

## PHYSICAL NOTES

MR. J. E. H. GORDON has lately patented a method of producing light from electricity based upon Mr. Spottiswoode's suggestion to apply the alternating-current magneto-electric machine of De Méritens to the induction-coil. Mr. Gordon arranges small balls of platinum or iridium, or of an alloy of these metals, at the ends of fine platinum rods in pairs in the middle of a suitable globe, and causes to pass between them a rapid succession of sparks whereby they are raised to incandescence. There is no consumption of carbon or any other substance, and the lamps may be connected either in series or in parallel branched arcs. The principal remaining disadvantage is the noise attendant on the rapid sparks. A mechanical contrivance is added to bring the knobs near together when no current is passing in the primary coil. The induction-coils used are of comparatively small size.

M. TERQUEM (*Four. de Phys.*, October) prepares, for the receivers of air-pumps, brass plates with a circular groove, in which is put a mastic fusing about 60°. The plate is placed over a vessel of heated water, and when the mastic is fused the receiver is brought down into the groove. When cool, the plate adheres to the jar. These receivers are tubulated, and a caoutchouc stopper in the tubule holds a tube bent at a right angle and provided with a stopcock like those used by M. Carré in his air-pump. For experiments with the air-pump several receivers with their plates can be easily prepared beforehand.

M. LIPPMANN points out (*Four. de Phys.*, October) that full justice has hardly been done to Carnot with reference to his law (in thermodynamics). It seems to have been forgotten that he verified the law directly by experiment; and did not merely (as is found stated in excellent treatises) furnish a demonstration *à priori* based on the indestructibility of heat. This is doubtless due to the fact that Carnot's original work has long been exhausted and unobtainable. M. Lippmann considers that work a mine imperfectly explored.

EXPERIMENTS have been made by M. Hesehus of the St. Petersburg Physical Society, as to the variations of volume and coefficient of elasticity of palladium and its alloys under the influence of hydrogen absorbed. The alloys contained 25 per cent. of gold, silver, and platinum. Wires 500 mm. long and 0.4 mm. diameter served successively as cathode in electrolysis of dilute sulphuric acid in a long vertical glass tube, where they were stretched by weights so that their length could be measured directly with a cathetometer. The alloy containing silver showed the greatest increase of length, 11.7 mm.; palladium-platinum 6.14 mm.; pure palladium 5 mm.; and palladium-gold only 0.9 mm. With a current of six bichromate elements, the elongation, very rapid at first, reached its maximum after nearly an hour. The shortening after breaking the current proceeded in a similar way, but less rapidly; e.g. for palladium wire it was only 2.6 mm. after twenty-four hours. Some experiments were made with the aid of a recording apparatus, and they also proved that, contrarily to Graham's opinion, the absorption of hydrogen takes place more quickly than the reverse action, and even when electrolytic oxygen is made to act on the wire (used as anode). M. Hesehus made a special delicate apparatus for measuring small variations in the length of wires. With this it was proved, that during the first day the shortening of the wire charged with hydrogen decreases very quickly, about the third day it becomes constant; it again decreases rapidly about the seventh day, then approaches zero asymptotically. This agrees with MM. Troost and Hautefeuille's experiments on the tension of hydrogen of palladium.

A PLUVIOMETER which registers the quantity of rain, and the duration and hour of the fall, is described by S. Grimaldi in *Rivista Scientifico-Industriale* for October 15.

In a recent note to the Vienna Academy, on the relation of the daily and yearly variation of temperature to the eleven-years sun-spot period, Herr Liznar first compares observations of the daily variation at thirteen places (including St. Petersburg, Calcutta, and Hobarton), and finds for all some correspondence with the sun-spot curve. The curve from data for Vienna, Prague, Caslan, Brünn, and Trieste from 1857-70, brought to an average, shows, for the minima of this variation in 1859-60 and in 1870-71, a very good agreement with the corresponding maxima of the sun-spot curve; while the maximum of the varia-

tion precedes the minimum of the spots by about two years. With regard to the yearly variation of temperature, Dr. Hahn's results for Leipzig are fully confirmed by data from eight other places in Europe, the variation showing a maximum and minimum corresponding to the maximum and minimum of spots.

