Electricity

Electron History.

(By Sir Oliver Lodge, in the *Journal of the Society of Chemical Industry.*)

The first inkling of the discovery of the atomic nature of electricity dates back to Faraday and his experiments in electrolysis. The indivisible atomic charge—the charge of a monadion—was then practically measured, at least as soon as the size of the atom was known; and an "atom of electricity" was spoken of, both by Maxwell and by Helmholtz. In amount, measurement indicates that it consists of 3.4×10^{-10} electrostatic unit, some uncertainty affecting the second significant figure. On this basis, Dr. Johnstone Stoney gave to these unit charges their name "electron," and speculated ingeniously on some of their porperties. Then J. J Thomson found that in the rarefied air of a vacuum tube these charges were loose, flying as cathode rays; and identically the same, no matter what was the kind of residual matter in the tube. It was in this state that their mass was measured, and found to be a thousand times less than the previous material minimum—the hydrogen atom. Then Zeeman found that their orbital motion was the source of all bright line spectra—that is to say, that they emitted radiation, carving the ether into waves.

The condition of electricity is due to the procession of electrons and positive charges; and the good conducting power of metals, whether for heat or for electricity, is supposed to be due to a crowd of electrons freely permeating the interstices between the atoms, being handed on from one to another so readily that they are practically dissociated or free in vast numbers. And the long-known connection between heat conductivity and electric conductivity is found to be thus rationally and quantitatively accounted for.

Furthermore, the regular gradation of electric properties exhibited by the elements in Mendeleef's classification can be stated electrically, in a way that certainly suggests an approximation to the truth. Each octave has an electro-positive and an electro-negative end, the most extreme members being at the ends, and an almost neutral body in the middle, of each series; and in the step from the extreme electro-positive of one octave to the extreme electro-negative in the next, an intermediate halting place of a neutral and quite inert body is now known, by the discovery of the argon-krypton-xenon series.

The atoms of the electro-negative set are those which can easily make room for, and have acquired, extra electrons—more than properly belong to their constitution; these are the non-metals, and are chemically active on that account. The atoms of the electro-positive variety are those which easily lose, and have lost, some of their electrons—thereby becoming good conductors by reason of the loose electrons which they have let go; these are the metals. A strong electric attraction naturally exists between members of the electro-negative and the electro-positive group, because they are oppositely charged; and the clinging together of these atoms, under electric attraction, constitutes chemical combination. Conducting power usually disappears after combination, except the variety of it, which may be brought about by the dissociation or breaking up of the compound molecules.

The epithets positive and negative, which from the electrical point of view seem so interchanged and inconvenient, from the material point of view get right again. For the atom which is hungry for more electrons and has absorbed them is electro-negative; while the atom which has a surplus and has extruded some is electro-positive. A tetrad can be either the one or the other. In methane the carbon is presumably acting as a negatively charged body. In carbon tetrachloride the carbon is presumably acting as a positive. Chlorine seems to have much more residual affinity than hydrogen has, and accordingly the molecules tend to cling together, and the substance is a liquid instead of a gas.

Once more I repeat that the term in Van der Waal's famous formula $\frac{a}{v^2}$ or Laplace's *K*, is the liquefying force, and is a measure of this outstanding affinity; it is determined by the latent heat of evaporation, or to some extent by the boiling point and the critical point.

Bleek-Love Electric Battery.

Since the original description appeared in these columns of the remarkable invention patented by Messrs Bleek and Love, of Brisbane, a paper on the subject was read before the Australasian Association for the Advancement of Science at its meeting in the North Australian city. The new thing in that paper was the statement that a third test had been made—in addition to those of Professor Lyle and Mr. Badger—by a new method, naming the ingredients, not known at the time of the former tests. This third test was conducted by a capable electrician, Mr. B. O'Connel, and showed a larger output than the very satisfactory ones previously disclosed. The inventor thus concluded his paper:—To the unskilled in electrical knowledge, the importance of a discovery of this nature would hardly appeal, but when the writer assures that person of the benefits that will accrue ultimately from the cheap and instant production of a powerful and constant electric current, its importance will become manifest. Electric lighting for private houses, vehicles, boats, or for decorative purposes will be instantly available to any unskilled person who is capable of filling an ordinary kerosene lamp; surgical operating, and exploring lamps, surgical cauteries, and similar instruments, will be effectively and cheaply provided with current. X ray induction coils, and cinematograph machines can be operated in the distant country towns, when there is no dynamo current available. The domestic sewing machine, fan motors, dental engines, and all kinds of small motors can be effectively worked with an installation of four cells. One small cell will provide a reading lamp or bed light, which is absolutely safe and without danger from fire, for a period of about 60 to 70 consecutive hours, at a cost of a few pence. In conclusion, it must be understood that no electric current chemically produced can compete with that produced by the dynamo, especially where coal is so cheap as in Australia, but in the thousands of country towns and villages throughout the world, where there is no power depot, the discovery made by the writer should prove a real boon to mankind.

Edison and the British Labour Market.

A correspondent of the *Times*, having visited the great inventor at his laboratory in New Jersey, reports him as having said: "Here I've had to close down my phonograph factory in England—what's the name of the place? I've forgotten; somewhere near London. All the others in Europe paying, we couldn't make that one pay. We get good work out of the French and the Belgians and the Germans and Austrians, but the English—no good. Belgians 85 per cent., English 30 per cent." Mr. Edison meant ratio of productive capacity. He went on: "Mind, I'm not speaking of the English mechanic. He's all right; none better in the world. I'm talking of the common labourer—man you pick up on the streets. What is it? Too much booze? Or general deterioration? Or what?" Now, the man who is primarily wanted in a phonograph factory is the skilled mechanic, who makes the machines, not the common labourer who humps the cases. Yet Mr. Edison is reported to have praised the skilled mechanic to the skies—"all right; none better in the world," and denounced the other as a boozer and a degenerate. Out of this dilemma there are only two ways. Either the correspondent failed to understand the usually plain English of the great inventor, or he "faked the par" without ever going near him.

A new process for making an insulator, according to the "Electrical Review," has appeared on the Continent. It resembles ebonite and consists of a mixture of tan bark with one-third of sulphur. The whole is heated until the sulphur melts. The mixture is well stirred and then cooled ,when it takes the form of small black grains. These are put in a pressure mould and heated, the result being a block of insulating material of any form.

For more than a year past Dr. S. Leduc, of the Medical School of Nantes, has been engaged upon experiments connected with the possibilities of the use of electricity for the slaughtering of animals for food consumption, and with good results.

The term electriculture has been applied to the use of electricity as an aid in the cultivation of plants and vegetation, and it would appear, from the reports circulated at intervals from various sources, that in this there is offered an attractive field for research with every promise of distinct beneficial results being achieved.