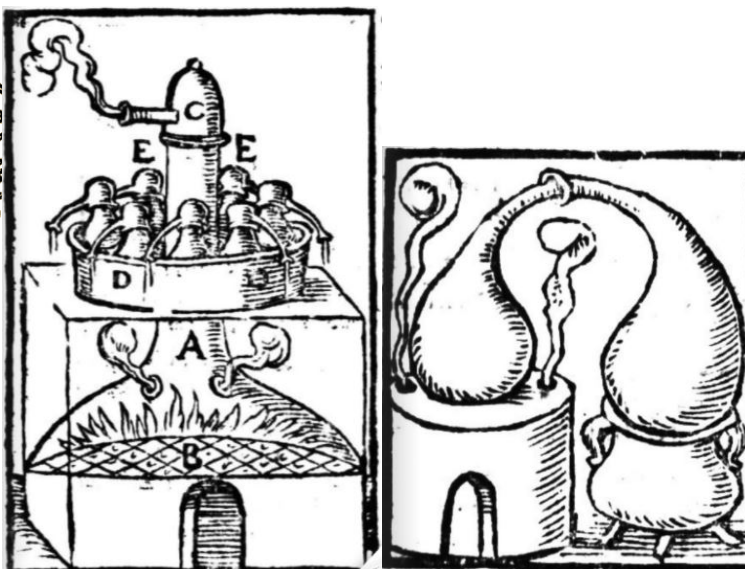


Figure 15 Images from Gesner's *Euonymus* and Woodcut Images of Distillation Apparatuses, *Euonymus De Remediis Secretis, Liber Physicus, Medicus et Partim Etiam Chymicus...Nunc Primum in Lucern Editus*, Konrad Gesner, 1569.

Gesner detailed how to do multiple distillations from the same apparatus at the same time.⁵⁰

⁵⁰ Konrad Gesner, *Euonymus. De remediis secretis, liber physicus, medicus et partim etiam chymicus... nunc primum in lucem editus*. 1569.