

characteristic thermo-electric curves by their sudden changes in magnitude and direction. Then the maximum voltage occurs when the difference of temperature is greatest; for such is the case on starting and stopping the gas (on starting, the pot becomes hot while the alkali remains relatively cool, and on stopping, the pot becomes cool while the alkali remains hot), which causes a great difference of temperature between the rod and the pot; this also shows a thermo-electric characteristic.

Also the addition of air would, if the action was chemical or galvanic, add oxygen and cause the curves of volts to become more negative, but this result is disproved in all the curves where air was used, and especially in *Plate VII*, where sodium nitrate was added, which held so much easily available oxygen, the curve being, in fact, positive instead of more negative.

Then again, the addition of air, air much colder than the melted alkali within the pot, would, if the action was thermo-electric, cause the voltage to be greater at starting and stopping the experiments than if it were not used, and also than during the interval between starting and stopping, a result shown just as expected in all the curves where air was used when compared with those in which the air was not used. Mr. Reed also stated that when ordinary illuminating gas was injected into the pot, no different results were obtained. Why should they be? Cold gas will cause the same effect as cold air if the action is thermo-electric, and not galvanic. That it is thermo-electric these experiments seem to conclusively prove.

The E.M.F. shown in this paper is much smaller than that stated by Jacques, and reported by other observers. The cause of this is probably due to the small diameter of the pot used, and to the very gradual and even heat employed, which greatly tended to lessen the differences of temperature between the two electrodes, that is, between the rods and the iron shell of the pot, for it is this difference only which causes the E.M.F. observed, according to the views put forth in this paper.