

*On new Compounds of Carbon and Hydrogen, and on certain other Products obtained during the Decomposition of Oil by Heat.* By M. Faraday, F.R.S. *Cor. Mem. Royal Academy of Sciences of Paris*, &c. Read June 16, 1825. [*Phil. Trans.* 1825, p. 440.]

The experiments of which the results are detailed in this paper, were made principally on the fluid which is found to be deposited in considerable quantity when oil-gas is compressed. This fluid, as obtained at the works of the Portable Oil-gas Company, is colourless, of a specific gravity less than that of water; insoluble in water except in very minute quantities; soluble in alcohol, ether, oils, &c.; and combustible, burning with a dense flame. It is strikingly distinguished from the oil from which it originated, by not being acted upon to any extent by solutions of the alkalies.

Part of this fluid is very volatile, causing the appearance of ebullition at temperatures of  $50^{\circ}$  or  $60^{\circ}$ ; other parts are more fixed, requiring even  $250^{\circ}$ , or above, for ebullition. By repeated distillations a series of products were obtained from the most to the least volatile, the most abundant being such as occurred from  $170^{\circ}$  to  $200^{\circ}$ . On subjecting these, after numerous rectifications, to a low temperature, it was found that some of them concreted into a crystalline mass, and ultimately a substance was obtained from them, principally by pressure at low temperatures, which upon examination proved to be a new compound of carbon and hydrogen. At common temperatures it appears as a colourless transparent liquid, of specific gravity 0.85, at  $60^{\circ}$ ; having the general odour of oil-gas. Below  $42^{\circ}$  it is a solid body, forming dendritical transparent crystals, and contracting much during its congelation. At  $0^{\circ}$  it appears as a white or transparent substance, brittle, pulverulent, and of the hardness nearly of loaf-sugar. It evaporates entirely in the air: when raised to  $186^{\circ}$  it boils, furnishing a vapour, which has a specific gravity of 40, compared to hydrogen as 1. At a higher temperature the vapour is decomposed, depositing carbon. The substance is combustible, liberating charcoal if oxygen be not abundantly present. Potassium exerts no action upon it below  $186^{\circ}$ .

This substance was analysed by being passed over red-hot oxide of copper, and by detonation of its vapour with oxygen. The results obtained were, that it consists of 2 proportionals of carbon, and 1 of hydrogen = 13; and that in the state of vapour 6 proportionals of carbon and 3 of hydrogen are present to form 1 volume, which is consequently of the specific gravity of 39, hydrogen being 1. It is named in the paper *bicarburet of hydrogen*.

Experimenting with the most volatile portions of the liquid, a portion was obtained, which, though gaseous at common temperatures, condensed into a liquid at  $0^{\circ}$ . This was found to be very constant in composition and properties: it was very combustible: it had a specific gravity of 27 or 28 as a gas, as a liquid that of 0.627, being the lightest substance, not a gas or vapour, known. When analysed, it was found to consist of one proportional of carbon 6, and one of

hydrogen 1, as is the case with olefant gas; but these are so combined and condensed as to occupy only one half the volume they do in that substance. A volume therefore of the gas contains four proportionals of carbon 24, and four of hydrogen,  $4 = 28$ , which is its specific gravity.

Beside the remarkable difference thus established between this substance and olefant gas, it is also distinguished by the action of chlorine, which forms with it a fluid body, having a sweet taste, and resembling hydrochloride of carbon, but from which a chloride of carbon cannot be obtained by the further action of chloride and light.

The other products from the original fluid do not present any characters so definite as the above substances; at the same time they appear to be very constant, boiling uniformly at one temperature. They cannot be separated by distillation into more and less volatile parts, so as to afford means of reducing their number to two or three particular bodies. They have the general properties of the original fluid, and with the other products, are all peculiarly acted upon by sulphuric acid, offering phenomena, in the investigation of which the author is at present engaged.

With reference to the presence of these substances in the state of vapour in oil- and coal-gas, the means of ascertaining it and the quantity are pointed out, in the peculiar action of sulphuric acid, causing their perfect condensation, and in the solvent powers over them possessed by fixed and volatile oils, &c.; the requisite precautions for their proper application being pointed out. Oil-gas was found to be saturated with many of these vapours: coal-gas also contained a portion of them.

The paper concludes with a short reference to the probable uses of the fluid, as originally obtained. If put into gas burning with a blue flame, it makes it produce a bright white flame; it is an excellent solvent of caoutchouc; it will answer all the purposes to which essential oils are applied as solvents; and having applied that portion of it which, though a liquid at common temperatures and under a pressure of two or three atmospheres, is a gas under any diminished pressure, as fuel to a lamp; the author has shown the possibility of such an application, if at any time such knowledge and command of the decomposition of oil or coal by heat should be obtained, as would enable us to furnish the substance in abundance.

*Account of the Repetition of M. Arago's Experiments on the Magnetism manifested by various Substances during the Act of Rotation.*  
By C. Babbage, Esq. F.R.S. and J. F. W. Herschel, Esq. Sec. R.S.  
Read June 16, 1825. [*Phil. Trans.* 1825, p. 467.]

The experiments of M. Arago having excited much interest, the authors of this communication were induced to erect an apparatus for their verification; and after a few trials they succeeded in causing