|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Names of Sub­stances.** | **Diameter of wire.** | **Length of wire submitted to experiment.** | | | | **Conductibi­lity, that of mercury being 100.** |
| **Palladium** | **Millim.**  **0∙l76** | **Millim. 1900** | **Millim.**  **1200** | | **Millim.**  **500** | **5791** |
| **Silver 963, pure.** | **0∙l74** | **2000** | **1500** | | **200** | **5152** |
| **— 900** | **0**∙**194** | **2000** | **1500** | | **200** | **4753** |
| **— 857** | **0**∙**178** | **1200** | **800** | | **400** | **4221** |
| **— 747** | **0∙179** | **1200** | **600** | |  | **3882** |
| **Gold, pure** | **0**∙**176** | **1000** | **500** | |  | **8975** |
| **— 951** | **0**∙**176** | **600** | **300** | |  | **1838** |
| **— 751** | **0**∙**176** | **400** | **206** | |  | **714** |
| **Copper, pure ...** | **0∙I82** | **2000** | **1000** | | **500** | **3838** |
| **— unmelted.** | **0**∙**182** | **2000** | **1000** | | **500** | **3842** |
| **Platinum** | **0**∙**186** | **800** | **600** | | **300** | **855** |
| **Brass** | **0∙l82** | Limits of conductibility. | | | | **1260** |
| **900** |
| **Steel, melted ....** |  | **Ditto.** | | | | **800** |
| **500** |
| **Iron** |  | **Ditto.** | | | | **700** |
| **650** |

Hence it appears that *palladium* is the best conductor of thermo-electricity, and *mercury* the worst, having *sixty* times less conductibility than palladium. That which lias a slight effect on the conductibility of mercury produces a prodigious variation in that of iron or steel. Even the heat of the hand produces very sensible effects, and what M. Pouillet justly thinks still more wonderful, the heating to redness of some millimetres of the length of a wire of iron or steel, is sufficient to make its conductibility *three* or *four* times less.

When thermo-electric currents are produced by a single element, and the thermo-electric power remains the same, M. Pouillet found that the intensity of the current which it produces, is inversely as the length of the circuit, and directly as the conductibility of the wire or rod which forms the current. He found, also, that in a thermo-electric cir­cuit, composed of wires of different sections, the elemen­tary force of the current is the same in all powers, if we take equal intervals on these different wires the direct cur­rents will be found to have different intensities, which are nearly in the inverse ratio of the sections of the wires in the intervals of deviation. M. Pouillet succeeded, also, in establishing the curious fact, which had been recognised by M. Marianini,@@1 that several electric currents propagate themselves in the interior of bodies, as if they were alone, like light and heat.

The first persons who succeeded in constructing thermo­electric piles, were MM. Nobili and Melloni, who employ­ed them successfully in their experiments on radiant heat. This instrument, however, has since been improved by Melloni, and we shall, therefore, describe it in preference af­ter Μ. Becquerel. M. Melloni constructed his thermo-elec­tric pile of fifty small bars of bismuth and antimony placed in a bundle, as shewn in fig. 90, the length of the bundle being 30 millimetres, and its section 96 centimetres square. The two terminal faces are blackened. The bars of bis­muth, which alternate with those of antimony, are soldered at their extremities, and separated throughout their whole lengths by an insulating substance. The first and the last bar have each attached to them a copper wire, abutting against one of the pins *c*, *c'*, of the same metal, passing through a piece of ivory fixed in the ring AA'. The in­terval between the interior surface of this ring and the ele­ments of the pile is filled with insulating matter. The free extremities of the two wires communicate with the ends of the wire of a multiplier, the needle of which indi­cates when the temperature of the anterior face of the pile rises or falls above that of the posterior face. Two metal­lic tubes B, B, polished without, and blackened within, are fitted to the two ends of the pile, to protect them from la­teral radiations. The multiplier is shewn in fig. 91, where AB*c* is the frame enveloped by the copper wire, whose extremities abut against the metallic tubes FF', fig. 92. This frame is fixed on a horizontal stage DE, which can turn in its own plane, and round its centre, by means of a toothed wheel and pinion placed below, and moved by the milled head G.

MN is the support of the astatic system of the two magnetic needles, suspended by the silk fi­bre VL, and the cylinder of glass RS covers the apparatus, and rests on the base KL Fig. 92 is a section of the ap­paratus, by a plane passing through the sup­port, and one of the tubes of communica­tion. The needles are 53 millimetres long, the diameter of the copper wire is 0.76 mm., and it is doubly covered with silk, and makes 150 cir­cumvolutions round the frame, which is 6 mil­limetres high, having its length a little great­er than that of the needles.@@2

We have already seen that thermo-electricity possesses the same ge­neral characters as common and voltaic electricity. Although Oersted failed in obtaining chemical action from his thermo-electric combinations, yet Professor Botto@@3 of Turin subse­quently decomposed acidulated water. His apparatus con­sisted of a metallic wire or chain, composed of 120 pieces of platinum wire, each an inch long, and 1/100th of an inch in diameter, alternately with the same number of pieces of soft wire of thesamedimensions. This chain was wrapped spirally round a wooden rule 18 inches long, so that the joints were placed alternately at each side of the ruler, receding from the wood at one side to the distance of four lines. By using a spirit-lamp the same length as the helix, and a No- bili’s galvanometer, a very energetic current was shewn to

@@@\* Ann. de Chim., &c. tom. xlii. p. 131.

@@@, Becquerel’s Traité, &c. torn. iii. p. 425.

@@@3 Bibliothèque Universelle, Sept. 1832.