Definition: **distillation** from *Philip’s Encyclopedia*

Extraction of a liquid by boiling a solution in which it is contained and cooling the vapour so that it condenses and can be collected. Distillation is used to separate liquids in solution, or liquid solvents from dissolved solids, to yield drinking water from sea water, or to produce alcoholic spirit. Fractional distillation, which uses a vertical column for condensation, is used in oil refining to separate the various fractions of crude oil.

Summary Article: **distillation**

From *The Columbia Encyclopedia*

process used to separate the substances composing a mixture. It involves a change of state, as of liquid to gas, and subsequent condensation. The process was probably first used in the production of intoxicating beverages. Today, refined methods of distillation are used in many industries, including the alcohol and petroleum industries.

**The Basic Distillation Process**

A simple distillation apparatus consists essentially of three parts: a flask equipped with a thermometer and with an outlet tube from which the vapor is emitted; a condenser that consists of two tubes of different diameters placed one within the other and so arranged that the smaller (in which the vapor is condensed) is held in a stream of coolant in the larger; and a vessel in which the condensed vapor is collected. The mixture of substances is placed in the flask and heated. Ideally, the substance with the lowest boiling point vaporizes first (see vaporization), the temperature remaining constant until that substance has completely distilled. The vapor is led into the condenser where, on being cooled, it reverts to the liquid (condenses) and runs off into a receiving vessel. The product so obtained is known as the distillate. Those substances having a higher boiling point remain in the flask and constitute the residue.

Since a perfect separation is never effected, the distillate is often redistilled to increase its purity (hence the expression “double distilled” or “triple distilled”). Many alcoholic beverages are distilled, e.g., brandy, gin, whiskey, and various liqueurs. The apparatus used, called the still, is the same in principle as other distillation apparatus.

**The Fractional Distillation Process**

When the substance with the lowest boiling point has been removed, the temperature can be raised and the distillation process repeated with the substance having the next lowest boiling point. The process of obtaining portions (or fractions) in this way is one type of fractional distillation. A more efficient method of fractional distillation involves placing a vertical tube called a fractionating column between the flask and the condenser. The column is filled with many objects on which the vapor can repeatedly condense and reevaporate as it moves toward the top, effectively distilling the vapor many times. The less volatile substances in the vapor tend to run back down the column after they condense, concentrating themselves near the bottom. The more volatile ones tend to reevaporate and keep moving upward, concentrating themselves near the top. Because of this the column can be tapped at
various levels to draw off different fractions. Fractional distillation is commonly used in refining petroleum, some of the fractions thus obtained being gasoline, benzene, kerosene, fuel oils, lubricating oils, and paraffin.

**The Destructive Distillation Process**

Another form of distillation involves heating out of free contact with air such substances as wood, coal, and oil shale and collecting separately the portions driven off; this is known as destructive distillation. Wood, for example, when treated in this way yields acetic acid, methyl or wood alcohol, charcoal, and a number of hydrocarbons. Coal yields coal gas, coal tar, ammonia, and coke. Ammonia is also obtained by the destructive distillation of oil shale.

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