was brought to a point, and after it was made red hot by a spirit lamp, he pressed it against the cold extremity of the other cylinder, when he found that a current was esta­blished from the hot extremity to the cold one. This ef­fect, as M. Becquerel states, arises from the mutual reaction of the two portions of water of different temperatures.

It did not escape the sagacity of Dr Seebeck, that the thermo-electric current might be increased, by forming a compound thermo-electric current, and arranging the me­tallic couples in a series analogous to those in the voltaic circuit. Having met, however, with some obstacles in this part of his inquiry, he discontinued the investigation, which was taken up without their knowing that he had en­tered upon it, by Baron Fourier, and Professor Oersted. They first employed a hexagonal combination of three pieces of bismuth, and three of antimony, soldered togeth­er. One side of the hexagon was placed in the magnetic direction, and a compass put below it. *One* of the junc­tions was then heated, then *two,* not adjacent. then *three,* al­ways leaving one junction not heated between the two heat­ed ones. By heating *one* junction the needle deviated some degrees, still more by heating *two,* and still more by heat­ing *three* junctions. When *three* junctions were cooled with ice, the other three having the ordinary temperature of the atmosphere, effects still more distinct were produc­ed. When *three* alternate junctions were *heated,* and the other *three* cooled with ice, the needle deviated sixty de­grees.

In a rectangular circuit, with twenty-two bars of anti­mony, and twenty-two of bismuth soldered together, the same effects were obtained. After dissolving one of the junctions, a little mercury cup was soldered to each of the disjoined bars, so that the circuit could be re-established by different means. A copper wire, four inches long, and l-25th of an inch in diameter, nearly re-established the current ; and it was completely re-established by two paral­lel pieces of the same ware. A wire of the same diame­ter, but *three* feet long, was found a tolerably good con­ductor ; but a platina wire, about sixteen inches long, and 1-50th of an inch in diameter, scarcely transmitted a *forti­eth* part of the effect. Acids, and solutions of alkalies, and other metallic oxides, though good conductors in the vol­taic or hydro-electric circuit, insulated entirely the thermo­electric current. The same effect was produced by two discs of silver, separated by the thinnest blotting paper, moistened with sulphate of copper. In these experiments, the intensest current produced no chemical effects, no ig­nition of the wires, and no electric condensation ; but a prepared frog was made to palpitate.

In thermo-electric currents, which differ only in lengths, the shortest is the most powerful, a circuit of double length having little more than half the effect. In order to find the law of increased effect, as depending on the num­ber of junctions, Professor Oersted composed circuits of equal length with different numbers of junctions.

In fig. 86, is shewn a simple circuit consisting of one bar, *a a,* of antimony, and one, *b b,* of bismuth, and in fig. 87, a complex circuit of the same length and materials. When one of the junctions in fig. 86 was heated or cooled, and two of the junctions at the extremities of the diagonals in fig. 87. heated or cooled to the same degree, the devia­tion of the needle was 22° in the first case and 30° in the second.

In like manner, open circuits, as in figs. 88, 89, having each the same length, but double that of the preceding two, had, the one *one* junc­tion, and the other *three* junctions, heat- or cooled equal­ly, the first gave a deviation of about 14°, and the other nearly 32°.

“ In several complex circuits,” says Professor Oersted,@@1 “ it is found that the heating or cool­ing of one junc­tion only produces twice the angular deviations of that add­ed by the addition of one active junction more. The effect of one active junction, when the others are at rest, is, by experiment, found to be twice the effect of all the arrange­ments divided by the sum of the elements + one. The effect of each addition of a new active junction is only *half* this quantity, and seems even to be in a decreasing ratio when the number of junctions is great.”

From these and other observations. It appears that the thermo-electric current produces a prodigious quantity of electricity, but in a state of very feeble intensity, while the voltaic current has a very great intensity. The for­mer is impaired by the resistance opposed to it by a long multiplying wire, while the latter is increased in surmount­ing this resistance. Μ. Pouillet has endeavoured to com­pare the intensity of these two currents, by passing the hy­dro-electric current through a platinum wire long enough to reduce it to an intensity which will just balance the thermo-electric current. In one case he found that 590 feet of platinum wire, ∙006 of an inch in diameter, including the resistance of the battery, reduced a hydro-electric current, produced by twelve pair of plates with double coppers, to an equilibrium with that of one thermo-electric pair of bis­muth and copper, in a circuit of 65∙6 feet of copper wire, ·039 of an inch in diameter, with a difference of tempera­ture of 76° Fahrenheit. By computing the rotation be­tween the electro-motive forces and the resistance in these two cases, he found that the hydro-electric current had an intensity 114,000 times greater than that of a single pair of bismuth and copper, produced by a difference of tempera­ture, between the two junctions, of 108’ of Fahrenheit.@@2

In order to compare the conductibility of metals for thermo-electro currents, M. Pouillet@@3 employed *two* equal thermo-electric currents. The *first* was weakened by making it traverse the metallic wire submitted to experi­ment, and the *second* was weakened precisely the same quantity, by traversing lengths, more or less great, of an­other wire, which served as the term of comparison. The following table shews the results of this comparison, the conductibility of pure mercury being reckoned 100.

@@@1 Edinburgh Encyclopædia, Art. Thermo-Electricity, vol. xviii. p. 585.

@@@a Becquerel’s Traité, tom. v. p. 27.

@@@• Elem. Phys. Exp. liv. v. chap. v. § 426.