the same property, (not by polarisation, as stated by Bec­querel), as light and heat which have passed through ab­sorbing media.@@1 We have no doubt, therefore, that cur­rents which have passed through plates of metals, will have thus acquired, or have possessed previous to their separa­tion, other properties than that of passing more freely through other metallic plates.

From the preceding results, M. Delarive has explained the difference between the effects of a pile with a small number of couples, and a pile with a larger number. The first produces more easily the effects which took place when the circuit is closed by a very good conductor, while the second may be best employed in producing phenomena which take place in the circuit of an imperfect conductor, such as a fluid, the transmitted currents in the latter case having acquired, in passing through a greater number of plates, a greater facility of traversing an imperfect con­ductor.

As the intensity of the electric current had been found to increase with the surface, acted upon by the fluid, M. De­larive endeavoured to determine the law of increase. He found that an increase of surface facilitated the transmission of the current ; that the augmentation of intensity produced by a greater extent of surface, increased in a *greater ratio than the surface* when the current is *feeble,* and in a less ratio when the current is intense ; so that we gain more by increasing the surface when the current is weak than when it is strong.

With regard to the influence of fluid conductors in di­minishing the intensity of the electric current, Μ. Delarive found that nitric acid diminishes the intensity least, then muriatic acid, then sulphuric acid. Nitric acid, pure and greatly diluted, produces a less diminution than concen­trated acid. The contrary takes place with sulphuric acid, which is a bad conductor. The silver solution came next, then potash and ammonia, which differ little from each other.

For further information on the subject of this section, see Marianini, *Saggio di Experience Electromotriche,* Ve­nice, 1825 ; *Ann. de chirn. er de Phys.* tom. xxxvi. p. 33; xxxvii. p. 256 ; xxxviii. pp. 49, 337 ; xlv. p. 2 ; Delarive’s *Esquisse Historique des Principales decouvertes faites dans l'Electricite,* Geneva, 1823; or in the *Bibl. Universelle* for 1833. See especially Becquerel’s *Traite de l'Elect, et Magnet,* tom. iii.

Sect. III.—*On* *the Production of Light, Heat, and cold*

*by Voltaic Electricity—the Ignition of Wires.*

The phenomena of light and heat, and the ignition of metals and wires by ordinary Electricity, having been fully described under that article, we shall here confine our­selves to the analogous phenomena produced by voltaic currents.

Soon after the discovery of the pile, Van Marum, Pfaff, and Tromsdorff discovered that thin leaves and fine wires of metal placed between the poles of a pile, became incandes­cent. and even burned while conducting the electrical cur­rent; and some time afterwards, M.M. Fourcroy, Vauque- lin, and Thenard observed that piles with large plates de­flagrated metals more powerfully than piles with a great number of plates of smaller surfaces.

It was in England, however, that the calorific and lumi­nous effects of the pile were principally developed. In 1813, the immense battery of the Royal Institution, com­posed of 2000 couples, and exposing 28,000 square inches, enabled Sir H. Davy to produce light and heat of the high­est intensity. When the ends of the wire from each pile terminated in two charcoal points, the most dazzling light passed from the one to the other, and continued for several hours. Platina, sapphire, quartz, and lime, &c., when exposed to this source of heat, were instantly melted, and the dia­mond and charcoal disappeared, as if they were completely volatilised ; and these effects were produced in vacuo as well as in air.

By means of the splendid battery described in a preced­ing part of this article, Mr Children obtained many impor­tant and curious results. His experiments commenced in 1809, but it was in 1815 that he brought into play the powerful instrument which we have already mentioned. He found that metallic wires connecting the two piles of the battery became red-hot in the following order :—

Platinum. Copper. Zinc. Iron. Gold. Silver.

And hence Mr Children concluded, that the conducting power of these metals was in the inverse order, silver being the most conducting, and platinum the least.

With this battery, five feet six inches of platinum wire, 0∙11 inch in diameter, were brought by Mr Children to a red heat throughout, so as to be visible in day-light.

Eight feet six inches of platinum wire, 0∙44 inch in dia­meter, were heated red.

A bar of platinum 1/6th of an inch square, and 2∙25 inches long, was heated red, and fused at the end.

The oxides of tungsten, uranium, cerium, titanium, and molybdenium, were fused. Having filled an opening in an iron wire with diamond powder, the diamond disappeared, and the iron was converted into steel.@@2

At the same time that Mr Children was constructing the greatest voltaic battery ever made, Dr Wollaston was occu­pied in constructing the smallest. He took a small thimble, and having removed the bottom, he flattened the remaining cylinder, till its sides were about 1/6th of an inch distant. He then placed between these two surfaces a small plate of zinc, which did not touch either side of the thimble. With a platinum wire about 1/40th of an inch long, and 1/3000dth of an inch in diameter, he united externally the plate of zinc with this thimble ; and when this little galvanic couple was immersed in acidulated water, the platinum wire be­came red-hot, and was melted ! This important result led Dr Wollaston to the valuable conclusion, that in order to ob­tain powerful calorific effects, we must increase the surface of the copper in negative metal.

In repeating the experiments of Davy on the light de­veloped by charcoal points, Μ. Brandes discovered that this light, like that of the sun, affected the combination of chlo­rine and hydrogen, and the decomposition of muriate of sil­ver and other bodies.

By means of the powerful voltaic battery, which Dr Hare calls a *deflagrator,* and which we have already described, this able chemist obtained some splendid results. A bril­liant light, equal to that of the sun, was produced be­tween charcoal points ; and plumbago and charcoal were fused by Professors Silliman and Griscom. By a series of 250, baryta was deflagrated ; and a platina wire, 3/16ths of an inch in thickness, “was made to flow like water.” In the experiments with charcoal, the charcoal on the copper side had no appearance of fusion, but a crater-shaped ca-

@@@1 Μ. Becquerel, to whose excellent work we are indebted for the latest and best information on this subject, asks, “ if we will from analogy say, that the current, in traversing different plates, *acquires* a polarisation similar to that of light.’’ Certainly not. When while light passes through a certain thickness of any coloured medium, or any similar number of coloured plates. It loses a certain portion of its rays, say 9-10ths, and the transmitted light is red. Now, this *red* light may be transmitted through the same number of the same plates, and yet not lose 1-10th of its light ; but there is no polarisation. The first plates absorbed all the rays but the red. and having the pro­perty of transmitting the red rays freely and more copiously than any other, they passed through in greater abundance. As these transmis­sions are all at a vertical incidence, polarisation can have nothing to do with the matter.

@@@‘ See Phil. Trans. 1815.