bar of αiv, *b*iv*,* of bismuth and antimony united at S'. A graduated scale is placed behind the thermometer tube E'. The current of the pile P is received by copper conductors F, G.

If we now place wires of different metals between the thermo-electric pincers F, H, and vary the intensity of the current, we shall observe a rise of temperature when the conductors are homogeneous, the heat being the same throughout the whole length of the wires, with the excep­tion of their extremities, where it increases or diminishes according as the pincers which retain the wire are worse or better conductors than itself. When copper pincers are used, a depression of temperature is felt at the distance of two or three centimetres, according to the intensity of the current. M. Peltier has found that when the current has double the intensity, or when the section of the con­ductor is one-half, the temperature is tripled. The results obtained by Μ. Peltier tend to prove that the two elec­tricities produce heat by their union, however feeble be their intensities.@@1

We shall now conclude this article with a description of two thermo-electric instruments, viz. Μ. Peltier’s thermo-electric hygrometer, for determining by the change of temperature whether a solution or a chemical combination has taken place when two bodies are brought into con­tact, and Mr Locke’s thermoscopic galvanometer. M. Bec­querel had long ago shewn that when a simple solution takes place, no electrical effect is produced, but that when two substances chemically combine, positive electricity passes from an alkali to an acid, and negative electricity from an acid to an alkali. The nature of the electric wires therefore determine by means of a multiplier, whether combination or simple solution has taken place. But as a change of temperature also takes place, M. Peltier has employed this as the means of deciding whether solution or combination has taken place, cold being produced in the one case, and heat in the other. This hygrometer is shewn without the galvanometer in fig. 95, where A is a wooden disc for supporting the thermo-electric couples, being itself supported by a rod and a bar ; B, B, B, three couples of bismuth or antimony forming the thermoscopic support ; W, W, the wires leading to the multiplier ; D, a platina capsule filled with dis­tilled water, which is to be placed on the couples ; E E, a cylinder of card ; and F F, a glass receiver open at top, but surrounded with paper to prevent radiation. When distilled water is placed in the capsule. Its spontaneous evaporation produces a depression of temperature which varies ordinarily from 40° to 60°@@2. As this apparatus is very sensible, the needle of the mul­tiplier arrives rapidly at 90° ; but this inconvenience is removed by placing in the circuit supplementary conduc­tors, which diminish the intensity of the current, and bring back the needle to the first 20°. Tables are then

formed which give the ratio between the deviations of the needles, the intensities of the current, and the differences ; a very extended scale is thus formed which may begin at 150° above zero, and descend indefinitely. To compare this instrument, we have only to determine the extreme dryness produced with muriate of lime placed in a close vessel. When the saturation of the air produces no evapora­tion, the capsule remains at the surrounding temperature, and the needle at zero. When we have determined the force corresponding to the number of degrees given by ex­treme dryness, we divided this force into 100 parts, corres­ponding to 100 degrees of ordinary hygrometers.

Dr Locke, professor of chemistry in the medical college of Ohio, has lately constructed a new thermoscopic gal­vanometer, the peculiarity of which is the massiveness of the coil, which affords a free passage to currents of the most feeble intensity, and enables them to deflect a very heavy needle. The coil is made of a copper fillet about 50 feet long, one-fourth of an inch wide, 91/3 thick, and weighing between 4 and 5 pounds. This coil is not made in a pile at the diameter of the circle in which the needle is to re­volve, but is opened out, the several turns lying side by side, and covering almost the whole of that circle above and below. It is wound closely and in parallel turns on a circular piece of board 11½ inches in diameter, and half an inch thick, covering the whole of it except two small op­posite segments of about 90° each. The board being ex­tracted, leaves a cavity of its own shape, to be occupied by the needle. The copper fillet is not covered with silk or any other coating, but the turns of it are separated at their ends by veneers of wood just so far as to prevent contact throughout. The coil is supported on a wooden ring with brass feet and levelling screws, and surrounded by a brass hoop with a flat glass cover, in the centre of which is in­serted a brass tube for suspending by a silk fibre, one of No- bili’s double astatic needles, each part being about 11 inches long, one-fourth of an inch wide, and 1/60th thick. The lower part plays within the coil, and the upper part above it, and the thin white deal placed upon it. This instrument is pecu­liarly fitted for experiments in a class. It is very sensible to a single pair of thermo-electric metals, to the action of which it seems peculiarly adapted. With a battery of five couples of bismuth and antimony, the radiation of a person 12 feet distant, without any reflector, and when the tem­perature of the air was 72°, moved the needle sensibly. If a thermo-electric pile, massive in proportion to the coil, is used, this thermoscope would exhibit the experiments of Melloni satisfactorily to a large class. A more detailed account of this instrument will be found in the London and Edinburgh Philosophical Magazine, October 1837, vol. xi., p. 378.

For further information on thermo-electricity, and the other subjects of which this article treats, the reader is re­ferred to Μ. Becquerel’s admirable work, entitled *Traite Experimentale de L'Electricité et du Magnetisme, et de leurs rapports avec les phenomenes naturels.* Five volumes; i. and ii., Paris 1834 ; iii., 1835 ; iv., 1836 ; and v, 1837.

VOLTAIRE, François Marie A rouet de, one of the most celebrated writers of modern times, was born at Paris on the 20th of February 1694. His father, François Arouet, was “ ancien notaire au Chatelet,” and treasurer of the chamber of accounts ; his mother was Marguerite d’Anmart. At the birth of this extraordinary man, who lived to a great age, there was little probability of his being reared, and for a considerable time he continued remarkably feeble. In

his earliest years he displayed a ready wit and a sprightly imagination ; and, as he said of himself, made verses before he was out of his cradle. He was educated under Father Poré, in the College of Louis the Great ; and such was his proficiency, that many of his essays are now existing, which, though written when he was between twelve and fourteen, show no marks of juvenility. The famous Ninon de l'Enclos, to whom this ingenious boy was introduced,

@@@, Μ. Becquerel’s Traité, &c., tom. iii., p. 165, and v., p. 286.

@@@, The degrees of the galvanometer we presume. Μ. Becquerel’s Traité, &c., tom. v., p. 243.