THE combinations formed by phosphuretted hydrogen with hydrobromic and hydriodic acids have been long known. Its combination with hydrochloric acid has lately been effected by M. Ogier (*Four. de Phys.*, November) by compressing equal volumes of the gases in M. Cailletet's apparatus. Compressing about 20 atm. at + 14°, small yellowish bright crystals appear, and with sufficient pressure the two gases disappear entirely (if the mixture have been well made), the tube being covered with a crystalline coat without trace of liquid. If the upper part of the tube be heated with tepid water (+ 20°), the compression produces a liquid layer. If the tube be slowly cooled, and 60 or 70 atm. maintained, so as to get only a small layer of liquid, the combination forms slowly in crystalline state. Sudden compression, without external heating, will also produce the liquid. On the other hand, if before there is any deposit of crystals the pressure be relaxed (from 25 atm. e.g.) one perceives not a mist, but small, light, solid flocks, which slowly go down the sides of the tube and disappear. The combination can also be produced under cold without pressure; crystals are formed about - 30°. If the compound exist in the gaseous state, it is almost wholly dissociated at ordinary temperature and pressure.

AN amplifying barometer has been invented by M. Debrun (*Four. de Phys.*, November). Suppose a Fortin barometer, in the tube of which the mercury is kept at a constant height. The cistern has two other vertical tubes open to the atmosphere, one rising out of the mercury, the other from water over the mercury. The variations of the water in the latter are read with the aid of a scale, and they are thirteen and a half times greater than those of the mercury in the other open tube.

RECENT experiments in capillarity by Herr Volkmann (*Ann. der Phys.*, No. 10) have led him to the following results:—1. The influence (affirmed by Wilhelmj) of curvature of the wall on constants of capillarity cannot be maintained, and is explicable by the supposition of a faulty determination of specific gravity. (The arrangement of the index is also objectionable.) 2. Observation of the height of rise between parallel plates warrants the assumption of a constant wall-layer, on which the liquid rises. 3. The thickness of the wall-layer in the case of neat's-foot oil and alcohol is found constant for plates and tubes at 0.004 mm. 4. In so far as the results with neat's-foot oil and alcohol may be extended to other wetting liquids, no influence of curvature of the wall on constants of capillarity is demonstrable.

PROF. SILOW of Moscow has studied the magnetism of iron chloride solution by the method of induced currents (*Ann. der Phys.*, No. 10), and finds that the coefficient of magnetisation is not a constant, but a function of the force of separation. As the latter gradually increases, the former at first increases too, and pretty quickly, but reaches a maximum and then decreases, first quickly, then slowly. The liquid is therefore relegated to the same class of magnetic bodies as iron, steel, or nickel, and the author considers that probably all magnetic bodies show this rising and sinking of the coefficient.

In a paper which appears in the *Ann. der Phys.* (No. 10), Herr Hankel gives the chief results of his study of the photo- and thermo-electric properties of fluor-spar. He states, *inter alia*, that the middles of the cube-faces become, in light, negative, the tension decreasing towards the edges, and especially the angles, which often show the opposite polarity. It is the chemical rays that act. The carbon electric light does better than sunlight. Sparks between two Leyden jars give the effects, but the light of Geissler tubes does not. Green Weardale crystals were the most excitable (of the specimens tried). The intensity of the effect generally grows with the depth of the colouring. The tensions produced by light do not change to those of opposite sign when the crystal is put and kept in the dark. Crystals long exposed to light are weakened in excitability. A moderate heating (to 130° to 150° C.) exalts the photoelectric effect. As to thermoelectricity, rise of temperature produces tensions of the same sign as illumination does. In cooling, the opposite electricities appear. In many crystals weakly excitable by light, the thermoelectric tensions are greater than the photoelectric (especially in the case of brown-red or brown-violet crystals).