VI. "On the Absorption and Dialytic Separation of Gases by Colloid Septa." By THOMAS GRAHAM, F.R.S., Master of the Mint. Received June 20, 1866.

(Abstract.)

It appears that a thin film of caoutchouc, such as is furnished by varnished silk or the transparent little balloons of india-rubber, has no porosity, and is really impervious to air as gas. But the same film is capable of liquefying the individual gases of which air is composed, while oxygen and nitrogen, in the liquid form, are capable of penetrating the substance of the membrane (as ether or naphtha do), and may again evaporate into a vacuum and appear as gases. This penetrating power of air becomes more interesting from the fact that the gases are unequally absorbed and condensed by rubber, oxygen $2\frac{1}{2}$ times more abundantly than nitrogen, and that they penetrate the rubber in the same proportion. Hence the rubber-film may be used as a dialytic sieve for atmospheric air, and allows very constantly 41·6 per cent. of oxygen to pass through, instead of the 21 per cent. usually present in air. The septum keeps back, in fact, one-half of the nitrogen, and allows the other half to pass through with all the oxygen. This dialysed air rekindles wood burning without flame, and is, in fact, exactly intermediate between air and pure oxygen gas in relation to combustion.

One side of the rubber-film must be freely exposed to the atmosphere, and the other side be under the influence of a vacuum at the same time. The vacuum may be established within a bag of varnished silk, or in a little balloon, the sides being prevented from collapsing, by interposing a thickness of felted carpeting between the sides of the varnished cloth, and by filling the balloon with sifted sawdust. For commanding a vacuum in such experiments, the air-exhauster of Dr. Hermann Sprengel* is admirably adapted. It possesses the advantage that the gas drawn from the vacuum can also be delivered by the instrument into a gas-receiver placed over water or mercury. The "fall-tube" has merely to be bent at the lower end.

The surprising penetration of platinum and iron tubes by hydrogen gas, discovered by MM. H. Sainte-Claire Deville and Troost, appears to be connected with a power resident in the same and certain other metals, to liquefy and absorb hydrogen, possibly in its character as a metallic vapour. Platinum, in the form of wire or plate, at a low red heat may take up and hold 3·8 volumes of hydrogen, measured cold; but it is by palladium that the property in question appears to be possessed in the highest degree. Palladium foil from the hammered metal, condensed so much as 643 times its volume of hydrogen, at a temperature under 100° C. The same metal had not the slightest absorbent power for either oxygen or nitrogen. The capacity of fused palladium (as also of fused platinum) is considerably

* Chemical Society's Journal, ser. 2, vol. iii. p. 9 (1865).

reduced; but foil of fused palladium, for which I am indebted to Mr. G. Matthey, still absorbed 68 volumes of gas. A certain degree of porosity may be admitted to exist in these metals, and to the greatest extent in their hammered condition. It is believed that such metallic pores, and indeed all fine pores, are more accessible to liquids than to gases, and in particular to liquid hydrogen. Hence a peculiar dialytic action may reside in certain metallic septa, like a plate of platinum, enabling them to separate hydrogen from other gases.

In the form of sponge, platinum absorbed 1·48 times its volume of hydrogen and palladium 90 volumes. The former of these metals, in the peculiar condition of platinum-black, is already known to take up several hundred volumes of the same gas. The assumed liquefaction of hydrogen in such circumstances appears to be the primary condition of its oxidation at a low temperature. A repellent property possessed by gaseous molecules appears to resist chemical combination, as well as to establish a limit to their power to enter the minuter pores of solid bodies.

Carbonic oxide is taken up more largely than hydrogen by soft iron. Such an *occlusion* of carbonic oxide by iron, at a low red heat, appears to be the first and a necessary step in the process of acieration. The gas appears to abandon half its carbon to the iron, when the temperature is afterwards raised to a considerably higher degree.

Silver has a similar relation to oxygen, of which metal the sponge, fritted but not fused, was found to hold in one case so much as 7·49 volumes of oxygen. A plate or wire of the fused metal retains the same property, but much reduced in intensity, as with plates of fused platinum and palladium in their relation to hydrogen.

VII. "Notes on the Rearing of *Tænia echinococcus* in the Dog, from Hydatids, with some Observations on the Anatomy of the Adult Worm." By Edward Nettleship, Mem. Royal Agric. Coll. Communicated by T. Spencer Cobbold, M.D. Received May 24, 1866.

On March 28th, 1866, I obtained from Clare Market the liver and lungs of a sheep containing numerous Echinococcus hydatids; in some the outer cyst was partly calcified, but all the hydatids contained clear fluid, and great numbers of scolices attached to the endocyst. Within two hours of the death of the sheep to which the organs belonged, I gave two or three of the smaller hydatids to a young dog, about six months old; first puncturing the hydatid and administering the collapsed cyst, and then making him drink the fluid of the cyst, in which some Echinococci were floating.

The next day I gave him a second feeding of the remaining hydatids; this second batch he threw up within half an hour of the feeding, but he afterwards swallowed the broken membranes again, and did not afterwards