

COAL TAR, or GAS TAR. During the process of manufacturing illuminating gas from soft coal, a thick, oily, black liquid collects in the hydraulic main and condensers of the gas works. This is coal or gas tar. It is slightly heavier than water and has a strong, disagreeable odor. Coal tar is a complex mixture of substances, and the separation of its components constitutes one of the most important branches of manufacturing chemistry. It is the only source of innumerable compounds of the greatest value to science and the industries.

By fractional distillation the tar is first

broken up into groups of substances—principally hydrocarbons, phenols, and bases—which are further distilled or otherwise treated. The original fractions, or distillates, vary according to the composition of the tar or the market demand, but the following is an average separation:

1. "*First Runnings*" or *First Light Oil*. This fraction is collected up to 105° C., and contains water, ammonium salts, the more volatile oils, and a small amount of the heavier oils carried over mechanically. 2. *Light Oil*. The distillate between 105° C. and 210° C. is taken as light oil. It is again distilled and the fraction up to 170° C. forms crude naphtha; above 170° C. the running is put with the next main distillate, the carbolic oil. The crude naphtha is treated with alkali and acids to remove phenols, thiophene, unsaturated hydrocarbons, and pyridines. On further distillation the naphtha yields "90 per cent benzol" up to 110° C., "50 per cent benzol" from 110° C. to 140° C., and "solvent naphtha," or "benzine," from 140° C. to 170° C. The "90 per cent benzol" contains about 70 per cent pure benzene, 24 per cent toluene, and xylene. The 50 per cent benzol contains about 46 per cent benzene. Benzene is the basis for the manufacture of many compounds, notably aniline and its derivatives. It is also used as a solvent. The fraction known as "solvent naphtha," or "benzine," contains xylenes, cumenes, and other higher homologues of benzene. It is used as a solvent for rubber and resins and is also employed to enrich illuminating gas. It is a grease remover, but is not identical with petroleum benzine, also used for this purpose. 3. *Carbolic Oil* is collected between 210° C. and 240° C. It contains phenols and naphthalene. The phenols yield carbolic acid, of powerful antiseptic properties, and the source of many dyes, explosives, and medicines. Naphthalene separates from the carbolic oil as a crystalline mass. It is one of the most important constituents of coal tar and is used extensively as moth-ball camphor and in the preparation of dyes and medicines. 4. *Creosote Oil*. From 240° C. to 270° C. a small amount of distillate is received which contains some naphthalene, together with cresol, naphthol and liquid paraffin. After the removal of the naphthalene its principal use is for preserving timber and railroad ties and as a vermin destroyer. (See CREOSOTE.) 5. *Anthracene, or Green Oil*, is collected above 270° C. This fraction contains anthracene, the most valuable constituent of coal tar. It crystallizes out from the oil, is purified, and is extensively employed in the manufacture of the beautiful alizarin dyes, which were formerly made from madder root. See ALIZARIN.

The *Pitch* remaining in the stills after the above fractions have passed over is used in making asphalt, varnishes, tarred paper or roofing paper, and as a cement to bind together soft coal dust as "briquettes" for fuel.

Coal tar in its crude form finds some use as a protective paint, in the preservation of timber, and in making tarred paper. See COAL-TAR COLORS; GAS, ILLUMINATING; and see the articles on the various products mentioned above.